THE ENGLISH CONVICT

A STATISTICAL STUDY

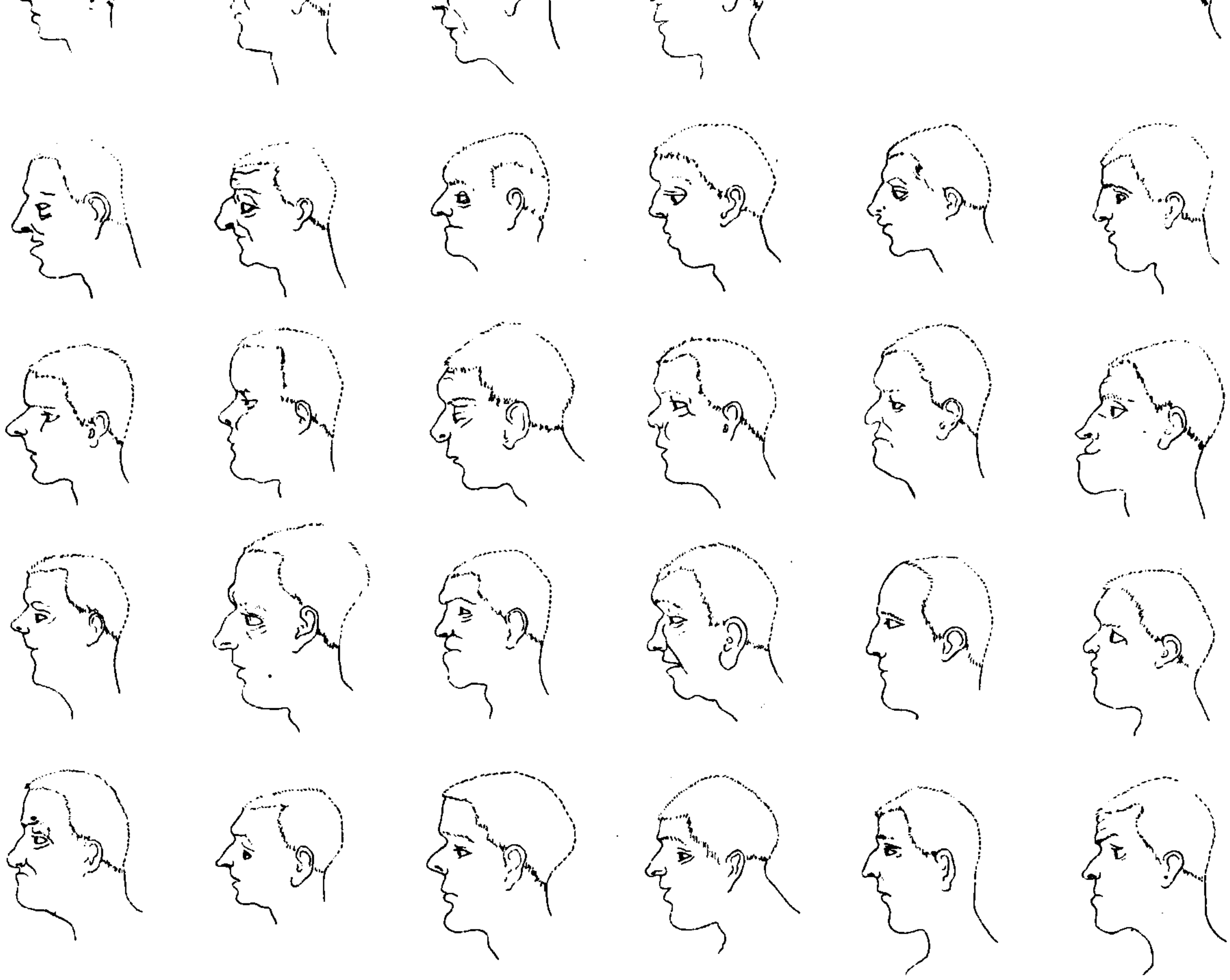
BY

CHARLES GORING, M.D., B.Sc. Lond.,
Deputy Medical Officer,
H.M. Prison, Parkhurst.

LONDON:
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.
To be purchased, either directly or through any Bookseller, from
WYMAN and SONS, Limited, Fetter Lane, E.C., and 54, St. Mary Street, Cardiff; or
H.M. STATIONERY OFFICE (Scottish Branch), 23, Forth Street, Edinburgh; or
E. PONSONBY, Limited, 116, Grafton Street, Dublin;
or from the Agencies in the British Colonies and Dependencies,
the United States of America, the Continent of Europe and Abroad of
T. FISHER UNWIN, London, W.C.

PRINTED BY
DARLING and SON, Ltd., Bacon Street, E.
1913.

Price Nine Shillings.



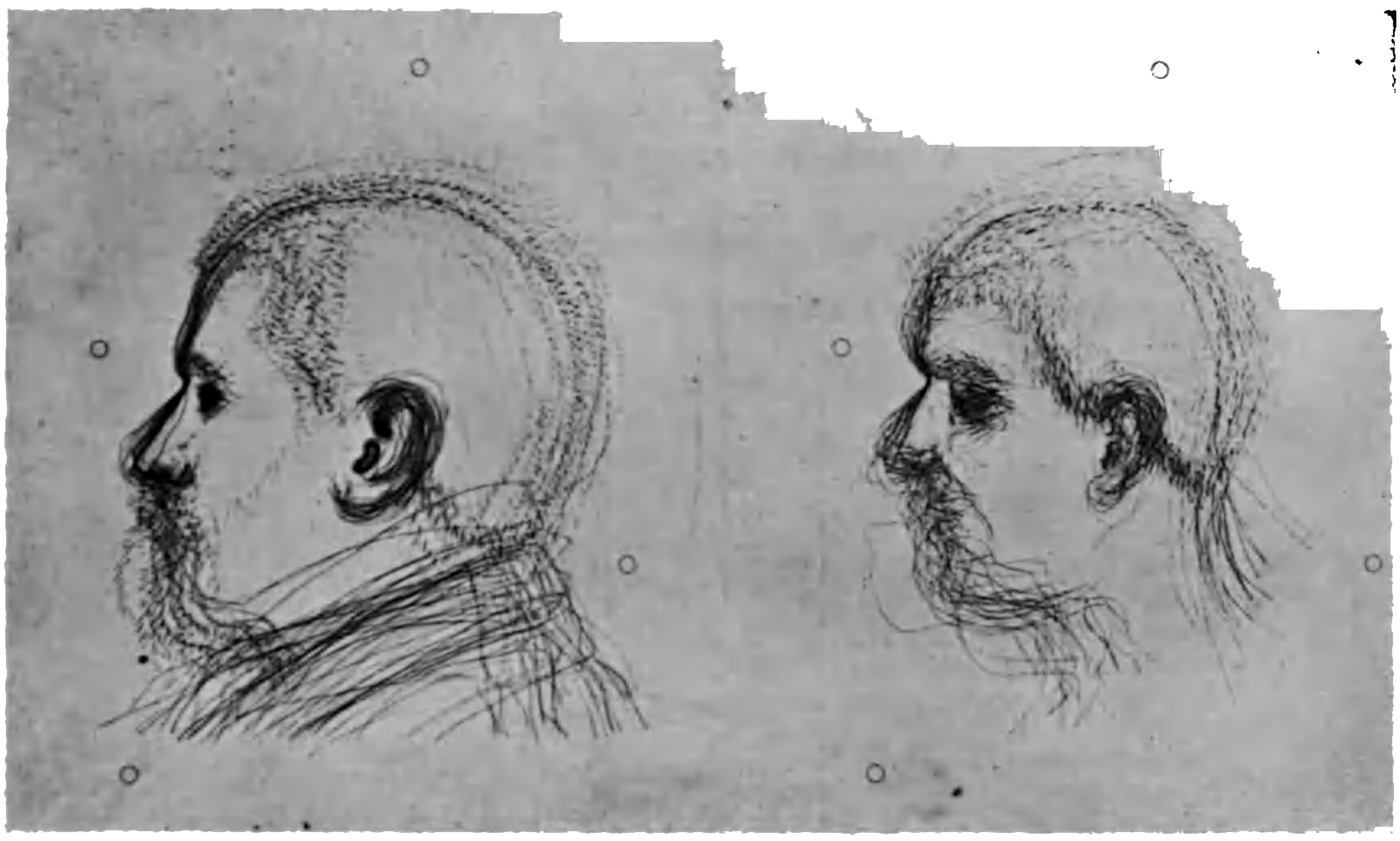
PHOTOGRAPHIC PORTRAITS OF 30 ENGLISH CRIMINALS.

2093 23341 322 (39) 2000 2 13

Malby&Sons, Lith.

COMPOSITE PORTRAITS.

30 CRIMINALS.



Photographic Portraits. *Imaginative Portraits.*

The series of 30 imaginative outline profiles were taken from Havelock Ellis' book on "The Criminal," wherein it is stated that they were "reproduced from sketches made by Dr. Vans Clarke at the model prison of Pentonville," and that the heads they depict are "by no means very exceptional, and represent at the least 10 per cent. of the criminals examined." Dr. Clarke also affirmed that "the sketches were necessarily taken in haste, but they were true, and were considered to be successful as likenesses"; and adds that he "was compelled to make a selection rather from want of time than from the lack of material." In the above reproductions, the only modification on the original drawings is that the distance between the base of the nose (nasion), and the centre of the ear (*i.e.*, of the auditory meatus), has been made of the same length in each outline: a modification
ove.

The series of 30 photographic outline profiles were traced from a corresponding series of photographs which were selected at random from the official stock of portraits at Parkhurst. Through the medium of a were enlarged on a
ose and the centre of the ear, in each outline; and the tracings, thus obtained, were subsequently reduced by photography to the dimensions presented above.

The composite portraits consist of the corresponding 30 outlines superimposed. This was achieved by tracing them successively, one on the top of the other, through carbon paper; each outline having been first adjusted so that the line between the nasion and the centre of the ear lay exactly in the same position.

An examination of these contrasted outlines shows most strikingly the difference between "criminal types," as registered by the mechanical precision of a camera, and as viewed by the imagination of an enthusiastic, but uncritical, observer.

CONTENTS

PART II.

CHAPTER I.—THE PHYSIQUE OF CRIMINALS.

CHAPTER II.—AGE, AS AN ETIOLOGICAL FACTOR IN CRIME.

CHAPTER III.—THE CRIMINAL'S VITAL STATISTICS.

(27042—1.) Wt. 23341—322/29. 1000. 7/13. D & S.

CHAPTER IV.—THE MENTAL DIFFERENTIATION OF THE CRIMINAL.

CHAPTER V.—THE INFLUENCE OF THE "FORCE OF CIRCUMSTANCES" ON THE GENESIS OF CRIME.

CHAPTER VI.—THE FERTILITY OF CRIMINALS.

CHAPTER VII.—THE INFLUENCE OF HEREDITY ON THE GENESIS OF CRIME.

PREFACE.

In presenting what Dr. Goring calls a "Statistical Study of the English Convict," a short preface is necessary describing the origin and purpose of the work.

In 1901, Dr. Griffiths, Deputy Medical Officer of Parkhurst Prison, formed the idea of subjecting a large number of prisoners convicted of certain similar offences to accurate measurements in order to ascertain whether these showed any deviation from what might be described as the normal, *i.e.*, non-criminal persons. His work came under the notice of Sir B. Donkin, M.D., the Visiting Director, and Sir. H. Smalley, M.D., the Medical Inspector of Prisons, and on their advice it was decided to extend the observations systematically to the general body of convicts without selection. In this way it was thought that very valuable records would be obtained, whereby the many hypotheses advanced by the different schools of criminology, and especially the Italian School, might be either confirmed or refuted, at least so far as the male occupants of the convict prisons of England and Wales were concerned.

As the result of discussion between the Medical Authorities of the Department, a tabulated form was prepared by Sir H. Smalley, who deserves great credit for the care and labour given by him at this stage of the work. He was ably assisted by Dr. Griffiths, Dr. East at Portland, Dr. Forward at Dartmoor, Dr. Cooke at Borstal, and Dr. Griffiths at Parkhurst kindly undertook the onerous task of the examinations, and recorded the observations on the same lines.

The scheme was finally started in June, 1902, the intention being to take the observations consecutively on all those sentenced to penal servitude after the 1st June in rotation, until the number deemed sufficient for the main purpose of this inquiry, viz. : 3,000 individuals, had been obtained. As the measurements of each prisoner, voluntarily undertaken by the medical observers and carried out entirely at such times as could be spared from their regular duties, necessarily involved much time, it soon became evident that some years would elapse before the detail of the observations was complete. In 1903, Sir B. Donkin was desirous of calling attention to the importance of the work, and brought the matter to the notice of the late Dr. W. R. F. Weldon, Linacre Professor at Oxford, then joint editor with Professor Karl Pearson ot University College, London, of "Biometrika," the well-known journal concerned in the statistical study of biological problems ; and a small set of selected observations by Dr. Griffiths on 100 ordinary and 30 lunatic convicts was published in that Journal (Vol. 111, Part I., 1904).

No conclusions, of course, were attempted to be drawn from this small number of observations which were published only with a view of showing what was being undertaken in the convict prisons of England and Wales.

The observations went on, changes in the *personnel* of the prison medical staff took place, Dr. Watson replacing Dr. East at Portland, Dr. Pitcairn replacing Dr. Cooke at Borstal, and, most important of all, Dr. Goring replacing Dr. Griffiths at Parkhurst. Dr. Goring from the time of taking up the work, threw himself heart and soul into the scheme, and of the total number—3,000—he himself made 1,500 observations, and 300 other supplementary sets. He also collected the numerical data of the 800 contour tracings of heads. At the end of the year 1905, a considerable amount of material having accumulated at the various prisons, the question was mooted as to how these should be collected together as a whole and arranged for printing. Dr. Goring offered, most kindly, to undertake this formidable task, and on it being found possible to have the printing of the data carried out in the printing establishment at Parkhurst, the matter was placed under his direct supervision. Up to this time, the investigation had been carried out in two distinct parts or tables, but Dr. Goring, after a short time, came to the conclusion that this multiplied the work so greatly and made the manipulation of the figures so much more intricate and laborious that it was highly desirable to recast the order of the data and amalgamate the two tables into one series, making use of symbols in order to compress the size of the printed tables into reasonable dimensions. This herculean task Dr. Goring offered to do, and after discussion, it was agreed to by Sir B. Donkin and Sir H. Smalley. At the same time, some other items were added, culled from the penal and medical records in this office and the prisons.

Finally, in 1908, the printing of 1,000 copies of the data was most successfully accomplished, much credit being due to Dr. Goring for his untiring zeal and industry, to

Principal Warder Rodway, in charge of the printing shop, and to the prisoners who set up the type under their supervision.

In the meantime, the advice of Professor Karl Pearson had been sought with regard to the printing and the form the tables should eventually take, and he kindly gave very valuable advice in the matter. Dr. Goring was also permitted to visit the Biometrical Laboratory at University College in order to study the methods there employed in dealing with statistics by the Biometric System. Professor Karl Pearson had expressed a strong opinion as to the great value to sociology and science of the material which had been accumulated, and it was arranged that Dr. Goring should be detached from duty with a view to tabulating the material at University College, with the assistance, and under the direction, of Professor Karl Pearson. It soon became apparent that the scope of the work had grown, perhaps inevitably, far beyond its original purpose, viz.: the refutation or confirmation of the various theories that had been promulgated concerning the existence of the criminal type. It will be seen that the work now embraces a wide range, including not only an analysis of the physical and mental condition of convicts, but also the data for speculations on very difficult and contentious questions as to the relative influence of heredity, environment, &c. Although the Commissioners had not contemplated, in the first instance, a work of this magnitude, they feel it is only fair to Dr. Goring that the work should be published on his own lines, and that the public should be in possession of the mass of information collated, and statistically tabulated by him, and of the conclusions he draws therefrom. It must also explicitly be understood that the Commissioners are not in a position to endorse all the conclusions at which he arrives, or to criticize the method employed in attaining them, as any attempt in this direction would involve an elaborate discussion of matters on which the highest scientific authorities differ.

It is, so far as I am aware, the first attempt that has been made in this, or in any other country, to arrive at results in criminology by the statistical treatment of facts, which in their crude form, as revealed by direct observation, are comparatively without scientific value. Criminality is not a morbid state akin to physical disease which can be diagnosed and established by pure observation. As individuals, criminals possess no characteristics, physical or mental, which are not shared by all people. The only difference is one of degree. The conclusion to which this inquiry points is not a solution of the question whether a criminal is born or made, or whether he is a victim of heredity or environment. It is a question of the extent to which certain constitutional, as well as environmental, factors are present in such a degree as to determine in the case of any individual the fact of imprisonment. Our Author designates these constitutional factors as the "criminal diathesis." There is no direct evidence of it. It is, he believes, common to the whole of humanity, but its existence must be assumed from the phenomenon of crime. The object of this work is then: how far this "criminal diathesis" depends on the physical and mental attributes of the criminal as measured by criminal records, and is associated with environment, training, and stock. It is interesting to note that Sir B. Donkin, in delivering the Harveian Oration for 1910, referred to the extensive inquiry then being undertaken in Convict Prisons, and anticipated from it a confirmation of his own experience which had come to him as a director of Convict Prisons, viz.: . . . . "There are no special qualities, physical or mental, common to all "criminals. The only important link between the study of crime and that of heredity "is the fact that a considerably larger minority of persons with clearly appreciable mental "defect, apparently of congenital nature, is found among convicted criminals than in the "population at large. The notable number of mentally defective persons among criminals "who are sentenced to penal servitude, and are usually the perpetrators of serious crime, "impressed me at the outset of my prison work. Though it is difficult, and often "impossible, to obtain an adequate history of the early life of these men, it is practicable, "from inquiry and from study of the men themselves, to assert with much confidence "that a significant proportion of them are of primarily defective mental capacity, or, as "the old legal phrase has it, are '*a nativitate mente capti.*' This conclusion is arrived at, "independently of their criminalty, from positive indications of mental defect observed in "their conduct, and, in some cases, from certain concomitant physical characters. This "class of mental defectives includes criminals of many kinds. They are, it seems, innately "unable to acquire the complex characters which are essential to the average man, and, "according to their surroundings, they follow the path of least resistance. This path is "more often than not, but by no means always, the path of unsocial or criminal action. "These statements about criminals will appear to be dogmatic, but are, I think, capable "of proof. I have reason for believing that the report of an extensive inquiry now "nearing completion, which has been carried out by the medical officers of our convict "prisons, will go far, in itself, towards their justification. This matter, indeed, is of "importance, not because any serious students of this subject now accept the doctrine of "the so-called science of 'criminology' as aught else than a mass of imperfect and "unclassified observations linked together by untested hypothesis, but because this "doctrine, so much emphasised by Lombroso, Max Nordau, and others, of the hereditary "nature of crime, or, in other words, of the criminal being a racial 'degenerate,' is still "very dominant over the public mind. It is widely popularised at the risk of producing "practical effects, not only by writers of fiction, but also by philanthropists, journalists, "and public speakers on social questions."

Putting aside the part played by the different circumstances affecting criminal man, biologically and otherwise, and without subscribing to the different views and doctrines which, in the opinion of the author, result from the inquiry. the broad and general truth which appears from this mass of figures and calculations is that the "criminal" man is, to a large extent, a "defective" man, either physically or mentally, or, in the words of Sir B. Donkin, is "unable to acquire the complex characters which are essential to the "average man and so is prone to follow the line of least resistance." This truth may not be new or startling. It is advanced now by Dr. Goring as a truth which is scientifically demonstrable and so commanding respect and possessing a value which would not belong to statements based on purely empirical observation. This result may be regarded as modest and even disproportionate to the labour involved, but it is worthy of attainment, for much is gained everywhere and especially in the realm of penology, when definite ideas as to the nature of the problems dealt with are substituted for vague notions, or even illusions, as to the nature of the criminal : notions which, in the absence of detached and scientific inquiry, undertaken, as this has been, from a single-minded desire to search out what is true may have their origin in two quite contrary sources, viz. : an undue pity for the offender or an undue desire to be revenged on him.

Till this inquiry was undertaken, it was not generally known that English criminals are, as a rule, markedly differentiated from the general population in stature and body-weight : thieves and burglars are 90 per cent. of all criminals, and are inferior relatively to other criminals and to the population at large, and puny in their general bodily habit. Dr. Goring believes these facts to be the sole facts of the basis of criminal anthropology, and the only element of truth in the theory of the criminal type. Dr. Goring shows in his Fourth Chapter on the Mental Differentiation of the Criminal that all kinds of criminals show a decadence in general intelligence very similar to the increasing physical defectiveness they exhibit, as we pass down in the economic scale. In every class and occupation of life the feeble-minded and the less physically and mentally able persons tend to be selected for a criminal career.

Quite apart from general incapacity to live up to the required social level which brings them within the meshes of the criminal law, Dr. Goring even suggests that the physical aptitude of evading the police may affect statistics, and the fact is that the weaker and not the stronger man is "run in," although the "criminal diathesis" may be equally strong in each. In any case his conclusion on this point is very emphatic, viz. : that English criminals are selected by their physical condition, and that the one significant physical association with criminality is a generally defective physique ; and that the one vital mental constitutional factor in the etiology of crime is defective intelligence.

This general theory of defectiveness as a general attribute of criminality may be regarded by some as confirmed by the fact that persons convicted of crime are mainly drawn from the lowest social scale ; and it is plausible to infer that physical and mental inferiority is allied to a low economic scale of living. This theory, however, must not be pressed so far as to affect the liability to punishment of the offender for his act. Penal law is, through its prohibitions, the expression of the social standard of life in the country. Where that standard is high, there must be a residuum of individuals whose mental and physical state does not enable them to live up to that standard. They fall below it through constitutional incapacity, which manifests itself in weakness of will and power of resistance. This inquiry goes to show that it may be predicated that with regard to the great mass of offenders coming within the meshes of the criminal law, this *defectiveness*, in its economic sense, is a predisposing cause, and has no necessary relation to definite physical or mental disease. It is a relative term only, relative to a high standard of social requirement to maintain which the law exists. Penal law, wisely and humanely administered, as in a highly civilized State, should apply its sanctions only with regard to the varying characters and capacities of those who come before the Courts. In other words, punishment must be individualized. The tendency towards the individualization of punishment is making marked progress in all the countries of the world, and nowhere more than in this country. In addition to the absolute discretion vested in the Courts and Tribunals, there is a careful classification for purposes of prison treatment, the object of which is to adapt, as far as practicable, the nature of the punishment to the character and antecedents of the offender. Although, therefore, the fact brought out by the inquiry that, on the average, the English prisoner is defective in physique and mental capacity, would seem to call in question the whole responsibility of any person guilty of an anti-social act, yet, if fully and properly understood, it does not mean more than that in a perfect world where the faculties of each would be fully and highly developed, the problem of punishment would not exist; and it would be a cause of rejoicing if the crime of the country could be demonstrated by statistical methods to be the result not of a general perversity pervading all classes, but a tendency only on the part of persons living on a low economic scale to fail on account of physical or mental defectiveness in conforming to the restraints of the criminal law. I regard this as a fair and reasonable explanation of crime generally in this country. It is, at least, an explanation which must fortify and stimulate all those who desire that there shall be fewer persons suffering from those incapacities which predispose to crime, or that, where incapacity is obvious and can be defined, special steps shall be taken not to expose such a person without care or oversight to the conditions of free life, which are likely to be not only ruinous to himself, but dangerous to the community.

It is satisfactory to note that incidentally to its general purpose, the inquiry (1) confirms the idea to which practical effect has been given in recent years by the institution of the Borstal system that the effective way of dealing with crime is to attack those between the ages of 16 and 21, which is shown to be the probable age for enlistment in the criminal brigade, (2) it demonstrates by statistical method that imprisonment does not have the adverse physical and mental results which are often alleged, (3) it confirms the opinion held of the necessity for better care being needed for the mental defective, and, lastly, (4) it shows that it is by consideration of the individual men and women who make up the criminal population that the best solution of the criminal problem is to be found.

Finally, I would wish to express, on behalf of the Commissioners, our deep sense of the devoted work which Dr. Goring has given to his task. His tables and diagrams are presented in an admirable way, displaying great ingenuity in their construction, and indicating the enormous labour bestowed by Dr. Goring and his assistants. We are also under a deep sense of gratitude to Professor Karl Pearson for the generous and unreserved way in which he placed his valuable experience and knowledge at the service of the Commissioners. Whatever opinions may be held as to the value of the work as furnishing scientific validity for its conclusions, a great step forward has been taken, and an attempt made to throw light on the problems of crime by the personal examination of no less than 3,000 convicted men guilty of grave and repeated offences, who for the time being were to be found in the English convict prisons.

E. RUGGLES-BRISE.

August, 1912.

Author's Note.

The statistical reduction of the data, yielding results set forth in the many tables and diagrams of this volume, was carried out in the Biometric Laboratory, of University College, London, between the months of May, 1909, and November, 1911 ; and now, at its conclusion, I wish to acknowledge cordially, and to express my thanks for, the co-operation I have received from the two gentlemen who were appointed by the Government to assist me, Mr. Herbert E. Soper, and Mr. Harold B. Oake, whose disinterested enthusiasm alone enabled the work to be completed by the appointed time. Particularly must I thank Mr. Soper, whose special knowledge of statistical methods, and whose skill as a draughtsman, were whole-heartedly given by him, and utilised by me, in the service of the investigation. I am greatly indebted also to Miss H. G. Jones, of the Biometric Laboratory, who voluntarily assisted me with the arduous task of compiling an index to the work. To Professor Karl Pearson I can perhaps best express my appreciation and gratitude by the mere statement of the fact that without the stimulus of his presence, interest, and counsel, this work, in its present form, could never have been achieved.

C.G.

THE ENGLISH CONVICT.

A Statistical Study.

INTRODUCTION.

I.—The Superstition of Criminology.

The recent application of exact and standardized methods to the study of anthropology has revealed the extent to which this science has been dominated and confused by conventional prejudices and unfounded beliefs. And of these beliefs there seems to be none more deeply rooted, more widely spread, than the conviction that the inward disposition of man is reflected and revealed by the configuration of his body. It would be a lengthy, though not a difficult task, to account for the tenacity of this conviction. Let us content ourselves, for he present, with the statement that the belief does exist, and that it is eagerly supported by the imagination. It is a survival, no doubt, from a multitude of similar *a priori* credulities. It is kith and kin with the misnamed "sciences" of phrenology, chiromancy and physiognomy. Such systems of belief have, for the most part, disappeared; a few of the more cherished alone remaining to defy criticism. Thus, time has shown sane minds that the once popular dislike of red hair had no occult justification; had no justification of any kind except as a whim of æsthetics. To distrust a woman with a man's voice, or to avoid a pale face and green eyes as synonymous with evil and Becky Sharp—time has shown us that to shape one's actions from such antipathies would entail inconvenient practical consequences, quite disproportionate in value to the worth of these beliefs as an imaginative luxury. On the other hand, parallel notions, more polite in their implications, and especially those beliefs which, based upon quantitative rather than qualitative estimates, are infinitely adaptable to circumstances—such parallel, plastic beliefs still remain with us. A case in point is the common contention that the size of head and the frontal development are reliable indices of character and intellectual worth. How baffling to criticism! For, whereas red hair and green eyes are always red and green, a forehead which to-day will seem low and receding may to-morrow, when more genially viewed, appear quite inoffensively normal.

The belief we have just referred to, that size of head is an index to ability, has been selected for survival; and so loyally is the conviction upheld to-day that its recent scrutiny by Science created genuine and wide-spread resentment. One is familiar with the objection usually put forward, in the circumstances, to face criticism. Can a doctrine which has obtained universal credit and currency possibly be without any basis in fact? is the typical question. In the absence of the facts, however, this plausible argument is merely a plea for the general validity of tradition. And that is why one calls a belief in this doctrine a *superstitious* belief. It may be true; but, if so, it is true in spite of, and not because of, the spurious evidence of its supporters. A strictly *scientific* belief—a belief, that is to say, which has been arrived at by disinterested and exact methods—may be entirely erroneous. Yet, the old superstition of the alchemists is none the less a superstition because Sir William Ramsay has scientifically shown that the transmutation of elements is possibly a fact. Cranial development may be an index of ability: but since the only evidence in favour of this belief, whether true or false, is the evidence, not of disinterested and exact investigation, but of imagination and tradition, we are justified in asserting that it originates in, and is entirely based upon, a superstition.

Now, the so-called science of criminology, which is our immediate concern, and some of whose salient features we would portray in this introductory note—the science of criminology, we contend, has been, up to the present, warped by its subjection to all kinds of superstitions and conventional dogmas.

What, in the first place, is commonly meant by "criminology?" In its most legitimate significance, the term should denote the scientific study of crime and the criminal: that is to say, any examination of the subject conducted upon standardised scientific methods, and in pursuance of the scientific aim. Thus understood, however, the name covers much that we are not here considering. Of late years, the criminal has been studied scientifically by many independent workers, whose sporadic contributions to books, journals, and Proceedings of Societies, will, when collected, form an invaluable asset in our knowledge of the criminal. For the present, however, we are limiting our attention exclusively to criminology in the narrower and more conventional sense of the term, which excludes all work of the above order.

In its narrower meaning, criminology denotes the criticism of crime and criminals as it has been carried out by certain conventional cliques of investigators; and, thus understood, it consists of the doctrines, dogmas and propaganda of what are improperly known as three Schools of Criminology: the Classical School, the Correctionist School, and the Positive or Continental School of Criminology.

The Classical School arose about the middle of the eighteenth century, and represented a spirit of reaction against the neglect and brutality of which criminals were the victims at that time. It drew its inspiration from Beccaria, the Italian philanthropist and reformer who, as early as 1764, published a famous work on "Crimes and Punishments," which led to subsequent reform in the penal code of all European nations. The fundamental doctrine of this school was that the criminal has a "natural right" to be humanely treated, in spite of his own wrong-doing, and in spite of the fact that he is a normal being, responsible for his actions. The Correctionist School was a later development of the Classical School. Influenced by the same humanitarian spirit, its efforts were directed towards the further amendment of the criminal law. But the Correctionist School, in direct opposition to its predecessor, which held that punishment should be graduated to fit the offence committed, without regard to the personality of the offender—the second school recognised the fact that the character of the criminal cannot be completely dissociated from his crime; and maintained that age and mental alienation, at any rate, must be taken into account in our estimation of personal responsibility. Our present modification of the law, with regard to criminal lunatics and juvenile offenders, and our modern reformatory system, derive their origin from the work and efforts of the Correctionists. Both schools,* it will be seen, concern themselves more with penology than with criminology; nor can they, in the strict sense of the word, be described as scientific. The pretensions of criminology to rank as a science were not recognised until the inauguration, about 40 years ago, of the world-famous school, known as the Positive School of Criminology because, for the first time, methods and aim claimed to be those of the positive sciences.

The founder of the Positive School, the creator, and most famous exponent of its doctrine, was the late Professor Cesare Lombroso: an Italian of genius, an indefatigable worker, and a man of strong personality, attracting to himself many disciples and co-workers from all countries of Europe. Lombroso's distinctive merit lay, not in his scientific study of the criminal, but in his humanitarianism: in the influence he exerted towards ameliorating the lot of the criminal. All thinking people to-day, legislators and judges, as well as the general public, the morality of the age, as well as the voice of science, attest the truth which Lombroso was the first to enunciate as the fundamental principle of criminology and penology: the principle that it is the criminal and not the crime we should study and consider; that it is the criminal and not the crime we ought to penalise. "The father of criminal anthropology" he has been called, with some appropriateness: but, if the title survives, it will, in the future, be associated, not with Lombroso the anthropologist, but with Lombroso, enunciator of the humane truth that iniquity and righteousness depend upon what an individual is, and not upon what he does; the practical corollary of this truth being that, in dealing justice to him, we must understand the criminal both as he is in himself, and as he becomes through the influence of environment.

Let us, at this point, briefly resume our position. Criminology, as it is understood to-day, consists of the doctrines of the three Schools of criminology just referred to. The Classical School, after Beccaria, taught that all criminals were equally responsible in the eyes of the law; that they should be punished according to the crimes they had committed; but that, despite their wrong-doing, they retained a natural right, common to all men, to be humanely treated. The Correctionist School, improving upon its predecessor, established the relative responsibility of lunatics and juvenile offenders, and led the way to our modern reformatory system. Finally the School of Lombroso, more humane still, declared it was the criminal and not the crime who ought to be studied and punished, and expounded a doctrine known as the new science of criminal anthropology.

We fully admit the value of this progressive humanitarianism, and the particular merit of Lombroso's own standpoint and aims; while pointing out the absence of any virtue of Science in the doctrines of all three schools, and insisting upon the total lack of the scientific spirit in the mind and methods of Lombroso himself. Nothing is more remarkable than the array of incompatibles, of false and true notions, cheek by jowl,

---

* For a complete account of these schools see *the principles of Anthropology and Sociology in their Relations to Criminal Procedure* by Maurice Parmelee.

We will now describe in detail some of the salient "criminal characteristics," according to the teaching of Lombroso's school. The *hair* of the criminal has been found by observers of this school (Marro, Salsotto, Ottolenghi, Boer) to be anomalous in many ways. Typical hair is dark and thick, they tell us ; another common type is woolly in texture ; whereas red and grey hair, and baldness, are relatively rare amongst criminals.* The *head* is alleged to be anomalous (Corre, Laurent, Lydston, Talbot, Benedikt, Lauvergne, Debierre, Pitard, Bordier, Héger, Dallemagne, Ferri, Winkler, Van der Plaats, Berends, Tenchini, Pellacani, Marimo, Gambara, Mingazzini, Vans Clarke) in shape, and in its dimensions. Dimensionally, there are two types of criminal heads : the one larger, the other smaller than the normal type. In shape, five types are described :—the head of the criminal may rise, rounded like a dome ; or it may be depressed, like a roof that is flat and low ; or its vault may be keel-shaped, from premature union of the median suture ; or it may be a bulging type of head, with the protuberance on one side, or on both sides, or in front, or behind ; or it may have a sugar-loaf appearance—the true Satanic type. In other words—to quote Lombroso—the head of the criminal is oxy-cephalic, trigono-cephalic, scapho-cephalic, plagio-cephalic, hydro-cephalic and sub-micro-cephalic. The *organs of sense*, criminologists affirm, are the seat of erratic conditions (Beddoe, Vans Clarke, Knult, Ottolenghi, Grohmann, Morel, Frigerio, Marro, Gradenigo, Talbot). Typical criminal *eyes* are anomalous in colour, position and shape, with *eyebrows* characteristically bushy, or characteristically scanty ; the typical *nose* is defective in shape and is frequently without a bony skeleton ; the typical *ears* project, are long, voluminous, and are often prehensile. Then, say the anthropologists (Corre, Debierre, Francotti, Ferri, Talbot, Manouvrier, Näcke, Pali, Carrara, Tarnowskaia, V. Clarke, Marro, Knecht, Ottolenghi), there is the pale and wrinkled *skin ;* there are the *lips* that are cleft ; there are the absent wisdom *teeth*, the undeveloped molars, the over-developed canine teeth ; there are the *palates* that are Λ-shaped, saddle-shaped, unduly high, round, and narrow ; there is the receding *chin*, or there is the chin that projects ; there are the two types of upper *jaw*, the one depressed and the other protruding, the latter approximating to types of jaw found in savages, anthropoid apes and prehistoric man. Finally, there are two characteristic *physiognomies* by which the criminal can be detected. In one the expression is cringing, timid, humble, suppliant ; in the other it is brazen, shameless, ferocious, brutal. "The criminal has often the face of an angel," declares Lombroso ; then, with picturesque impartiality : "The criminal has a face like a bird of prey" ! The *limbs*, *trunk*, *viscera*, and other structures of his body are also affirmed to be morbidly constituted ; certain observers maintain that the criminal is shorter in stature, and lighter in weight, than are law-abiding people (Lombroso, however, found him to be taller and heavier) ; and that his *muscular condition* is more feeble and flabby ; that his *arms* are longer and more developed, his *legs* are shorter and less developed, his *spine* is more curved, his *shoulders* are more sloping ; and that he is afflicted unduly with all diseases, and suffers more frequently from flat feet. Finally, to select from a host of remaining characteristics, we must add that, according to various authorities, the male criminal has often the bust of a female and the female criminal the beard of a man, and that both male and female suffer from infantilism ; that the criminal has an ape-like agility and a prehensile foot ; that he is left-handed and ambidextrous, with his right hand smaller than his left and his left foot smaller than his right ; that he stammers and squints ; that he sleeps soundly, tattoos his body, is given to the early use of tobacco, is sensitive to the weather, and is seldom seen to blush !

---

* The so-called "characteristics" herein described have, of course, in every case received their definition from the comparison of criminals with the law-abiding community. Thus, thick and dark hair, defined as a criminal characteristic, does not mean that all criminals have hair of this shade and quality : it means that, on the whole, the hair of the criminal is darker and thicker than the hair of people who are morally well conditioned. To quote a specific example, Ottolenghi found that 60 per cent. of law-abiding peasants had grey hair, whereas, amongst a sample of criminals, only 12 per cent. showed this quality. The assumption in this case, that absence of grey hair is a criminal characteristic, is based solely on the difference of percentages found for the two contrasted sections of the population. At the same time, it must be insisted upon that the only logical interpretation of a veritable criminal characteristic is that the degree or quality of a character so designated is modified by the criminal tendencies of its possessor. If thick and dark hair be defined as a criminal characteristic, the implication cannot be evaded that, whatever be the actual colour and quality of any individual criminal's hair, the colour is darker, its quantity is greater, than it would have been were he mentally constituted a law-abiding citizen. Lombroso verbally avoided, but does not evade, this implication by describing his criminal characteristics as "anomalies" or "stigmata," *i.e.*, as conditions which should not be present in the normal body. Low foreheads, high palates, outstanding ears, all marked deviations from the mean value of any character, are, according to Lombroso's diction, "anomalies," despite the fact that these characters, in some degree, are possessed by the whole human race.

Lombroso's science has advanced to an even finer perception of criminal proclivities. Murderers, we are told, can be detected by a deficiency in their frontal curve, combined with a projecting occiput and receding forehead. Thieves are revealed by their enlarged orbital capacity and bulging forehead; sexual offenders by their bright eyes, rough voices, over-developed jaw, swollen eyelids and lips, and by the fact that, occasionally, they are bump-backed. The nose of the thief is rectilinear, short and large; the eye of the homicide is "glassy, cold and fixed"; while the forger has generally a "clerical appearance," a "singular air of bonhomie." Nor were the adventures of Lombroso confined within prison walls. On one occasion, he pointed out, as an example of the criminal type, a youth who had never appeared in a court of justice: "he may not be a legal criminal," was the airy utterance, "but he is a criminal anthropologically." At pause before the skull of Gasparonne, a famous nineteenth century brigand, the seeker found many of the stigmata common to the skulls of ordinary prison inmates. Thus, he tells us, there was, in the unfortunate Gasparonne, a wormian bone: microcephaly of the frontal region, erignathism, oxycephaly, dolico-cephaly, and enlarged orbital capacity, were also implacably present. Charlotte Corday's skull inspires this eloquence: "Not even the purest political crime, that which springs from passion, is exempt from the law which we have laid down!"* And, borne onward by the flood of enthusiasm, our intrepid explorer sets foot at last upon the shores of antiquity. Confronting the effigy of Messalina, he sees in triumph the unmistakable criminal stamp—the heavy jaw, the low forehead, the wavy hair: he recognises them all! . . . Perhaps, however, he is at his best, his happiest, in contemplation before the old woman of Palermo, who poisoned so many people with arseniated vinegar. "The bust," writes Lombroso, "which we possess of this criminal, so full of virile angularity, and, above all, so deeply wrinkled, with its Satanic leer, suffices of itself to prove that the woman in question was born to do evil, and that, if one occasion to commit it had failed, she would have found others."

As a result of this attitude of mind, of its haphazard methods of investigation, of its desire to adjust fact to theory, rather than to formulate a theory by observation of fact—as a result of all this, we have that modern criminology we have described: an organized system of self-evident confusion whose parallel is only to be found in the astrology, alchemy, and other credulities of the Middle Ages. And, just as alchemy was a superstitious study, based upon a preconceived belief in the philosopher's stone; just as astrology was a superstitious study, based upon a preconceived belief in the influence of the heavenly bodies on terrestrial affairs: so has criminology been a superstitious study, based upon a preconceived notion of the criminality of criminals as found in prison.

The preconceived, and, in our opinion, totally unfounded, Lombrosian notion, w a that criminality is a specific condition of mind or soul: is a definite state of psychical instability. And this psychical state, with its outward and physical signs of an inward and spiritual darkness, this mental and moral instability, underlay, according to the above supposition, any and every form of lawlessness, and potentiality for crime;† and was its only explanation, and its sole promoter. Murder, larceny, fraud, every kind of law-breaking, from the most elaborate to the simplest instances, were all, in varying degrees, expressions, or revelations, of an identical abnormal state of being. Not the petty thief in prison to-day, nor the supreme criminals of history; neither Gasparonne the brigand, nor Charlotte Corday the patriot, were exempt from the law Lombroso had laid down. There is, in short, according to Lombroso, a definite line of demarcation, an absolute difference in nature, as opposed to degree, between those human beings who are, and those who are not, criminal. But, since this belief of Lombroso's was arrived at, not by methods of disinterested investigation, but, rather, by a leap of the imagination, the notion thus reached then forming the basis upon which he conducted his researches, and constructed his theory—the whole fabric of the Lombrosian doctrine, judged by the standards of science, is fundamentally unsound.

It must not be understood that we are here condemning the Lombrosian investigation merely on the ground that it was directed by a working hypothesis. As Darwin said: "Without hypothesis and speculation, good and sound investigation is impossible." But, unless employed in conditions where the rigour of the scientific method is scrupulously respected, the working hypothesis is a dangerous thing. And it is particularly dangerous unless the notion of it resumes in its formula a certain number of unquestionable facts. Now, behind Lombroso's notion there were positively no facts at all. He had been studying the cadavers and living persons of criminals for months,

* He adds "In the skull of Charlotte Corday, after a rapid inspection, I affirmed the presence of an extraordinary number of anomalies."

† The designation "criminal" with Lombroso includes not only the criminal who is a legal fact, but also that vague, nightmare abstraction, "the anthropological criminal."

when, suddenly, at the sight of certain anomalies in the skull of one particular brigand,* revelation flashed through the surrounding gloom: the hypothesis was framed. We contend that a notion arrived at in these romantic and emotional conditions could not legitimately be employed as a working hypothesis for directing a disinterested investigation; we maintain that the whole of Lombroso's enterprise was conducted, we do not say with the express purpose, but with the unconscious intention, of stamping a preconceived idea with the hall mark of science. As evidence for this contention we need not probe further than the facts of criminal anthropology we have described, and the particular method, invented by Lombroso, by which these facts were elicited.

In the opening paragraph of his book, "The Female Offender," Professor Lombroso refers to his special method of investigation, which he calls the "anatomico-pathological method." We quote the passages verbatim, because they contain a frank and unequivocal statement of the reasons why Lombroso adopted this method, and recommended it to the notice of other investigators.

"When the present writer began his observations on delinquents some thirty years ago, he professed a firm faith in anthropometry,† which he regarded as the backbone of the new human statue of which he was at the time attempting the creation, and only learnt the vanity of such hopes when use, as is usual, had degenerated into abuse.

"For all the differences between criminologists and the most authoritative modern anthropologists arise precisely from the fact that the variation in measurement between the normal and the abnormal subject are so small as to defy all but the most minute research.

"The writer only became convinced of this fact when Zampa's observations upon the crania of four assassins in Ravenna disclosed an exact correspondence between their measurements and those found in an average taken upon ten normal Ravennese. And while the anthropometrical system failed thus to reveal any salient differences whatever, anatomico-pathological investigation, on being applied to the same crania, proved the existence in them of no less than thirty-three anomalies.

"But, unfortunately, the attention of inquirers had been diverted from the anatomico-pathological method to anthropometry, with the consequence that the former came to be rashly abandoned. And as one result of this we may mention that Topinard and Manouvrier, being deficient in anatomico-pathological knowledge, failed to detect the immense anomalies existent in certain crania of assassins; and because there were no salient anthropometrical differences in those skulls and the skull of Charlotte Corday, they rejected the theory of anomaly altogether.

"We must not, however, be understood to advocate the total abandonment of measurements. On the contrary, we would retain them as the frame, so to speak, of the picture; and we would recommend such retention the more, that whenever a difference does result on measurement, the importance of the anomaly is doubled."

Lombroso clearly had no liking for the exact scientific method of precise measurement. The differences between normal and abnormal subjects, revealed by measurement, were too small for the purpose of criminological investigation. This method might be retained, however, on one condition. If any differences between the normal and abnormal subject could be made to emerge by measurement, such differences should appear in the foreground of the "picture": they were "doubly" significant. But if measurements failed in this respect—no, the negative results must not be discarded; they must be relegated to the picture's "frame": the picture itself must be filled in only with positive results, which the anatomico-pathological method might always be relied upon to supply.‡ Could anything be more *naïvely* satisfactory?

Now, we divine that the method dignified by the name anatomico-pathological is simply direct observation by the senses, and without the aid of instruments, of abnormal anatomical characters in man, *i.e.*, structures which, differentiated by their quality, as opposed to their degree, cannot be measured—cannot be investigated anthropometrically. For instance, when observing the physical signs of disease—symptoms of insanity, let us

* We assume that in the skulls examined during the previous months, no similar anomalies had been noted.

† *I.e.*, the knowledge of man to be obtained by measurement.

‡ Lombroso's ingenuity in extracting positive results even from recalcitrant measurements is illustrated by the following passage, which we cannot refrain from quoting, so typical is it, in a flagrant way, of the man's temper as an observer, and of the combination in him of inherent honesty and fanatical casuistry. Seeking to establish the inferior cranial capacity of criminals, he has to record that "arithmetically speaking the average capacity of criminals (1322 cc) is higher than the average shown by normals (1310 cc)"; but, the author adds, "in only 14 per cent. of normals was the capacity below 1200 cc, whereas, among criminals, 20 per cent. fell below this figure: a result which establishes the inferiority of criminals."

say, or congenital malformations in man—the so-called anatomico-pathological method is the first, and, in the present state of our knowledge, is generally the most fruitful method to employ; but if the subject of inquiry be a comparative study of the physical and mental characters of normal man, then, callipers, tape, and other instruments for refined measurement are undoubtedly the appropriate tools.* And this was also Lombroso's standpoint. Preconceiving criminality to be a diseased or anomalous mental condition, he realised—although, not, be it noted, until measurements had failed him—that this conception could only become universally acceptable by demonstration of the presence in the criminal of physical and mental abnormalities, *i.e.*, of structures and conditions in him by which the criminal could be qualitatively differentiated from the law-abiding community. But, unfortunately, there are no signs peculiar to the criminal by which he can be inevitably detected. And so, to circumvent this rather formidable obstacle to the development of his plan, Lombroso availed himself of a series of subterfuges, among which figured conspicuously his invention of a "theory of anomaly."

The theory of anomaly, so ruthlessly rejected by Topinard and Manouvrier, presupposed that all marked deviations from the mean value of any character in man were "anomalies"; and that a definite line of demarcation existed between characters which were, and were not, thus designated anomalous; and that, according to the anomalies stigmatising them, the degree of moral alienation in individuals could be diagnosed.† The following is a list of some of the principal characters that have been enrolled as "human anamolies."‡

The various forms of cranial asymmetry :—
Oxycephaly, scapho-cephaly, platy-cephaly, plagio-cephaly, trigono-cephaly.
Size of head :—Very large heads, very small heads :
Low, narrow and receding foreheads :
Facial asymmetry :
Great development of lower jaw :
Projecting cheekbones :
Projecting ears :
Prognathism :
Virile, ferocious, idiotic physiognomies :
Defective teeth :
Shape and deflection of nose :
Thin lips :
Hairiness :
Wrinkles :
Tattooing :
High, narrow, Λ-shaped, saddle-shaped palates.

It is unnecessary to point out that although some of the characters just enumerated may, in special cases, be abnormal, none of them are, in any intelligent meaning of the word, inevitably so. A high palate may sometimes result from congenital malformation; voluminous ears may, on rare occasions, be an expression of acromegaly; mis-shapen heads may frequently be the result of rachitis; hydrocephaly may be the result of ventricular disease, &c. In such conditions, these characters are rightly called "anomalies." But to assume that every high palate, that every very large or very small head, that all deviations from an artistic ideal of beauty and symmetry, are human abnormalities, is obviously absurd. Moreover, despite their polysyllabic terminology, all the characters we have enumerated, are measurable characters. They are more or less *extreme* degrees of characters which in *some* degree are present in all men: and which differ in degree only, never in quality, as possessed by different members of the human race. To the scientific imagination, all foreheads have some degree of lowness; all ears outstand to some negative or positive extent. Individuals are not distinguishe by the possession of low foreheads, high palates, small heads: the terms high, low, and small are only convenient descriptions of extreme degrees of characters common to the whole human race, which, by insensible gradations, do all merge into their opposite extremes. Low foreheads, high palates,

* The methods we have been discussing differentiate the descriptive, a priori systems of knowledge, from exact science. The modern contention is that all scientific knowledge should be exact: that "science is measurement."

† A corollary to this theory is that all people are more or less morally insane. The objection, however, was met by the limiting of criminality to individuals stigmatised by a certain number of anomalous characters. It was decided that the normal individual might be allowed three cranial anomalies, and that more than three should indicate an incomplete criminal type, the complete type including only those individuals with more than five anomalies.

‡ See list of anomalies in criminal women, Table V.—The Female Offender.

outstanding ears, oxycephaly, hydrocephaly, sub-microcephaly, &c. are only colloquial descriptions of rough measurements on a coarsely divided scale of characters which, precisely described, must be exactly measured upon a scale finely and accurately divided.

It will be seen that the advocacy, by Lombroso, of the anatomico-pathological, in lieu of the anthropometric, method, is merely a plea for the superior virtue of rough anthropometrics over precise anthropometry—a virtue, which, from the Lombrosian standpoint, is particularly valuable. Roughness of method condones a wide range of error due to personal equation; and almost any degree of error when, anticipating certain looked-for results, the mind of the observer is sufficiently biassed. While the one (*i.e.*, the precise) method, to quote Lombroso's own statement, fails to reveal any salient differences whatever between normal and abnormal subjects, the other (*i.e.*, the rough) method of investigation proves the existence, in the abnormal subjects, of any number of anomalies. A forehead which, noted to-day by a biassed observer, may seem low and receding, may to-morrow, when viewed with an open mind, appear quite inoffensively normal. In short, the range of error possible to this order of observation may be so great as to render the results of the investigation entirely nugatory.

And so our knowledge of the criminal to-day is where it was forty years ago, when Lombroso, remarking certain abnormal structures in the skull of a brigand, formulated his theory of a criminal type. The "facts" of criminal anthropology, gathered by prejudiced observers employing unscientific methods, are inadmissible as evidence either for, or against, the existence of this type. The criminal type may be a real thing: but if so, it is real despite of, and not because of, the spurious evidence of its supporters; its existence may be scientifically proved by future investigation: yet Lombroso's system will never, by the scientific critic, be otherwise regarded than as the superstition of criminology.

II.—The Scientific Study of the Criminal.

Now, although it is true, that Lombroso's criminology is dead as a science, it is equally true that, as a superstition, it is not dead. As a superstition, in the mind of the general public, it is still dangerously alive. There is some quality in it which has appealed to those imaginations whose impressions of the criminal have been gained chiefly from newspaper sketches, from the romantic literature of picturesque villains, from popular pseudo-scientific treatises, and from the galleries of Madame Tussaud. To register the extinction of this superstitious criminology, and to lay the foundations of a science of the criminal, truly accurate, and unbiassed by prejudice, is the purpose of an investigation, which, as described in a prefatory note, was inaugurated by the Directors of Convict Prisons in 1902, and was successfully accomplished in 1908. This investigation consisted of a statistical survey of a random sample of 3,000 English male convicts: the immediate purpose of the survey being the acquisition of a mass of data which, collected without partizanship to any particular penal system, or criminological theory, would provide, it was thought, an unique field for the scientific study of the criminal.

For many years, a vast amount of statistical information relating to the personal condition, social estate, and penal histories of convicts, has been accumulating in official records. This information is of immense scientific and practical value; but, scattered as it is, without plan or arrangement, through penal and medical records, police reports and other official documents, it is never available for any coordinated scientific purpose. The data resulting from the survey in question, consist of information gathered from these various sources, amplified by physical measurements, by details of family and personal history, and by descriptions of physical and mental qualities revealed through our examination and inquiry. The data of each individual were arranged in a schedule, carefully planned to facilitate the subsequent statistical reduction of the records. The whole series of data, thus arranged, has been published in a separate volume; which contains altogether some 96 statements with regard to each one of 3,000 individuals, and forms a representative and unprecedented statistical portrait of those of our population who become convicts.

These records have furnished, during the past three years, the raw material for a scientific study of the collective criminal, the object of which has been twofold:—

(i) To clear from the ground the remains of the old criminology, based upon conjecture, prejudice, and questionable observation;

(ii) to found a new knowledge of the criminal, upon facts scientifically acquired, and upon inferences scientifically verified: such facts and inferences yielding, by virtue of their own established accuracy, unimpeachable conclusions.

The first object, although a negative one, is not on that account unimportant. The recovery of truth is as valuable as its original discovery. But, it may be objected, does the particular truth we are now considering really stand in need of recovery? It has been maintained that the fallacies of criminal anthropology are so self-evident that they do not require to be demonstrated scientifically. We have been told that, to the scientific imagination, Lombroso's system, being dead from its birth, can no more be affected by thrashings than the proverbial horse. This may be so: but, as we have said, that system is not extinct to the public mind; and, in many influential quarters, it is dormant only, and ever ready to be revivified under official patronage. During the past year, three books of scientific pretentions have been published*; one dedicated to Lombroso himself; all three devoted to the propagation of his discoveries and creed. The Reformatory of Elmira in America stands to-day as an example of the fruitfulness of Lombroso's teaching. It must, however, be remembered that, in this inquiry, our first object is not to disprove the Lombrosian doctrine, nor is it to prove the falsity of the conclusions of criminal anthropology, upon which this doctrine is based. Our attack, in so far as it is an attack at all, is directed not against *conclusions*, but against the *methods* by which they were reached. We cannot presuppose, at the outset, the invalidity of these dogmas, nor make any judgment upon the extent of their falsity or their truth: we can only assert that, since they were arrived at by unscientific means, they must not be accepted without further investigation.

In addition to an inquiry into the existence or non-existence of criminal characteristics, the scientific study of the criminal must also concern itself with a wide range of problems. Even though the first effort of our investigation should result only in proving a negative, as critics have anticipated, our data has still to deal with very positive matters. Having failed to trace a criminal type, the object of our search must still be to find the types of people who become criminal—which is a very different thing. What are the nature and origin of the criminal? How and why, if at all, does a criminal differ physically and mentally, in health and disease, from law-abiding persons? What do we know of his antecedents? What are the constitutional determinants, and environmental conditions, which lead to his lapse into crime?

Now, the inquiry, whose two principal objects we have just described, can only, in our opinion, be pursued satisfactorily by the statistical method, *i.e.*, by the mathematical analysis of large series of carefully collected data. That opinion will not pass unchallenged. We shall be told that the knowledge, ultimately acquired by the analysis of these statistics, could have been equally well obtained by ordinary observational experience of individual criminals. There is contained in this criticism the implication of an essential difference in character between the statistical and other methods of scientific inquiry. We do not admit the distinction. Statistical inquiry, all scientific inquiry, is observational in character: that is to say, it is based upon the observation of individual facts. But these facts, in themselves, do not constitute knowledge. Knowledge consists in the discovery of relationships revealed by the systematic study, and by the legitimatised weighing, of facts. No series of biological or social data, obtained by the observation of criminals—whether the observations be recorded as statistics, or whether they be stored as impressions in the memory—no such series does, in itself, constitute *knowledge* of the criminal. That knowledge lies potential in the facts, but ineffectual for use until their associations with each other have been accurately weighed. It is this weighing of observations which demands, for the present inquiry, the employment of statistical methods: such methods being merely a regulated mechanism by which the relation between certain orders of facts can be precisely estimated.

There is not, as is sometimes imagined, any *special* theory or hypothesis involved in conclusions revealed by statistics. The science of statistics provides only for the systematised study and legitimatised interpretation of observed facts: such interpretation consisting mainly in one and the same process—the associating or dissociating of one set of facts with and from another. Before any association can be legitimately postulated, certain conditions must be fulfilled: evidence must be produced to show that the relation, affirmed to exist, is not a chance or accidental, but a natural, association; that it is not one resulting from coincidence, but that it represents an inseparable connection between natural phenomena. In some orders of observation there is no need for a calculating mechanism to trace and prove the existence of association—this lies revealed upon the surface of the facts observed. The relationship between the phenomena of fire and burning by fire is of this order; and so also is much of the clinical experience of the physician: although associations of phenomena with disease are never entirely unquestionable or definitely precise. The precision and validity of so-called clinical experience

* "*Les femmes homicides*," by Dr. Pauline Tarnowski; *Criminal Anthropology*, by Maurice Parmelee; *Criminal men*, by G. L. Ferrero.

depends upon the aptitude for memorising the frequency of past relations, and for correctly estimating by a mental statistical process the probabilities of their recurrence. Observations of the clinician being mainly estimates of quality, rather than of degree, the disturbing effects of chance associations can be allowed for mentally and without aid from the elaborate meticulousness of statistical processes. But in social and biological science, and very often in the science of medicine, and sometimes even in physical science, the phenomena under observation are of an entirely different order to those referred to above. The attributes and conditions of living things are so widely variable, are so delicately graduated in different individuals, that their correlation can seldom be legitimately postulated, and can never be precisely estimated, without aid from a correlation calculus: that is to say, social science almost entirely, and biological and medical sciences to a great extent, can only be built up after preliminary mathematical analysis of large series of carefully collected data. And that is why we assert that statistical methods are indispensible for the scientific study of the criminal.

Criminological study, whatever branch of it is being pursued, and by whatever method it may ultimately proceed, should be *based upon*, and originally consist in, the statistical treatment of facts which, in their crude form as revealed to direct observation, are valueless for construction. Were criminality a morbid state, akin to insanity, with physical signs comparable to those that indicate disease, much study of the criminal could be profitably conducted without mathematical aid. There was, for instance, no need for mathematics to trace and measure the relationship between tubular breathing and pneumonia. But there are no characters, physical or mental, peculiar to criminals which, apart from differences in degree, are not shared by all people.* We observe the endless variety in shape and size of the heads of criminals: we observe that the heads of the law-abiding public are, in the same way, endlessly varied; but the interpretation of these observations is different and distinct from the art of observing itself; no bird's eye view of criminals, however wide, can reveal to us the relation between size of head and criminality, or the extent to which some subtle moulding of the head is associated with criminal proclivity; a meticulous precision in extracting data from observation, mathematical accuracy in dissecting the data, can alone supply that knowledge.

When we come to study the relation of the criminal to sickness and disease, or the particular association between crime and any of the recognised forms of abnormality†—as, for instance, when we are estimating the proportional frequency of these conditions, or are determining to what extent they originate from, or are fostered, or are ameliorated by, prison environment, or to what extent they are special factors in the causation of crime—in all these problems, we shall be dealing with subtle numerical associations, latent only in those facts visible to observation, but ripe for discovery by the dissecting process, and significant for the co-ordinating purpose, of the science of statistics.

The etiological factors in crime, the influence of heredity and of environment upon the production of criminals, are problems which, hitherto, observers have attempted to solve by employing deductive methods in the study of individuals. Authorities, quoting their general experience, have often dogmatically asserted that poverty, intemperance, lack of education, irreligion, parental neglect, feebleness of physical constitution, age, love of excitement, laziness, &c., &c., are causes of crime; and all of these, including also the force of heredity, have in their turn been appointed a place in the making of criminals. But the effect of these factors upon any one individual cannot be traced with certainty or be accurately estimated. We cannot be certain that because poverty, or lack of education, or parental neglect are found associated with an individual who commits a crime, these associations are therefore anything more than chance relations; and, consequently, to quote, as is frequently done, such association as facts in the causation of crime is entirely misleading. Some instances of crime may find in their attending circumstances a plausible explanation; other instances may thus be accounted for on grounds which appear to be beyond cavil or question. But we are dealing with influences so subtle, so elaborate, so elusive, that far-reaching conclusions as to their effect upon separate individuals can never be more than conjecture. What we have to do, all that can be done, is to measure, by the statistical method of *averaging large numbers*, the extent to which

* The anomalous characters which it has been alleged stigmatise the criminal are, as we have already shown, not qualitative in their nature, but only so by verbal implication.

† The view we have expressed, that there are no abnormal characters peculiar to criminals, does not preclude the existence of any form of recognised abnormality amongst criminals. The insane, the epileptic, the tubercular, the diseased, the imbecile, may occur anywhere, and are obviously not excluded by the prison walls. There may even be atavistic people in prison as well as out of prison. And if there are "savages who wander into strange environments," it would be strange if some of them did not wander into jail.

religious convictions,* social expediencies, and psychological subtleties of all kinds ; but we are convinced that much confusion as to the nature of crime, and the anomalous character of criminals, influencing the mind of the public in general, and of the old criminologists in particular, has been fostered by the continual misuse and ambiguous interpretation of the words "normal" and "abnormal." The proposition that crime is an unusual act, committed by a perfectly normal person, can only be properly intelligible after a precise differentiation between these two terms.

The wide divergence in the physical and mental constitution of all people is a patent biological fact that may be accepted without proof. Thus, we distinguish between tall and short people, between people who are thin and those who are corpulent, between young and old, wise and foolish, good and bad, and so on, with all physical and mental characters and conditions. There is, however, in these verbal distinctions, the suggestion of a *qualitative* element which has no existence in reality. Nature distributes her attributes in a continuous *quantitative* series : and any apparent differences of quality, in a *normal* series of people, will invariably be found, upon analysis, to consist ultimately in a difference of degree only. There is no line of demarcation, for instance, between good temper and bad temper, and no qualitative difference, as the verbal distinction suggests ; there is, rather, every degree of temper between an extreme serenity of good temper and an extreme violence of bad temper. And in the same way, there is no line of demarcation between short people and tall people : short merging into tall, by insensible gradations. A normal character is not a specific physical or mental entity, of one definite degree : it is a character which may exist in any and every degree of relation, in different people. Very extreme degrees of any character are, of course, rare ; extreme degrees are unusual ; moderate degrees are customary : but no matter what the degree, all degrees have this in common, that they are every one of them *perfectly normal*, in the sense that they are all *perfectly natural*.

The point we would emphasise is that the terms "abnormal" and "unusual" are not really interchangeable as, colloquially, they may appear to be. Colloquially, a very tall man is described as "abnormally tall" ; a very self-centred man as "abnormally egotistic" ; a very dull man as "abnormally unintelligent." Now, between the terms abnormal and unusual there is a real and important difference, upon the recognition of which clarity of thought depends. The failure to recognise this difference is responsible for an immense amount of confusion. The essential idea in what we call "unusual" is *rarity* of existence : and the term implies nothing more than this ; on the other hand, connected with the term "abnormal," there is an idea of *unnaturalness* and *morbidity*, which forms an essential part of its connotation. The unusual is always quite natural, and is the outcome of natural laws. Unusually tall people are rare, but their stature is part of natural growth, and is the outcome of the natural laws of growth.† The abnormal on the other hand, is essentially morbid, and implies a condition of things against nature. Thus, a victim of acromegaly might have hands which, although not unusually large as hands go, would be abnormally large for him. An unusually tall child, suffering from spinal disease, might become thereby abnormally short. To sum up : we may say, generally, that the abnormal is a qualitative variation from the natural ; whereas the unusual, no matter what its extent may be, is never anything more than a deviation in degree from the normal average.

Now, every judgment of abnormality presupposes a definition of what is normal.

* We can only speculate upon the origin and evolution of the tendency to regard the detected and convicted offender as almost a distinct species, separated from the rest of mankind by an absolute difference in the nature, as opposed to the degree, of its moral identity. A likely source may be found in the theological and ecclesiastical tradition by which all our ethical ideas have been influenced in the past. It is safe to say that the gradual recognition of the criminal, as a definite element in society, was coincident with the foundation of the criminal law, and the developing perception of abstract, as opposed to personal, right and wrong. Now, the characteristic feature of the law's administration was the infliction of punishments upon its enemies and offenders ; and in the inhuman quality of these punishments—"death, mutilation, every kind of torture were the almost inevitable doom of those convicted of the pettiest larceny"—we discover more than the desire for personal retaliation, more than the fulfilment of the demands of abstract justice : we see in them, rather, a propitiation of the Divine wrath. The criminal came to be looked upon not only as the enemy of the individual, the rebel of society, but as a voluntary outcast from the spiritual world. His offence may have been a trifling one, but with the verdict of the law upon it, it became symbolic of hidden iniquity. In the spiritual dualism universally preached and accepted, there were Good and Evil, there were Light and Darkness. The soul of man was either black or it was white ; there were no intermediate shades. Man was either for God or the Devil ; and the criminal, by his act, had proved himself to be on the side of the latter.

† Excluding cases of pathological dwarfism or giantism, the rare occurrences of extremes of stature are as essentially part of the law of growth as are the more frequent occurrences of moderate degrees of stature.

What, then, is the idea of normality, the standardised notion by reference to which the anomalous nature of any human state, character, or condition, can be determined? Criminologists, although they make frequent use of some standard, have consistently evaded its definition.* We would assert, then, that a normal mental or physical character, no matter to what degree it deflects from any ideal standard, is one which is an outcome of the natural physiological and psychological laws of existence; and that any such character only is, or becomes, abnormal, when these laws are interfered with, or are supplanted by some pathological process.

In illustration of the foregoing, we may quote the pulmonary vesicular murmur, which, whatever be its intensity, is a normal human character. Likewise, any degree within the range of healthy bodily temperature is a normal human condition. Again, any amount of credulity and suspiciousness, of capacity for folly and vice, of poverty of imagination, of lack of purposive control, are, in the sane, normal mental states. These characters, conditions, and states, are every one of them normal: because, with all their differences of degree, they are the mental and bodily attributes of healthy humanity On the other hand, all intensities of tubular breathing, all degrees of febrile temperature, every variety of delusion, of hallucination, of purposeless maniacal movement, and of melancholic lassitude, are rightly termed abnormalities; they are never found in the healthy subject: they are part of the mental and bodily state of humanity diseased. These conditions—both those that are normal and those that are abnormal—vary widely in degree amongst different individuals. But the normal and abnormal do not *gradually merge into each other*. The transition, whatever the appearance may be, is always abrupt; the one state is separated from the other by a definite line of demarcation: that is to say, the change from health to disease, from what is natural to what is anomalous, even when it appears to be only a quantitative one, is, fundamentally, always qualitative in character. There is no relation, there is a positive break in continuity, between the loudest vesicular, and the softest tubular, breathing; between an extremely high degree of normal temperature and an extremely low degree of febrile temperature; between infinite credulity and the mildest delusion. What is normal never merges into what is abnormal.

This attempt at definition will admittedly not facilitate the differential diagnosis of individual cases.† Our only claim is to establish a definite understanding of what is implied when any human character is dogmatically asserted to be "anomalous." We contend that any such assertion implies one of two things. It either means that the character in question possesses in itself a qualitative genius, by which its identity as an anomaly is self-evident (as, for instance, in the case of a palate which is cleft, and which is identified as anomalous by that particular quality which is entirely absent from palates normally developed); or else, a qualitative differentia in the character itself being absent, the assertion means that the distinction of abnormality has been established from other criteria (as, for instance, when we deduce the hydrocephalic nature of a large head from the fact that its possessor suffers from ventricular disease). It follows, therefore, from the implication of the term, that a character, precisely similar in appearance in two individuals, may be legitimately called an anomaly in the one case, but not so in the case of the other. And, consequently, because morbid biological conditions do, in some cases, determine the anomalous character of a human structure, this is no justification for assuming that *every* appearance of this character, in *any* individual, always betokens a similar morbid origin, and is itself anomalous. That defective development may determine the excessive height of some palates is no reason for supposing that all high palates are developmental defects. Because drunkenness, disregard for truth, filthy habits, excitability, profligacy, etc., sometimes result from brain disturbance, it does not follow that all individuals exhibiting such traits are morbidly unsound. These are merely extreme degrees of qualities which, in some degree, are possessed by the whole human race.

There is prevalent an unfortunate tendency to theorise as to the existence of abnormal

* They describe, for instance, a low forehead, a high palate, asymmetry of head, as "anomalous"; they compare the number of "anomalies" found in criminals with the number found in "normal" people; and Lombroso has maintained that characters, such as projecting cheek-bones, which are "anomalous" in the male, are quite "normal" in the female. But nowhere is it explicitly stated upon what grounds these characters are thus regarded. Sometimes it seems probable that the designation refers to an artistic standard of beauty; at other times the reference appears to be to an ethical standard of perfection. Sometimes the term "abnormal" is used with a pathological suggestion, sometimes, as above, with only a physiological implication. Generally, with these writers, and most consistently, any marked deviation from the mean is regarded as "abnormal": the adopted standard of "normality" then being apparently the statistical *average*.

† Difficulty arises in borderland cases, where the range of "normal" and "abnormal" distributions overlap. In these cases, other indications must be relied upon for exact diagnoses.

types of human beings—unfortunate, because that theorising has been done before distributions of the qualities determining these types (qualities assumed to be congenital defects),* have been statistically defined for a normal population. During late years, three breeds in particular have been thus differentiated from the mentally and morally well-conditioned public—a "mentally defective" type, a "degenerate" type, and a "criminal" type. Although overlapping, and intermixed in various ways—some criminals being recognised as mentally defective, and both criminals and the mentally defective being included sometimes amongst the degenerate—these three types have been accepted by biologists as spontaneous variations of normal humanity. Now, the terms feeble-minded, degenerate, criminal, signifying only three roughly-differentiated classes, are convenient as statements of certain facts. The description "weak-minded" conveys the notion of a class of individuals whose general intelligence has been found to be below a certain mark on the scale of common intelligence ; the name "degenerate" embraces a class of individuals distinguished by certain attributes which they possess to a more marked degree than does the rest of mankind† ; and the title "criminal" designates that class of person whose tendency to committ anti-social acts is sufficiently intense to lead, eventually, to his conviction and imprisonment for crime. This separation of individuals into classes is justifiable on the grounds of its convenience ; but the atmosphere which seems, in consequence of their separation, to surround certain classes—the weak-minded, the degenerate, and the criminal ones—an atmosphere charged with a morbid qualitative genius, whereby individuals within its circle have come to be regarded as spontaneous germinal variations, and their attributes no longer as deviations from the normal average, but as congenital defects—this special atmosphere is unacceptable to those critics who have realised the nature, and range of variation, of the distribution of human characters in a normal population.‡

We maintain that arguments for the existence of all these types were thought of after their recognition—the hypothesis that inspired their original discovery being based entirely upon prejudice. But it was felt that the existence of these morbid states, when postulated, must be justified by argument ; which argument, so far as we have been able to ascertain, amounts to the following : the feeble-minded, the degenerate, the criminal, constitute specific mental types, or special breeds of human beings, because, when observed under control, they are found to possess low degrees of general intelligence and low standards of morality ; or to hold extreme disregard for truth, for opinion and for authority ; or to be unteachable, unemployable, profligate, lazy ; or to display marked preferences for undesirable company ; or to be very impulsive, excitable, restless, uncertain, passionate, violent and refractory in conduct ; or to be careless in business, neglectful of responsibility, false and malevolent in speech, filthy in habits, and nearly always inebriate. In other words, the inherent defect in mental mechanism, postulated for individuals belonging to these classes, is based solely upon the fact that, in addition to their general stupidity, they display objectionable or dangerous degrees of qualities which, in some degree, are possessed by the whole human race. The theory of the existence of these specific morbid types is founded wholly upon the prejudice which assumes that all human qualities showing a marked deviation from the average are spontaneous germinal variations and indications of mental defect or disease. In short, the theory in question is an unverified hypothesis, based entirely upon the assumed legitimacy of a very questionable inference.

This, then, is our contention : admitting the criminal does possess all the characters that have been attributed to him ; admitting, even, that he is marked by a "dome-shaped" head, and by a face like a "bird of prey" ; admitting that he is drunken, impulsive, obstinate, dirty, and without control—despite all this, we maintain he is not an abnormal man. He may represent a selected class of normal man ; many of his qualities may present extreme degrees from the normal average : yet the fact remains that, in the

* The qualification "congenital," applied to these so-called defects, of course implies that normal attributes of normal people are not congenital in origin.

† Stocks, for instance, in which occur low degrees of general intelligence or marked degrees of the insane and tubercular diathesis, or of the tendency to commit crime, or of proclivity to albinism, may be conveniently grouped into a class. It is unfortunate, however, that the particular word "degenerate," presupposing as it does the existence of morbid germinal changes, has been employed to designate this class. In saying this, we do not overlook the possibility of the existence of stocks in which various defects appear interchangeable, and which may possibly be described as deficient in some general control determinant.

‡ The mental derangement of individuals, who become grouped within these classes, is certainly not recognised by their associates, relatives, and employers in the same way as insanity or pathological idiotcy are recognised by the laity. Stupid; incapable, ne'er-do-well, similar descriptions may be applied to them ; but the *morbidity* of the mental state of these individuals seldom becomes patent until they have come in conflict with the law, or, as paupers, have become a burden upon society.

pattern of his mind and body, in his feelings, thoughts, desires, and recognition of right and wrong, and in his behaviour, however outrageous it may be, he exists by the same nature, and is moved by the same springs of action, that affect the conduct, and constitute the quality, of normal human beings.

The principle we have enunciated, that the criminal, although probably a selected, is a normal, human being, involves no theory as to the kind of normal person, mentally, morally or physically, that he represents. We have maintained that the iniquity of law-breaking is not different in kind from that of any other anti-social act. Some people, accepting this view, might nevertheless contend that punishable sinfulness, although not differing in quality, is greater in degree than is non-punishable sinfulness; that the primitive impulses actuating the will of all men—the impulse, for instance, which tends to make a man relentless in hatred and desire for revenge, selfish in lust, rapacious in gain—are uncontrolled to a greater degree amongst legal, than amongst non-legal offenders: and that, consequently, the former are the more iniquitous. Following this contention, it might be assumed that the criterion upon which the legal designation of "criminal" depends is a man's moral position on a scale of criminality, between extremes of iniquity and righteousness.* But scientifically, we can make no such assumption; nor do we see how, without omniscience of the factors and circumstances that control men's destinies, individuals could be so distributed upon any such scale. An elaborate understanding of the foundations of society, and a capacity for keeping, or evading, the Law, are not necessarily coincident with a simple religious instinct for acting upon the verdict of conscience as to what is right and what is wrong. The thief, forger, or incendiary, being more radically inimical to the constitution of society, may be logically regarded as more anti-social than, say, the law-respecting juggler in financial operations: but he is not necessarily more iniquitous, nor is he, as Garofalo would assert him to be, necessarily being guided less in his conduct of life by the passion of pity.

So far, our criticism of prevalent notions of "criminality" has been entirely destructive. We have still to decide what may be legitimately assumed with regard to the moral identity of the criminal. We have found no *a priori* justification for assuming, even as a provisional hypothesis, the Lombrosian idea of the criminal as the delegate of a spiritual mission of sinfulness; nor for the notion that he represents a morbid type of human being, akin to the type of the insane; nor for the claim that he should be regarded as necessarily corresponding to the iniquitous or to any other particular moral class of normal humanity. Ultimately, with scientifically acquired evidence in hand, we may be compelled to adopt one or the other of these conceptions; but, for the time being, we are not justified in taking our stand by any one of them. What, then, may be our assumption? What notion of the mental and moral constitution of the criminal would it be legitimate to adopt as a provisional working hypothesis for our inquiry? The suggestion will be proffered to us, no doubt, that there is no need for any hypothesis at all. It will be said that the scientific investigator, approaching his problem in a spirit of complete detachment, must look upon criminals with dispassionate tranquillity, as upon a collection of men brought together merely by the fortuitous hazard of the Law. For, it will be maintained, all we do definitely know of our subjects at the outset of an inquiry, is that they are individuals, detected of committing breaches of the law sufficiently serious to be dealt with by imprisonment—we know nothing more, nothing less than this. Such is the fact: yet no man, we think, would undertake to pass sentence upon an offender, nor would he pledge himself to introduce penal reform, or to construct a policy of administration, without framing some hypothesis as to the nature of the human material with which he was dealing. And the criminal cannot be studied, satisfactorily to science, without similar premising in respect of the same notion. Our ultimate aim is to arrive at an explicit conception of criminality, which will make the phenomenon of crime intelligible. To achieve this end, we must start with some provisional hypothesis as to the nature of the mental and moral identity of the legal offender.

The criminal is a legal fact: but it is difficult to understand the suggestion that he should be considered simply and solely in this light, nor are we able to reconcile that injunction with the spirit of unbiassed investigation. For the proposition which denies the necessity of any presumption with regard to the mental constitution of the criminal does not represent, as it would claim to do, a complete detachment from theory. On the contrary, it presumes that there is no constitutional factor determining, either wholly, or in part, a criminal career; it presupposes that, innately, all men are mentally and morally equal, and that the criminal must be explained, not by reference to what he does (as the

* Or, following Garofalo's analysis of the criminal mind, one might be inclined to assume the relative absence of the passion of pity as one's criterion.

classical school premised), nor by reference to what he is (as Lombroso declared), but by reference, solely and entirely, to the circumstances in which he is placed. This proposition has, however, been chiefly employed not as a theory of criminality, but as an artifice by which to steer clear of the dangers of those picturesque conceptions which have loomed too high in the passage of criminological pioneers. But the necessity for forming *some* conception is not to be evaded by the mere negation of those fallacious ideas whose development has been as inevitable in the past as it has been logical and true to one common guiding principle: the principle, in fact, that all men are innately, morally equal.

We have traced the starting point of the "criminality" idea to the evolution of the criminal law,* when the criminal was regarded as an outcast from the spiritual world. Innately, all men were mentally and morally equal: by deliberate choice the criminal had enlisted away from the side of the angels. It was against this first notion, and against the severity of the punishments it engendered, that the classical school protested†: all men were mentally and morally equal, but crime very often was the result, not of the criminal's deliberate selection of evil, but of his misdirected choice. Next came the Lombrosian notion. All normal men were mentally and morally equal: therefore the criminal's abnormal choice of evil was a proof of disease. Finally, the latest *a priori* development of the notion of criminalty yields the same refrain. All healthy men are mentally and morally equal, and, consequently, the criminal must either be morally insane, or he must be solely and entirely the product of an adverse environment.

We have, in this series of notions of criminalty, the logical outcome of deductive reasoning from one fundamental assumption, whose truth has been regarded as incontestable: the assumption that, organically, all normal persons are mentally and morally alike —that there are no differences between them of constitutional or germinal origin. Admitting the truth of this proposition, it follows, logically and inevitably, either (i) that the presence or absence of criminality depends upon the deliberate choice of an individual between good and evil (the classical idea); or (ii) that the criminal is not a normal individual, and that his criminality is a product of disease, (the Lombrosian notion); or (iii) that criminality is a traditional moral acquirement, resulting solely and entirely from misdirected education (the modern deduction).

We wish to approach the present inquiry with an open mind regarding the theory of original equality, which hitherto has been regarded as beyond question: and, in so doing, we must assert that, in view of the intricate nature of the mind of man, and of the mutability and complexity of environmental influences, it is impossible to state dogmatically, on *a priori* grounds, whether the criminal is born or made; and to what extent criminality results from a constitutional quality of moral fibre; or to what extent this condition is a purely traditional acquirement. All we can assume, and what we must assume, is the *possibility* that *constitutional*, as well as *environmental* factors, play a part in the production of criminality. In other words, we are forced to an hypothesis of the possible existence of a character in all men which, in the absence of a better term, we call "the criminal diathesis."‡

Using the word "criminal," not necessarily in description of moral defectiveness, but merely to designate, in legal terminology, the fact that an individual has been imprisoned—using "criminal" in this sense, the term "diathesis" implies a hypothetical character of some kind, a constitutional proclivity, either mental, moral or physical, present to a certain degree in all individuals, but so potent in some, as to determine for them, eventually, the fate of imprisonment. Direct evidence of the existence of a criminal diathesis cannot, of course, be given. The criminal diathesis, like the tubercular diathesis, if existent, would not be visible to the senses. Direct experience of the

* The relation of the criminal to the criminal law is summed up in the retort of the brigand, who, when threatened by the law is said to have exclaimed: "The law! I am the law!"

† Even up to the middle of the last century the punishments for criminal offences were very severe. The crank, the treadmill, and the silence cells, the insanitary prisons where the labour was so severe that men would voluntarily mangle their limbs to avoid both the work and the merciless penalties inflicted upon those who shirked it—these penal conditions persisted even up to forty years ago. And that the public regard for the criminal is not even now quite free from ferocity is shown by the following suggestion, lately proposed in America, as an alternative to the death penalty. It was suggested that, instead of being hanged, a convicted murderer should be placed in a cell underground, and that this inscription should be written upon the door of his cell:—"Here lies A.B. convicted for the murder of C.D.; his food is the coarsest bread, his drink is water mingled with his tears, he is dead to the world, this cell is his tomb."

‡ In every branch of our investigation, we shall be compelled to assume the possible existence of this so-called "criminal diathesis"; that is to say, we shall have to pursue our research with a mind open to the possibility that innate or constitutional, as well as environmental factors, play a part in determining the fate of the criminal.

existence of either is impossible. But, just as we are compelled to assume that the existence of a tubercular diathesis is revealed by the phenomenon of tubercular disease, so are we compelled to assume the possible existence of a criminal diathesis from the phenomenon of crime. We make no presumption as to what qualities constitute this diathesis: but unless the committing of crime, and the apprehension and conviction following it, be regarded as a series of absolutely fortuitous catastrophies—unless the criminal in the dock is chosen as much at random as is the juryman in the box—we do not see how the conclusion can be evaded that the criminal diathesis, although present in greater average intensity among the lawless, is a certain constitutional fact, common to the whole of humanity. In fine, however criminality may be analysed, or crimes may be classified, however the penal record of the criminal may be accounted for, we must presume that, determining his fate, there may be, within the criminal himself, some quality or combination of qualities, some constitutional tendency of stupidity, perhaps, or of lack of control, or, as the cynic might suggest, of unfortunate *naiveté*, which leads to his being found out, while his more acute fellow scoundrel escapes—something in him, we must presume, there may be, which, as we have stated, is a character proper to mankind.

Our object will be to find out how far this criminal diathesis, as measured by criminal records, is associated with environment, training, stock, and with the physical attributes of the criminal.

Descriptions of the various statistical methods employed in the pursuit of this object will be given, as they are referred to, in the course of the text.

The merits of these methods, applied to the study of social and biological problems, are the following:—Firstly, by employing material composed of all the facts, and not merely of such straws of fact as chance may blow before our eyes, the statistical method builds up our knowledge of organic beings upon foundations as solid and reliable as those of physical science. Secondly, the method is so detached from the subject under investigation that it records facts in their original crudity, unaffected by partisanship to any particular system or theory. Thirdly and chiefly, investigations conducted by the statistical method are developed from the outset upon a consciously chosen plan, and proceed logically, and by steps explicitly defined, to inevitable conclusions.

We owe much to the experimental methods of investigating natural phenomena in plants and animals; but, in the future, our debt will be as great to the statistical method, which has already begun to throw light upon the many hitherto obscure phenomena related to the lives and conditions of human beings. From lack of suitable data, and in the absence of experts with sufficient statistical knowledge to handle such data as has been collected, the employment and development of this method of inquiry has been, in the past, exclusively the pursuit of a small body of workers, inspired by the genius of Francis Galton, and of Quetelet, who preceded him. Owing, however, to the stimulating personality, and to the brilliant mathematical researches of one master, who has recently reduced to order the previous chaos of statistical science, the singular importance of the method is at last being appreciated and applied by other workers in innumerable directions with ever increasing fruitfulness.

The present investigation, which has been pursued exclusively by the statistical method, separates naturally into the following sections:—

Part I.

An inquiry into the alleged existence of a "physical criminal type."

Part II.

Chapter I.—The physique of criminals.

Chapter II.—Age as an etiological factor in crime.

Chapter III.—The criminal's vital statistics: health, disease, mortality, enumeration.

Chapter IV.—The mental differentiation of the criminal.

Chapter V.—The influence of the "force of circumstances" on the genesis of crime.

Chapter VI.—The fertility of criminals.

Chapter VII.—The influence of "heredity" on the genesis of crime.

PART I.

AN INQUIRY INTO THE ALLEGED EXISTENCE OF A "PHYSICAL CRIMINAL TYPE."

I.—General Remarks.

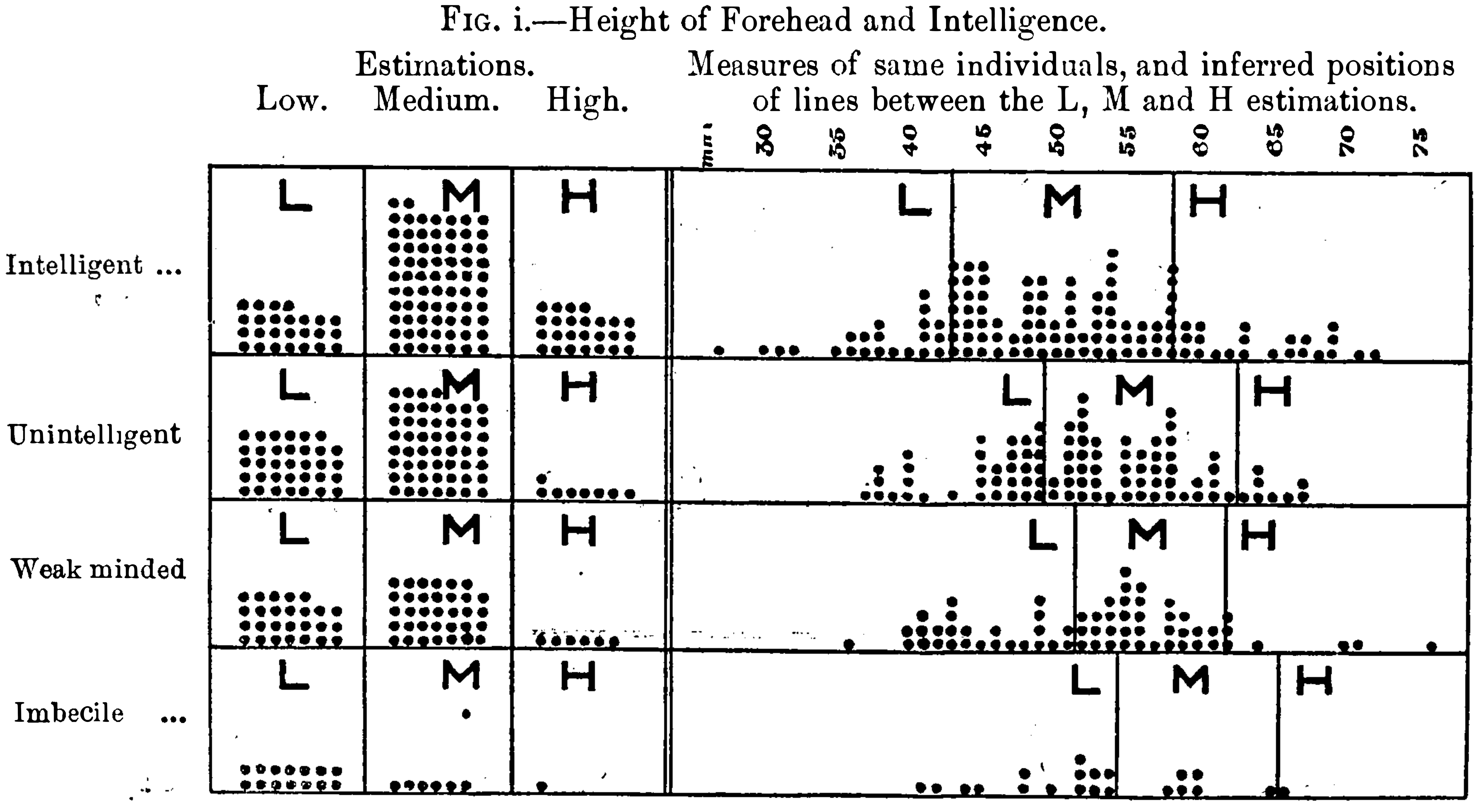
In this section we deal with the problem of the alleged existence of a "physical criminal type"; that is to say, our object is to ascertain whether, as has been stated, there are any physical attributes which specially characterise the criminal.

The data, or raw material, upon which the inquiry is based, will be found recorded in a separate volume; and an account of where and how the information was collected is given briefly on p. 18 of the present work, and is more extensively described in the preface.

In view of the loose talk that is current about criminal characteristics, and of the rough methods by which the existence of so-called anomalies of the criminal have been investigated, it is essential at the outset to emphasise two points: firstly, that the problem before us is essentially an anthropometrical one; and secondly, that, as such, it is only to be solved by the proper statistical analysis of large series of measurements.

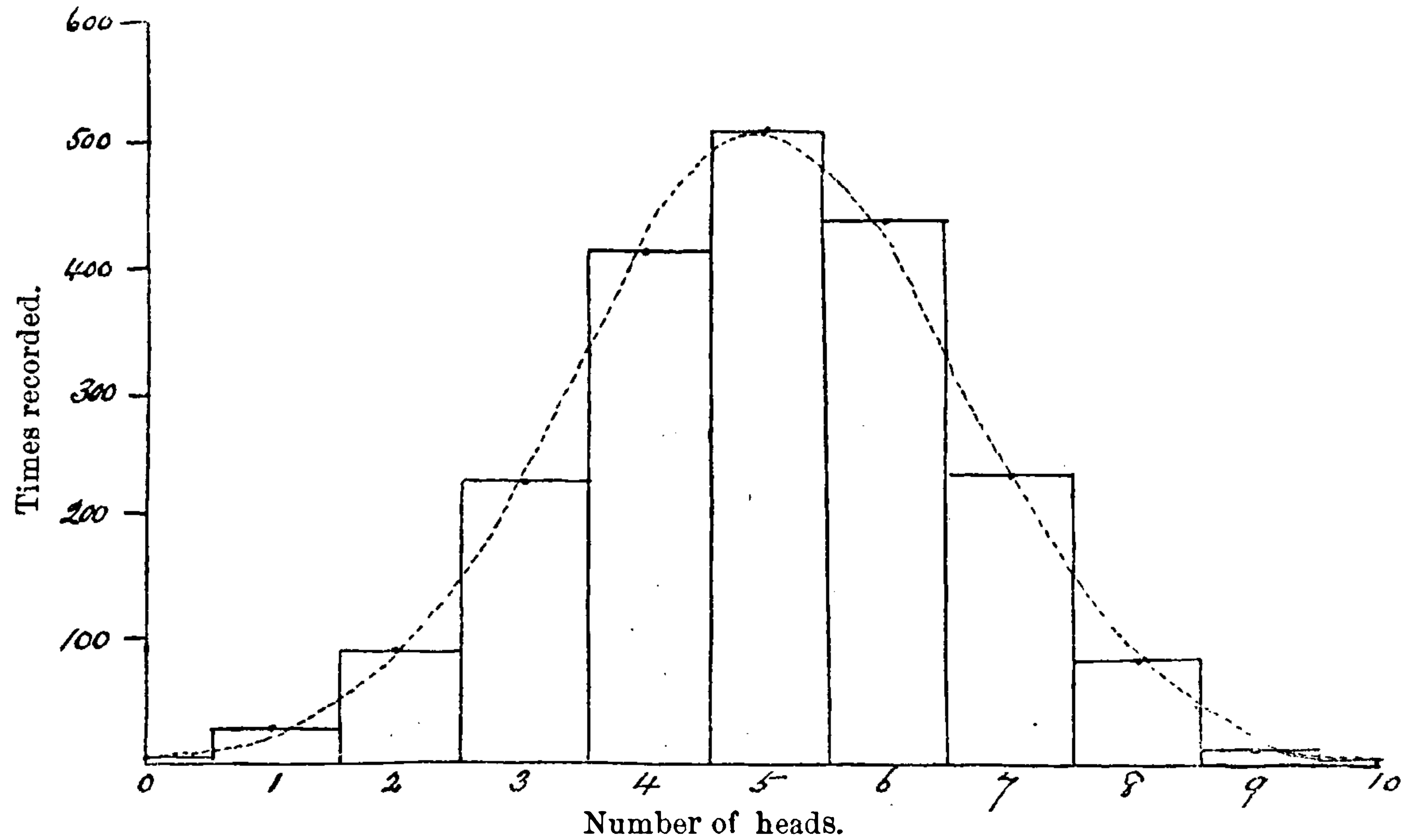
We have already referred to the fact that the science of criminal anthropology has been largely built up of conclusions based upon rough observations, *i.e.*, upon visual appreciations of anatomical quantities, rather than upon precise measurements; and it is this form of observation that we deprecate when we assert that the problem of the existence or non-existence of a criminal type is essentially an anthropometric one. The existence of this type must stand or fall by the verdict of measurements, and of measurements only. The futility of drawing conclusions merely from rough observations, and the wide opportunity afforded, when this method is employed, for drawing almost any conclusion from the same human material, by an unconscious modifying of the standard of grouping, is conclusively proved by the following illustration. Three hundred criminals, classified by three grades of intelligence, were observed in the above mentioned manner, for the purpose of discovering if there be any appreciable association between height of forehead and intellectual capacity; the forehead of each of these three hundred individuals being loosely recorded as either a low, a medium, or a high forehead. The result of the inquiry was that, of the intelligent group, 20·5 per cent. had low foreheads and 20·5 per cent. had high foreheads; of the unintelligent group, 35·7 per cent. had low, 8·3 per cent. had high, foreheads; of the weak-minded group, the corresponding figures were 46·0 per cent. and 8·0 per cent. The conclusion would seem to be obvious that frontal development is undoubtedly associated with intelligence. However, two years after this inquiry, the same three hundred individuals were included in a group of eight hundred criminals whose head contours were being traced; and, this fact presenting a unique opportunity for obtaining a series of precise measurements of the forehead heights of the same individuals, these were then taken. The distribution of measurements thus obtained, contrasted with the rough observation previously made upon the same material, are as follows:—

Fig. i.—Height of Forehead and Intelligence.



of natural law. It has been demonstrated by a variety of experiments that such chance events fall into definite types of distribution, which correspond closely to an expected distribution, according to the law of probability. As an instance, we give, in the following diagram, the distribution of the result obtained at the classic experiment, when ten coins were simultaneously tossed 20,000 times.*

FIG. ii.—2,048 tosses of 10 shillings. The number of heads in each throw recorded.



All the possible combinations that might result from any particular throw are named, at equal intervals, along the base line, and the relative heights of the ordinates at each named point are proportional to the number of times each particular combination occurred in the series of tosses. The figure formed by the rectangles whose heights are the ordinates is called the frequency distribution of this experiment; and the smooth dotted line drawn in the same figure, called a frequency curve, illustrates the results that would have been expected, according to the theory of probability, assuming that each throw in the experiment had been influenced solely by chance. It will be seen that the results of coin-tossing occur in a very orderly fashion, and are by no means chaotic—in fact that the frequency distribution only requires a little adjusting to correspond exactly to the frequency curve. In other words, it is assumed, from the approximate coincidence of the distribution and the curve, that if the number of trials were sufficiently increased, the fit between the two would become perfect. The conclusion is that chance events in nature are regulated by the mathematical law of independent probability.

The frequency curve just described is only one of many chance distribution curves.† If not the most important, this curve has been the most studied, and its properties have been tabulated. It is sometimes called the "Gaussian distribution curve," from the German Gauss, who first described it; or it is called the "normal curve of error," because it was originally studied in relation with statistics of error. Any series of statistics that can be described by this form of curve are said to have a "Gaussian" or "normal" distribution.

It will be understood that series of statistics *normally* distributed, *i.e.*, that can be described by a curve of the normal type, may be endless in variety with regard to certain magnitudes distinguishing the distribution. The characteristic of *all chance distributions* is their continuity. There are no breaks, no peaks, in the line of distribution which, from one extreme to the other, is continuous and uninterrupted. The characteristics of *every normal distribution* are, firstly, that the curve is symmetrical about the mean, which corresponds to its summit; and, secondly, that the curve falls away more or less rapidly on both sides of the mean by a definite law of diminution, until, almost level with the axis, it continues indefinitely in both directions.‡ The peculiar genius of any Gaussian,

* *See* Karl Pearson's "*Chances of Death*," p. 13.

† The constants of any chance distribution can now be determined, and the curve can be found which most appropriately fits the statistics, by a method evolved by K. Pearson and described by him in *Skew variation in homogeneous material. Phil. Trans. V. 186A, p. 343.*

‡ See figures xi and xii, pages 152, 153.

or other type of curve, is defined by the constants of that curve, which are described variously as the mean, the mode, the standard deviation, the coefficient of variation, the successive higher moments and their derivatives, &c.* The *mean* of any distribution curve is that value on the axis, or scale, of possible events, which represents the average event of the whole distribution. For instance, the mean stature of 100 individuals, of whom 40 are 67 inches in height, 20 are 69 inches, 20 are 65 inches, 10 are 72 inches, and 10 are 62 inches, respectively, would be $\frac{67 \times 40 + 20(69+65) + 10(72+62)}{100}$ inches. The *mode* of the curve is that value of the variate for which the frequency is a maximum. In the normal curve, which is symmetrical about the mean, the values of the mean and the mode are identical. In other curves, the difference between the mean and the mode is a measure of the lack of symmetry in the distribution. The *standard deviation* of the curve gives an average of the degree to which each individual event in the series deviates from the mean value of the whole. It measures the variability of the distribution. The *coefficient of variation* of the curve is the ratio of the standard deviation to the mean, expressed as a percentage. The relative variability of different distributions, *i.e.*, the variability of one character which is legitimately comparable to that of another, is not given by the standard deviation which expresses absolute variability, but by the relation of the standard deviation to the mean, which is the coefficient of variation.

Now, an important anthropometrical discovery has been the fact that practically all human characters which have been exactly measured have an approximately normal distribution†—that the frequencies of all series of human measurements occur in the definite proportion we have described for such purely chance series of occurrences as the results of coin-tossing. For instance, the distribution of stature measurements, obtained from a random population, gives a frequency distribution which approximates almost as closely to the normal curve of error as did the distribution resulting from the coin-tossing experiment described.‡ The distributions illustrated in Fig. IX, p. 122, will give a good idea of the universality of this anthropometric fact.

We see, then, that chance occurrences are distributed according to a definite mathematical law, and that the proportional frequencies of many human measurements are of the nature of chance distributions. It accordingly follows that our knowledge of the laws of probability, which enables us to predict the occurrence of chance events, can also be applied for the prediction of human measurements; and that the properties of the normal curve of error, which have been studied and tabulated, can be utilised for such prediction. For instance, by the law of probability we are able to predict the definite chance that any single event will fall within a certain range of events, and the same chance that the average of any series will fall within a narrower range, which becomes more and more constricted as the number of events in the series increases. And we can make a similar kind of prediction with regard to the distribution of any human character. We can state, for instance, with definite probability, that the stature of any unknown individual will fall within a certain range; and for a random series of individuals, our prediction of their average stature will become more and more precise as the number of individuals in the series increases.

The point we would emphasise is, that although random human measurements—subject, like all chance occurrences, to the law of probability—can be predicted, nevertheless the prediction is never absolutely precise: the statistical results of any series of measurements can only be foreseen within the limits of a more or less extended range.

* The determining of these constants is the first and chief task in the reduction of any series of statistics. Comparison is the ultimate object in the collecting of statistics; but no valid comparison between two series of statistics is possible until the constants of each series have been determined. At the same time, we must point out that the mean and standard deviation are not properties peculiar to distribution curves. For the distribution of any series of statistics, whether it has been regulated by the law of chance, or has been influenced by a selective agency, such as the bias in loaded dice, or whether it is purely chaotic in character, as is the frequency distribution of a series of letters called out at random—for any such distribution, the mean and standard deviation can be calculated. But until a curve has been found which approximately describes the statistics, statements as to their mean and standard deviation values have less precise significance and are inadequate for comparison or prediction.

† In a work, entitled *Lettres sur la Théorie des Probabilités*, Quetelet originally pointed out that the distribution of certain human measurements corresponds to the curve known to mathematicians as the normal curve of error. This conclusion has been confirmed by many observers and extended to most human attributes that have been measured, but with this qualification: that the correspondence of the distribution of these characters to the Gaussian type is not exact, as Quetelet had believed it to be, but only approximately so.

‡ Actually, there is a slight degree of asymmetry in the distribution of human characters, the position of the mean and mode of the distribution curve being seldom absolutely coincident. The degree of skewness, however, is seldom enough to interfere with any statistical deductions or operations based upon the assumption of the normal frequency. (See frequency distribution of stature p. 199.)

We can never say what the *precise* value of the mean of any series of measurements may be; all we can legitimately assert is that the value will probably fall somewhere within a stated range. We could never deduce that a mean stature would be exactly so many inches, but in certain conditions we might be able to predict, say, the even chance, or the 5 to 1 chance, or the chance of 100 to 1, or of 1,000,000 to 1, &c., that the mean stature would fall somewhere within the range of such and such a number of inches. The extent of this range of prediction depends upon the variability of, and upon the number of instances in, the series of events whose mean, or other statistical value, is being foretold. As the human variability, measured by the standard deviation, of any character becomes smaller, predictions upon measurements of this character become more precise; only when there is no variability, and the standard deviation is zero, would the prediction become absolute. Again, as the total number of individuals dealt with increases, the variability of the prediction decreases. For an indefinitely large random population, the prediction of the average value of any character becomes almost absolute.* If the average stature of all people is known to be 67·58 inches, we can predict, with very small probable error, that the average stature of a very large random sample of the population will be the same figure. This probable error of the prediction depends upon the standard deviation of, and the number of cases included in, the whole distribution.† Its value, preceded by the sign ±, should accompany any stated value for the mean, or other numerical experience, calculated for any population. For instance, a mean value of a series of stature measurements, written 67·58 ± ·16 inches, tells us that the means of other samples—equal in number to ours, and drawn at random from an infinite population having the characteristics of our sample—would differ, one from another, and from 67·58 inches, in an orderly and predicable way: that is to say, the probable error, written ±·16, informs us that 1 in 2 of these mean values would be ·16 inches greater or less than 67·58 inches; that 1 in 5·6 would be ·32 inches, that 1 in 23·3 would be ·48 inches, and that 1 in 143 would be ·64 inches respectively, greater or less than the value—67·58 inches—of the original mean. It is plain that, unless its probable error be also given, any statement of the mean or other statistical value is of little import for prediction or comparative purposes.

A lack of precision with regard to the prediction of human characters, conditions, and other events of chance, will not be satisfactory to any demands for exact prophecy. The science of statistics, however, makes no claim to rival the soothsayers' pretension of revelation. For individual prediction, we admit, it appears to avail little. The knowledge, for example, that it is an even chance that any unknown stature will fall somewhere within a range of between 5 feet 5 inches and 5 feet 9 inches, seems of little more value than complete ignorance.‡ But our science makes no attempt to reckon with the individual: the value of statistical knowledge lies chiefly in its application to individuals *en masse*. Legislation, social and economic organisation, the schemes of the actuary, all practical affairs whose aim is to control, protect, or materially better, not this or that individual, but the people as a whole, must turn for direction to the science of statistics. The knowledge that this particular man has, or has not, been led to repentance by a reformatory system is small evidence either for or against that system: the information required by the legislature is whether the system, in the main, is an influence towards reform.

The value of statistical prediction with regard to the existence or non-existence of criminal characteristics is our immediate concern. The problem, it is admitted, can only be solved from a comparison of statistics—by comparing the statistics resulting from an anthropometrical survey of criminals with similar statistics of the public at large. And since there are no qualitative characters peculiar to the criminal, such differences as may exist between criminals and the law-abiding public being differences of degree only, and never of kind, it is obviously not individual measurements, but whole series of measurements, that we have to compare. No statement can be legitimately made, for instance, as to whether the criminal is or is not characterised by a dome-shaped head, until a random

* Hence the impropriety of dealing with very small samples. The range of variability in prediction with regard to one individual is so wide as to be practically valueless.

† In a character normally distributed there are as many individuals exceeding the mean by more, as there are by less, than ·6745 times the standard deviation of the character. Hence this measure (·6745 σ) is called the probable error of an individual. The probable error of the mean of n individuals drawn from a large population is the same divided by $\sqrt{n}$.

‡ But this knowledge illustrates some of the absurdities of Lombrosian predictions. For instance, Lombroso's verdict that the skull capacity (1360 c.c.) of Charlotte Corday was abnormal because it was greater than the mean capacity of French female skulls (1337 c.c.) would imply, if true, that there is no variation in the skulls of criminals, and that all non-criminal skulls are 1337 c.c. in cubic capacity.

series of criminal head-shapes has been compared with a similar series of heads of non-criminals. How is the comparison to be accomplished? In comparing two individual objects, these are placed side by side, and essential points of agreement and difference are noted. How are two complex groups of objects to be compared in a similar fashion?

In order that complex groups, such as two series of measurements, may be compared, these have to be reduced to a simple form, to the genius, as it were, of the series, *i.e.*, certain values, called constants (the mean, mode, standard deviation, &c., *see* p. 31), have to be extracted; and the groups are compared through the medium of their constants. These values, however, are only themselves comparable in certain conditions. First, we must know that the statistics they represent are not chaotic in their distribution—that the sequence of their frequencies has been determined by law. And, secondly, we must know the range of error to be discounted before any actual differences between the constants compared may be regarded as significant. Before we can assert that one series of measurements inherently differs from another, we must predict and allow for a certain amount of difference or arithmetical inexactness, which, according to the law of probability, is bound to appear in limited samples of the same homogeneous material. This predicted amount of insignificant difference is called, as we have already said, the probable error of the constants under consideration. Briefly resumed, the matter stands thus: we must compare, in determining the existence or non-existence of criminal characteristics, not this or that particular measurement, but the whole series of measurements obtained from a random sample of criminals with a similar whole series obtained from a random sample of the non-criminal population. In order to make this comparison, two things will be necessary: we must extract from each series its statistical constants, the mean, standard deviation, &c., of the series; and by the theory of probability, we must determine for each constant obtained, its probable error. These constants, with their probable errors, will be the representatives of the series, which, through their medium, become comparable with each other. If the differences between the results compared are not greater than the probable errors of these results, such differences may be regarded as insignificant; if the difference is not greater than twice the probable error, it may be regarded as probably insignificant; and if it is not greater than three times the probable error, it may be regarded as possibly insignificant. On the other hand, if any difference found is greater than three times the probable error, it is reasonable to assume that that difference is due to some definite influence over and above those causes which are inherent in the sampling process.*

This brief description will show that it is not possible to compare one set of data with another until the statistical constants of the contrasted series, and their probable errors, have been calculated. But even then, no conclusion can be safely asserted from the comparison, until a certain condition has been fulfilled. Before drawing conclusions from the comparison of statistics, we must be certain that we are dealing with strictly *random* samples of the same homogeneous material; that is to say, we must be certain that our contrasted samples have not been selected in respect to any characters associated with the particular characters whose constants we are comparing. For instance, before we can conclude that any significant difference, discovered between the mean head length of a sample of criminals and that of the general population, is one organically associated with criminality (*i.e.*, represents a veritable criminal characteristic), we must be certain that, apart from criminality, the contrasted series of head-lengths have been obtained from homogeneous human material. We must see that the distributions of age, of stature, of intelligence, of all characters, in fact, associated with head-length that we wish to eliminate from our conception of criminality, are the same for both sections of the population we are comparing.† If these distributions do not correspond—and in practice they will seldom be found to do so—the differences must be equalized; or, in other words, the effects of these differences upon the mean head-length must be allowed for, before any conclusion can be drawn as to the amount of organic association between head-length and criminal proclivity. How is this allowance to be made? The principle of the process depends upon our knowledge of how, and to what extent, the qualities to be allowed for are associated with the particular one we are dealing with.

Let us suppose that we measure the head-lengths of several groups of a hundred individuals, taken at random, *i.e.*, individuals not selected either by their age or by their stature, which, for the sake of the example, we will choose to regard as the only two qualities fortuitously associated with criminality which are likely to affect head-lengths. We should find that the values of the mean head-length, and that the average deviation

* For such causes will account for this amount of difference once only in 23 samplings.

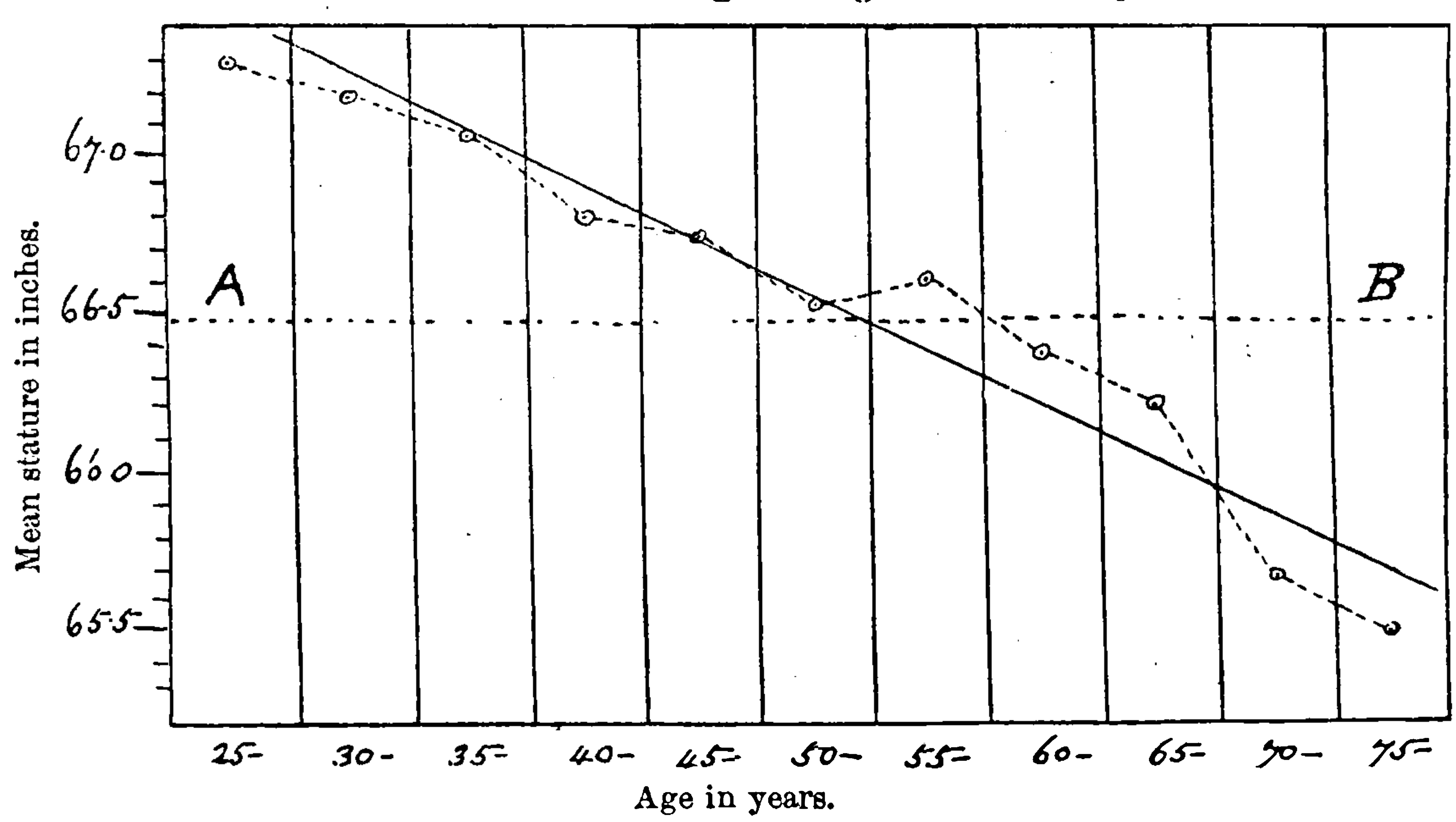
† Grey hair is associated with age. It would obviously not be legitimate to conclude, from the results of comparing a group of young adult criminals with a sample of law-abiding veterans, that absence of grey hair is a criminal characteristic.

from the mean of all the individual head-lengths, would be the same for each of the samples ; that is to say, they would be the same with known frequency of error : which, as we have explained, is inseparable from the sampling process. Let us next suppose that we measure the head-lengths of other groups of a hundred individuals, taken at random as before, in respect of their stature, but, with regard to their age, so selected this time that every individual is between 40 and 50 years old. We should find that the means and standard deviations of head-length would still be approximately in accord for all such selected groups, but that they would differ appreciably from the results obtained from the previous unselected groups. The restriction by age of the individuals measured will have been accompanied by an increase in their average head-length, and by a decrease in the variability of the individual head-lengths. Finally, let us consider the effect upon the head measurements if we so select the individuals in our samples that they are all between 40 and 50 years of age, with statures that lie between 70 and 72 inches, let us say. We should find that the mean head-lengths of the third set of samples would be greater than those of either of the two proceeding sets, and that the variability of the head-lengths would be still further decreased from the amounts previously found. We conclude, therefore, that, although different samples of homogeneous human material yield constant results for the mean and variability of head-length (with a certain frequency of error), samples of individuals whose mean age and stature are at variance differ appreciably from each other in both these respects. In technical language, we describe these facts by saving that head-length is *correlated* with age and with stature ; and the measure of the exact intensity of this relationship, expressed upon a scale between − 1 and + 1, is called a correlation coefficient.

Stated in general terms, the degree of numerical relationship, or the coefficient of correlation, of one character with another, represents how, and to what extent, the mean vâlue of one varies with any change in an assigned value of the other. If, as one variable increases the mean value of the other remains unchanged, there is no correlation between these two values, and the coefficient is zero ; if, on the other hand, with increase of one variable the mean value of the other either *progressively* increases, or decreases, there is either positive or negative correlation, as the case may be, and the numerical value of the coefficient is the ratio of these increments when measured on suitable scales whose units are the variabilities of the characters.

Now, the accuracy of prediction depends, as we have seen, upon the assumption that we are dealing with random samples of statistics. Consequently, when dealing with samples that are not random ones, we must correct our prediction by reducing them to a standard basis—that is to say, by allowing for differences in the mean values of those characters, within the samples, in respect of which they have been selected. The method whereby heterogeneous material can thus be reduced to a standard basis, for prediction or comparison, depends upon the knowledge of the degrees of correlation between all the characters in question, and will best be appreciated by reference to the following figure :—

FIG. iii.—Correlation of Stature with Age. Regression line : $y = 68{\cdot}34 - {\cdot}0337x$.



It will be seen that along the left-hand side of the figure a scale of stature is given, and along the bottom of the figure a scale of ages is noted. A series of measurements of statures is taken for a population of individuals of ages 25 years and upwards. Selecting from these measurements all those belonging to individuals aged 25–30, the arithmetic mean of this selected series is found to be 67·3 inches. This result is recorded by plotting, in the column devoted to individuals of age 25–30, a dot against stature: that is to say, the fact is recorded that individuals of age 25 have a mean stature of 67·3 inches. In the same way, by selecting in turn measurements of individuals aged 30, 35, &c., &c., the mean statures of individuals at each successive age-period are recorded by the series of dots plotted in the table. It will be seen that the series of dots lies approximately upon a sloping straight line, which is called *the line of regression*. The slope of this line expresses the degree to which progressive change in mean stature is influenced by increasing age; and it measures the coefficient of correlation of head-length with age, when deviations in these characters are expressed as fractions or multiples of their standard deviation. If, with changing age, there be no change in mean stature, the value of the mean for each age group will be the same—all the dots plotted in Figure iii. will lie upon a horizontal line, *i.e.*, upon the line AB which represents the mean stature of the total population of the individuals of all ages. In this case, the regression line being horizontal and without slope, the correlation coefficient will be zero. If, however, corresponding to any change in age—a change, let us say, equal to the standard deviation of age in the series—there is a change in mean stature—a change, let us say, equal to one-half of the standard deviation of stature—this fraction, ·5, will express the slope of the regression line, and will measure the coefficient of correlation of head-length with age. The fraction cannot exceed unity, which will be its value when one character determines the other exactly: that is to say, the intensity of association between two variables become absolute, and is expressed by a coefficient of unity, when a change in one determines a change in the other which is constant in proportionality, and invariable among the individuals. But between this perfect correlation represented by unity, and the previous nil-correlation represented by zero, there will be a continuous series of measures of correlation represented by fractions of descending value.* Consequently, intensities of relationship between any two variables, may be expressed by a series of correlation coefficients upon a scale between 0 and 1, *i.e.*, by a series of fractions which measure the slope of the regression line.† In other words, if "r" be the value of the correlation coefficient of one variable with another, we may say, generally, that any change in the value of the one variate will determine in the mean "r" times this amount of change in the other: the changes in the variates being always measured as fractions of their variability or standard deviation.

A further important meaning contained in the correlation coefficient lies in the information this supplies as to how the variability of any character becomes modified in its association with another character. The correlation coefficient tells us how, and to what average extent, between two associated characters, the range of variation in one becomes constricted within any stated group of the other. For instance, in Fig. iii. the range of variability in the stature of individuals within each of the age-groups has a smaller value than that of the standard deviation for the total population of all ages. This constriction in the standard deviation of any one variable for the constant value of another becomes more and more marked as the intensity of correlation between the two variables increases: until, when the correlation coefficient reaches unity, the range of variability disappears; the standard deviation within the group becomes zero. Stated generally, if "r" be the value of the correlation coefficient of one variable with another, the range of variability of the one, for constant value of the other, becomes reduced on the average to the fractional amount $\sqrt{(1-r^2)}$, of its initial value.

The description we have given is sufficient to show the first merit of a correlation coefficient, which lies in its precise meaning as a factor in prediction. The knowledge of the correlation coefficient of one character, whose mean value is to be predicted, with other characters, whose values are known, renders the prediction more accurate and its range more precise. In other words, the knowledge of these correlation coefficients enables us. when dealing with samples which are not strictly random ones, to correct a prediction, by making proper allowance for the heterogeneity of our material. The significance and validity of this correcting process follows immediately from the import of the two propositions relating to the correlation coefficient we have already formulated.

* Moreover, since it may be that the second character decreases as the first increases, a sign + or — is attached to the coefficient to indicate whether increase or decrease in the second character answers to an increase in the first. Since stature diminishes with increase of age above 25 or 30, the correlation coefficient is negative in the instance chosen.

† For a detailed practical description of the "product moment" method, whereby a measure of the slope of the regression line, *i.e.*, a correlation coefficient, is obtained from the figures within a correlation table—*see* W. Palin Elderton, *Frequency Curves and Correlation*, p. 117.

If "r" be the value of the correlation coefficient of one variable with another, we may say generally :—

(i) that the change in the mean value of the one variable will be "r" times any assigned change in the other ; and

(ii) that the range of variability of the one character, for constant value of the other, is reduced in the average to an extent given by the fraction $\surd(1-r^2.)$.

In order to apply these propositions for correcting a prediction, it is necessary to realize implicitly what is meant by the phrase "change of value," as applied here to a variable quantity. To what unit do we refer, in speaking of a change in one variable as equal to "r" times the amount of change in the other? Head-lengths, for instance, are measured in millimetre units ; age is a character usually expressed in units of one year. What is to be the prescribed standard of measurement so that a change in duration can be made comparable with a change in extension? The implication is that we should express all values in terms of the standard deviation from the mean value. Thus, to correct a prediction in a sample, by allowing for the particular age distribution in the sample, we say the difference between the corrected and the crude prediction of mean head-length, expressed in terms of the standard deviation of head-length, will be equal to "r" times the difference between the mean ages, expressed in terms of the standard deviation of age.* Let us consider a concrete example :—the mean head-length of a group of criminals is 190 mm., the standard deviation of head-length is 5 mm. ; the mean age of the group is 55 years, and the standard deviation of age is 10 years. Now, within the group of criminals, there is a relatively small sub-group of 100 murderers, whose mean age is 25 years, and whose mean head-length is 186 mm. Our object is to ascertain to what extent the mean head-length of the sub-group of murderers differs from the mean head-length of criminals generally. The actual difference in the observed means is 4 m.m. ; this difference may, or may not, be significant. No conclusion can be drawn from a mere comparison of mean values. So we start the inquiry by making a crude prediction. From our knowledge of the mean and standard deviation of head-lengths of all criminals, we predict what ought to be the mean head-length of a sub-group of murderers, assuming the sub-group to be a random sample of a total group. On this assumption, we predict that the mean value might fall anywhere within a range of $\frac{\cdot 6745 \times 5}{\surd n}$ mm. = ·34 mm.† above and below 190 mm. This, however, is only a first crude prediction which, since age is correlated with head-length, must be corrected by our allowing for the different distribution of age in the two groups of criminals whose head-lengths we are comparing. We ascertain that the correlation coefficient "r," of age with head-length, is ·25 ; the difference between the mean age of the sub-group and total group is 30 years ; what difference in mean head-length corresponds to a difference of 30 years of age? The standard deviation of age is 10 years : therefore 30 years equals three standard deviation units. Applying our formula, we know that "r" times the difference in mean age, *i.e.*, $\cdot 25 \times 3 =$ the difference in mean head-length expressed in units of the standard deviation of head-length. The difference in mean head-length, in mm., is therefore $3 \times \cdot 25 \times 5 = 3\cdot 75$ mm. Correcting, then, for age, our crude prediction of 190 mm. ± ·34 becomes 190 − 3·75 mm. = 186·25 mm., $\pm \frac{\cdot 6745 \times 5}{\surd n} \times \surd\overline{(1-r^2)}$. *i.e.* = 186·25 mm. ± (·34 × ·97) or ·33 mm.‡ That is to say, allowing for the difference of age in the two groups, we predict, that, if there be no relation between crime and head-length, the mean head-length of the sub-group of murderers would fall, not within a range of 189·66 to 190·34 mm., but somewhere within a range of 185·92 and 186·58 mm. ; or, assuming that twice the probable error gives the best idea of the range of variation that may reasonably be attributed to random sampling, we would predict that one out of every five or six random samples of a hundred criminals would yield an average head-length which, without any significance attaching to the variation, would fall even

* When the means lie upon a straight line, *i.e*, when the regression is "linear," the same correction is to be applied to a group differing in *mean* age as to a group all of whose individuals have the same deviation.

† See † note, p. 32.

‡ This value of the probable error is an expression of the second proposition given above, that the restriction in variability of one character, for constant value of another, $= \surd\overline{(1-r^2)}$. Thus the knowledge of correlation coefficients enables us to predict more accurately and more precisely. In the above examples, the accuracy of the prediction is increased by nearly 4 mm ; and the variation in the prediction is reduced to the extent of the fraction $\surd\overline{(1-r^2)}$: which equals, in this case $\surd\overline{1-\cdot 25}$ = ·968.

considerable portion of the conclusions of criminal anthropology have been based upon differences between criminal statistics, collected by one observer, and statistics of the general population, collected by other individuals. Conclusions derived from the comparison of results obtained in this way should only be stated with the greatest reserve; their validity depends entirely upon the extent to which the contrasted statistics have been subject to personal bias; no dogmatic statement is legitimate until differences due to this bias have been estimated and allowed for. The chief source of personal error lies not so much in varying precision in making measurements, as in the fact that the actual thing measured is variously defined or interpreted by different individuals. Head and body measurements are often defined as distances between conventionally described points; but, anatomically, there is no such thing as a distinct, definable point in the human head and body. The location of points described, depending as it does upon personal opinion, may introduce appreciable error into a series of measurements. Moreover, the varying degrees of pressure exerted by different investigators measuring soft flesh parts covering bone will inevitably lead to a diversity of results, even if they all be working upon the same material. It is obvious, therefore, that some measurements are more liable to be influenced by personal equation than are others, and that, consequently, their statistical results are less reliable for comparison. Visual appreciations of anatomical quantities provide the least reliable data, *i.e.*, the data most influenced by the personal equation. Measurements involving pressure upon soft parts will also be similarly influenced to a greater or lesser degree. Measurements of bony parts, such as the head, will be subject to a less degree of error; the extent of which will depend upon the precision of the measurement's definition and upon the facility for locating the points between which the measurement is taken. Precisely defined cephalic diameters, for instance, are more trustworthy measurements than cephalic projections, which have a more or less vague definition. In the present work, when the personal equation of different observers may be suspected of influencing results, this effect will be eliminated as far as possible by confining attention to data collected by one individual only.

Necessarily, a work of the present limitations cannot contain reference to all the characters which have been quoted, by innumerable observers in all European countries, as stigmatising the criminal. We have limited our examination to those characters which are the most important, because they have been the most widely accepted as "criminal characteristics"; and even of these we have not attempted to give an exhaustive statistical account. We do not think, however, that this is necessarily a disadvantage, since a portrait in outline, which is all we have undertaken, often brings out characteristic features with the greatest clarity. The principal objects we have had in view have been (while confining attention to statistics of criminals only) to determine whether there be any characteristic physical differences between various orders of criminals, *i.e.*, criminals distinguished by the perpetration of different types of crime; and (while comparing statistics of criminals generally with similar statistics of the non-criminal classes) to determine whether criminals, as a class, are physically differentiated from the law-abiding community; and (when lacking comparative material) to place on record the data, and the statistical constants and general statistical treatment of the data, relating to a wide range of characters in criminals for service in the future, when similar information of the law-abiding classes may have become available for comparison.

The whole virtue of statistics lies in comparison. The aim of statistical science is to legitimatise statistical comparison. The weakness of criminal statistics lies, at present, in the absence of suitable comparative data. To meet this fault we have, accordingly, in all cases separated our statistics of criminals into five groups, on a basis of the type of crime committeed by each delinquent. Assuming that inward criminal proclivity is associated with outward physical signs, it is a reasonable hypothesis that criminals distinguished amongst themselves by such very different orders of crime as petty larceny, murderous assault, incendiarism, sexual offences, and fraudulence, would also be distinguished from each other in physical characteristics. At any rate, the absence of such marks, distinguishing criminals amongst themselves, should be strong presumptive evidence against the presence of these marks distinguishing criminals as a class: their consistent absence may be regarded as evidence against the alleged existence of a criminal type. Moreover, in this regard, an interesting suggestion presents itself from the comparison of fraudulent criminals* with the general population. The close similarity in their marriage rates, distribution of occupation, and other social conditions; the proportionate class-differences amongst fraudulent criminals, much the same as in the population at large; the low degree of alcoholism, the higher average of intelligence and

* We include in this group individuals guilty of forgery, embezzlement, bigamy, fraudulence as trustee, as well as every kind of fraudulent pretence.

education of criminals who commit this type of crime, compared with criminals who commit other crimes—these facts, coupled with the additional knowledge that the penal record of our fraudulent group consists almost invariably of a solitary offence, permit the assumption that *our fraudulent group of criminals forms an approximately representative sample of the well-to-do classes in the non-criminal population.* In the absence of more legitimate comparative material, this assumption affords the possibility for our comparing criminals with the general community in certain directions that would otherwise be closed to us.

The facts, resulting from this investigation, whose collecting cost five years of laborious spade work, and whose reduction into coherent statistical knowledge of the criminal covered another three years, are set forth in a consecutive series of tables and diagrams accompanied only by such descriptive text as is essential for a clear understanding of the tabulated facts and figures. Our endeavour has been to limit the text as far as possible, the facts finding their most appropriate outlet in the illustrations of figures which should speak for themselves.

II.—Definitions of Measurements and Descriptions of Characters.

An account of some of our measurements, and of our methods of making them, will be found in Biometrika, Vol. III, p. 60, accompanying the publication of certain anthropometrical observations made upon 130 criminals, by Dr. G. B. Griffiths. As explained in an introductory note by Sir Bryan Donkin, one of the Directors of Convict Prisons, the observations then recorded were a preliminary instalment of a much larger series of observations, anthropometrical and otherwise, which, at that time, were about to be collected. The observations then referred to, in anticipation, are those which now form the basis of the present investigation. Excepting, therefore, where new data and new methods of procedure have been introduced, it will not be necessary to give more than a brief description of our measurements and methods of measuring, already defined and explained by Dr. Griffiths.

We may divide our observations of physical characters into five groups:—

I. A group comprising several series of simple calliper measurements. The stated definitions of these measurements are free from ambiguity; and consequently, during the process of their statistical reduction, any possibly existing error, due to personal differences in interpreting and making these measurements, has been neglected.

II. A group comprising some series of more complicated and less unambiguously defined measurements. In the statistical reduction of these, allowance has been made for error due to personal differences in the judgment and technique of different observers.

III & IV. A group of several series of rough appreciations of anatomical quantities, measured by inspection, and without mechanical aid from measuring instruments, and recorded within alternative or multiple categories. The personal equation of different observers is here a factor of such statistical importance that we have confined attention to the records of one observer only.

V. A group relating to certain cephalic characters which, hitherto observed by methods of rough inspection, have been recorded, by the particular method adopted in the present investigation, as series of exact measurements.

It is assumed, in all the following definitions, where such can be appropriate, that the head is held in a horizontal position, with the eyes at rest, looking towards an object at their own height above the ground. (Broca's horizontal position.)

First Group:—

Head-length.—This is the maximum length of head, and is the shortest distance between the glabella and the occipital point, *i.e.*, between the prominence of the forehead immediately above the nose to the most projecting point at the back of the head. Measured with callipers.

Head-breadth.—This is the maximum breadth of head above the back of the ears, as measured with callipers.

Head-height.—This is the vertical distance of the centre of the external auricular meatus below a horizontal plane tangential to the top of the head. It was not discovered, until the measurements of this character had been statistically reduced, that the error, resulting from difference in the personal equation of our observers, was greater than the error due to random sampling; and, consequently, that it ought to have been allowed for. The magnitude, here, of the personal error is probably due to the greater difficulty in measuring height of head consistently with its stated definition. The auricular point, although not difficult to localise, is liable to be variously interpreted by different observers; and there may be any disparity from one to three mm. between measurements of auricular height taken by one observer and those taken by others, according to whether the auricular point is localised upon the upper rim, at the centre, or upon the lower margin, of the auditory meatus. Moreover, the technique adopted by most of our observers, in obtaining this measurement, was unnecessarily complicated (for description *see* Biometrika, Vol. III, p. 61). The auricular height, however, in records 1 to 1,000, were measured more simply, with callipers, to which a projecting detachable rod was fixed to the sliding rim and at right angles to the callipers' stem. In taking the measurements 1 to 1,000, in each case the fixed limb of the callipers was placed in the middle of the external auditory meatus, and the sliding limb was adjusted until the rod projecting from it touched the top of the head, immediately above the ear.

Cephalic index.—This is the ratio $\frac{\text{head-breadth} \times 100}{\text{head-length}}$. It measures the extent to which the head is relatively long or broad.

Head circumference.—This is the distance round the head, measured across the middle of the forehead, and round the most projecting part of the back of the head. Taken by means of a steel measuring tape.

Facial-length.—This is the shortest distance between the nasion (*i.e.*, the angle between the nose and the forehead) and the lower border of the chin in the median line, as measured with callipers.

Facial breadth.—This is the maximum breadth of face, as measured with callipers, between the most prominent points on the right and left cheek-bones.

Facial index.—This is the ratio $\frac{\text{face-breadth} \times 100}{\text{face-length}}$. It measures the extent to which the face is relatively long or broad.

Auricular-alveolar radius.—This is the shortest distance between the centre of the external auditory meatus and the roots of the upper incisor teeth in the median line, as measured with callipers.

Auricular-nasal radius.—This is the shortest distance between the centre of the external auricular meatus and the nasion, as measured with callipers.

Gnathic index.—This is the ratio $\frac{\text{auricular alv. radius} \times 100}{\text{auricular nasal radius}}$. It is taken as a measure of the extent to which the upper jaw projects beyond the rest of the face.

Distance between eyes.—This is the distance between the external margins of the orbit, as measured with callipers.

Eyesight.—This is the ability to see clearly at a stated distance. Variance in the acuity of vision of individuals may be due to many causes, such as differences in the shape and symmetry of the eyeball (long-sightedness, short-sightedness, astigmatism), or defects and disease of the various parts of the visual apparatus, &c. Moreover, apart from such morbid causes of defective vision, there is also a range of physiological variability in normal vision—some people having a naturally acuter visual power than others. In the present investigation, we deal only with statistics of crude, uncorrected visual capacity, *i.e.*, the eyesight of our subjects was tested without correction being made, by the use of glasses, etc., for any particular source of visual defectiveness. To test eyesight, each individual was required to name the smallest letter, out of a graduated series, he could see distinctly with unaided vision, at a distance of 6 metres. Adopting the usual notation, the vision of those individuals who could read the smallest letter in the series was recorded as $\frac{6}{6}$, the vision of those who could read only the largest letter was $\frac{6}{60}$; intermediate capacities being recorded as $\frac{6}{9}$, $\frac{6}{12}$, $\frac{6}{18}$, $\frac{6}{24}$, $\frac{6}{36}$, according to the smallest size of letter distinctly seen. This scale of vision, although convenient for the practical purposes for which eyesight is usually tested, is of course an entirely artificial one. It is, nevertheless, a fair presumption that individuals, thus sorted, are placed in their right position upon a scale based upon physiological fact. The scale actually adopted, for the statistical analysis of this material, was that one which gives a normal distribution of the frequencies obtained upon the scale employed for collecting it. So many human characters are distributed upon the normal plan, that the presumption is warranted that a scale of normal distribution would correspond to physiological fact more closely than would any artificial scale.

Second group:—

These are two head-projections, and measurements of the right and left ear. Our remarks upon the measurements of head-height, and the method employed in making them, apply equally to our statistics of the occipital and chin projections. The ears, also, are organs whose length is difficult to measure, because of their extreme flexibility; that length, moreover, is liable to be variously interpreted, because the points between which the maximum length of ear lies have no anatomical definition. Consequently, when analysing the data of these characters, due allowance has been made for the influence of the personal equation of different observers.

Occipital projection.—This is the distance of the centre of the external auditory meatus from a vertical plane tangential to the most prominent part of the back of the head. As in the case of head-height, records 1 to 1,000 were measured with a detachable projecting arm, fitted to ordinary callipers, and with a horizontal hinge allowing movement of the arm in a vertical plane. The fixed limb of the callipers was placed in the middle of the external auditory meatus, and the sliding limb was adjusted until the projecting rod touched the most projecting part of the back of the head.

Chin-projection.—This is the horizontal distance of the middle of the external auditory meatus from a vertical plane tangential to the lower border of the chin in the median line. The measurements of this character were taken by the same means, and in the same way, as described for the occipital projection, the sliding limb of the callipers being adjusted, in the present case, until the projecting rod impinged against the lower border of the chin.

Length of ears.—This is the greatest length of right and left ears, as measured with callipers.

Third and fourth groups:—

Judgment upon the various scale-orders of these characters is obviously determined by the personal standard in the mind of any observer; and different investigators, working upon the same material, may achieve widely different results. When separating, for instance, hair-shades into light and dark, eye-brows into concurrent and non-concurrent; or when judging nose-shapes or eye-colours; or when estimating whether a palate is high or low, or whether lips are thick or thin, &c., &c.—we are making rough appreciations of anatomical quantities, upon an unstandardized scale of opinion, which will inevitably vary with every different observer. Hence, when dealing statistically with these characters, the personal equation becomes of such importance that it is imperative to eliminate its effect by treating observations of different observers entirely apart from each other. In the present work, the observations numbered 1 to 1,000, and 2,501 to 3,000, all recorded by one individual, are alone considered; and the classifications are thus only subject to one personal equation.

Symmetry of face—This is judged by noticing whether one side of the face is larger than the other, or whether there is no difference between the two sides. Three categories are recorded: a-symmetrical to the right or to the left, and symmetrical.

Hearing.—This is judged as good, fair, indifferent, or nil, according to the subject's capacity for hearing the tick of a watch at a varying distance.

Eyebrows.—These are judged as concurrent or non-concurrent by simple inspection.

Nose.—The shape from the nasion to the tip is judged by inspection, and is described within any of five categories, as rectilinear, concave, convex, humped, or undulating.

The angular relation of the nose to the upper lip is similarly observed, and described as horizontal, elevated, or descending.

The deflection of nose is judged and described in a similar manner to facial symmetry.

Lips.—The three categories are thin, thick, and medium, as judged by inspection.

Palate.—The height of palate is judged by inspection, and is classified within four categories, as high, low, medium or Λ-shaped.

The width, similarly observed, is described within the alternative categories narrow or medium.

Right-handedness.—From interrogation as to his manual dexterity, each subject is classified as either right or left-handed, or as ambidextrous.

Eyes.—The colour is classified, according to the observer's opinion, as either black, brown, blue, or gray.

The shades of eye-colour are divided into the categories, light, medium, and dark, according to the intensity of pigmentation, as estimated by inspection.

Hair.—No attempt is made to classify hair-colour upon a scale of pigmentation intensity. The four categories, black, brown, blonde and red, are taken; and the hair of each individual is entered within any one of these lists, according to the observer's valuation of its colour. Grayness of hair is noted independently of colour.

The shades of hair-colour are divided into the categories, light, medium, and dark, according to the relative presence or absence of black pigment, as estimated by inspection. Generally, "dark" hair covers black and dark shades of brown; "medium" covers chestnut and other intermediate shades between light and dark brown; "light" embraces blonde, light shades of brown, and red.

Texture of hair is separated, by inspection, within the categories, fine, coarse, and medium.

Quantity of hair is recorded as thin, thick, and medium, as estimated by inspection. The conditions "going bald" and "completely bald" are also noted.

Complexion.—Three categories are admitted, fair, dark, and medium, corresponding to intensity of skin pigmentation. This character must be distinguished from the next.

Facial pallor.—Here the three categories, ruddy, medium, and pale, refer to the extent of vascularity of the face; and the categories, anæmic and not anæmic, refer to the relative poverty or richness of the blood.

Tattoing of skin.—For this condition we recognise five group differences—no marks, a few trifling marks, some definite image or symbol, more than one definite picture, and elaborate or profuse distribution of marks. The scale is, of course, quite artificial; but the records are reliable, being taken from official documents, where these marks are carefully noted for purposes of criminal identification.

Fifth Group:—

Our method of obtaining and dealing with characters within this group will be described in a later section.

In the above descriptions we have explained the nature of the various observed characters we shall deal with statistically in this section. These observed characters are, however, in some cases, not in themselves actual anatomical characters; they are only the representatives of these characters, or the best measure of them that is available. Thus, our records of hair and eye colour, and of complexion of skin, refer directly to observations of varying quantities of light reflected from certain parts of the body, and only indirectly to some underlying anatomical fact, such as extent, or intensity, of pigmentation. In the present work there is no need to dwell upon the exact anatomical nature of the characters which our observations represent; such interpretation of our observations in terms of anatomical fact being of very secondary importance. Our object certainly is to measure the degree of relationship between various anatomical characters and criminality; but, in order to obtain an exact measure of this relationship, all we need assume is that the characters we correlate have an approximately normal distribution—it is quite immaterial whether or no the precise nature of the characters can be specified anatomically. Now, the remarks we have made above make it sufficiently clear that most of the characters with which we are dealing are, at any rate, distributed upon a scale which is progressively continuous. And, consequently, since we have found that all the anatomical characters we have been able to measure exactly, upon a graduated scale, are distributed upon an approximately normal plan (*see* p. 122), we shall feel justified in assuming that, in our rougher observations, we have sorted our subjects into their right position upon a scale of anatomical fact, which, whatever the fact may actually be, has in nature a very nearly normal distribution.

In five cases, however, our observations have not been made upon a continuous scale—symmetry of face and nose, palate, eye, and hair colour. In these cases we cannot justify the assumption of a normal distribution of our material. To surmount this difficulty, therefore, we have measured the relationships of these particular characters by the less satisfactory method of "contingency," which, however, has this advantage, that it completely dispenses with any assumption of a continuous scale.*

* For reasons which will appear as we proceed, the analysis of age and of stature, of body-weight and some other allied characters, is dealt with in a separate section under the heading "physique of criminals." *See* part II., chap. I., page 174.

III.—Statistical Treatment of Data.

A. *Mean Values, &c., of Characters*, 5 *groups*.

Group Ia.—The length, breadth, index, height, and circumference of head, and the length, breadth, and index of the face, are eight characters we group together, because the results of their statistical analysis are presented upon a common plan, and somewhat differently to the scheme adopted for the remainder of our results. The statistics of these characters, obtained from the sample of 2,348 male convicts (records 1 to 2,500, excluding omissions), are fully set forth in Tables 1 to 8, and are illustrated diagrammatically in Figures 1 to 8. These figures and tabulated measurements also contain the principal results derived from the statistical analysis of the characters mentioned above. These statistics and results in each case are:—

(i) The total number of individuals, in every group and sub-group, upon which statistical constants are based.

(ii) Frequency distributions (*a*) of the character, (*b*) of age, (*c*) of stature, in total criminals and in six sub-groups of criminals.

(iii) The mean value, with its probable error, and the standard deviation of the character for total criminals, irrespective of age, stature and crime.

(iv) The mean value of the character with its probable error, for each of six sub-groups of criminals, irrespective of their age and stature.

(v) The mean value of the character, with its probable error, for total criminals, irrespective of stature and crime, at every quinquennial period of age.

(vi) The mean value of the character, with its probable error, for total criminals, irrespective of age and crime, for every inch difference in stature.

(vii) The mean value of the character, with its probable error, for each of six sub-groups of criminals, irrespective of stature, at successive periods of age.

(viii) The mean value of the character, with its probable error, for each of six sub-groups of criminals, irrespective of age, for successive degrees of stature.

(ix) Correlation tables, and their resulting coefficients, of the character with age and stature, for total criminals.

(x) The prediction formula, which gives for each sub-group the predicted mean of the character, with its probable error, allowing for the mean age and mean stature of the sub-group; and contrasted with this, the actual mean of the sub-group with its probable error is given; and the difference between the predicted and actual mean is also tabulated, and the probable error of the difference.

(xi) Finally the correlation ratio, or the exact extent of relationship of the character with crime, at given age and stature, is expressed upon a scale between 0 and 1: and thus sums up in one figure the ultimate significance for our purpose of all the results given in the table.

It will be seen that these tables (1 to 8) show, and the figures (1 to 8) accompanying them illustrate diagrammatically, (1) the changes that occur, in the character under investigation, with increasing age and stature—the correlation coefficients of the character with age and stature expressing this relationship precisely; and (2) they also illustrate how, when reduced to a standardized "age—stature" basis, sub-groups of criminals, distinguished by very different types of crime, differ from each other with regard to the character under investigation: the correlation ratio of the character with crime giving the precise degree of this relationship. Upon these points the tabulated numbers and diagrams should speak for themselves, and should require only the briefest supplementary notice.

Table 1, *see* page 54.

Mean head-length. Figure 1* (see next page) illustrates mean head-length by series of black dots plotted against hatched bands. Each dot represents the value of mean head-length, which can be read off on the millimeter scale drawn along the left margin of each diagram. The hatched band, or shaded zone, drawn across each diagram, represents (1), *by its centre*, the mean of all the criminals, of the age or stature, regardless of crime committed, and (2), *by its width* on either side of its centre, it represents twice the probable error of means of samples, equal in number to the group and drawn at random from the totality of criminals: that is to say, the band illustrates the range of variability, from the general mean, within which its observed value might be expected to fall in such limited samples. For instance, the mean head-length of the sub-group of "malicious damage to property" offenders,

* The diagrams in the succeeding seven figures are constructed upon the same plan as those in Fig. 1, with a view to bringing out similar essential points. The general remarks we make upon Fig. 1 apply, therefore, equally to the figures 2 to 8.

aged 25 to 30, is pointed at the level of 191·85 mm.—this being their observed mean. The mean of all criminals at this age is 191·80 mm., and the standard deviation at this age is 6·41 mm. The probable error in samples of 17 is, $·6745 \times 6·41 \div \sqrt{17}$, or,* 1·05 mm. Hence the band is drawn between the limits 191·80 ± 2·10 mm., and shows the range of error of five out of six random samples numerically equal to that selected for "malicious damage."† The width of the band, be it observed, varies indirectly with the number of individuals in any sample: the larger the sample employed, the smaller becomes the width of the band. On the other hand, the smaller the sample, the wider becomes the band: until, with a sample of one individual only, the band would represent twice the probable error of the individual, or 2 x ·6745 x standard deviation. Precisely stated, therefore, the relation of the plotted dots to the hatched band in the diagram is such that, where any mean value, recorded as a dot, falls *outside* the band, this represents a difference which could only be expected in 18 per cent. of random samples, or once in five or six times. When examining the diagrams, then, the significance of differences in the mean values of head-length therein recorded may be tested as follows:—If 82 per cent. of the means, *i.e.*, 5 out of every 6 of the dots, fall anywhere *inside* the limits of a shaded band, the significance of 18 per cent. of the means, *i.e.*, 1 out of every 6 of the dots, falling *outside* these limits, will be of no moment. In other words, if our sub-groups had been selected, not by the types of crime committed by individuals within the group, but entirely at random, one-sixth of the means would be expected, by the laws of probability, to deviate beyond the limits of a shaded band. But, on the other hand, if more than 18 per cent. of the means, if a proportion greater than 1 in 6 of the dots, fall outside the zone of negligible variation, such an amount of deviation would be greater than the laws of probability would lead us to expect from pure random sampling. In these circumstances, we must conclude that any greater difference than the expected one in our recorded means is not entirely the result of chance and is due to some influence over and above those causes inherent in the sampling process.

When examining the diagrams, first of all the mean and standard deviation for all criminals, irrespective of age and stature, should be noted. This mean head-length with its probable error, which latter value follows immediately from that of the standard deviation and the number of individuals, are plotted, as a dot against a narrow hatched band, in the small top, left-hand diagram in Figure 1.

Next, it will be seen that the 2,348 individuals forming the group of total criminals have been separated into a series of sub-groups, according to their respective ages, and into a second series, according to their respective statures. The means of head-length, with their probable range of variation, of all these sub-groups, are described in the two top central diagrams, which show at a glance that head-length increases regularly and continuously, both with increasing age and with increasing stature. The increase with age ceases at 60; when, with further advancing years, there is a slight diminution of average head-length. With increasing stature, the increase in the mean length of head is more marked; and it continues progressively to the end of the stature scale, without any final falling off. From the sequence of the recorded dots, it is evident that the regression of head-length, both with age and with stature, is best represented by a straight line;‡ and that the slope of the line is steeper with stature than it is with age. With age, the gradient of the regression line, given by the correlation coefficient of head-length with age, is ·153; with stature it is ·264: that is to say, unit deviation of age is associated with ·153 of unit deviation in mean head-length, and unit deviation in stature with ·264 of unit deviation in mean head-length. These correlation coefficients of course only state the facts of association; they contain no verdict as to the explanation of these facts. For instance, the correlation coefficient does not tell us whether increasing stature depends upon increasing head-length, or whether the latter condition is dependent upon the former, or whether changes in head-length and stature are mutually independent, concomitant variations, resulting from a common cause, such as the law of growth—the most probable explanation. Nor does the correlation coefficient tell us whether head-length

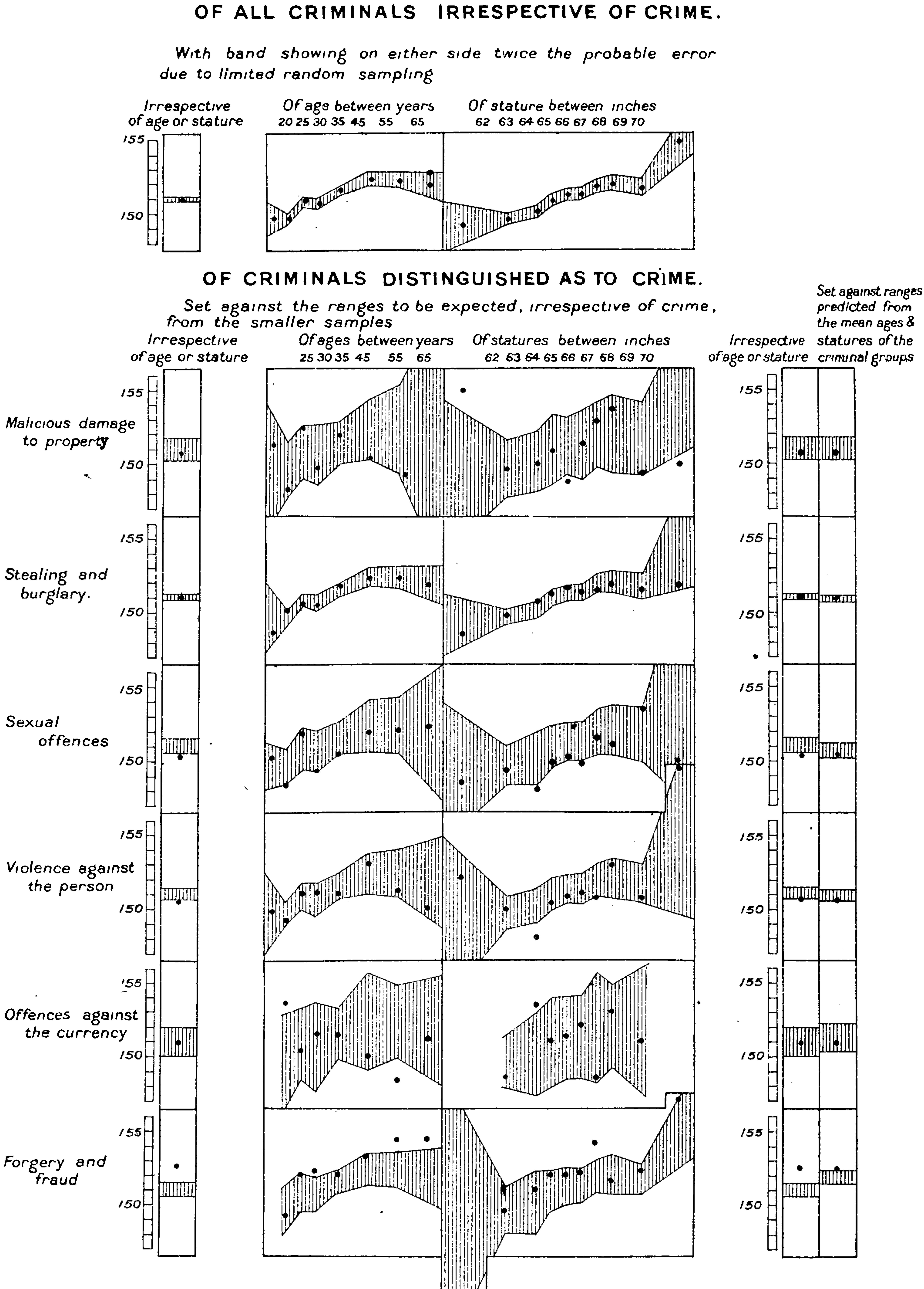
* This formula $·6745\,\sigma/\sqrt{n}$ gives the value, according to the mathematical theory of chance, of the probable error, when the sub-group of n individuals represents a random sample of an indefinitely large population having the same mean and standard deviation as those in the total population of criminals examined.

† The standard deviations of head-length, within the age-groups, differ from that in the totality by less than 10 per cent., and in subsequent computations of errors the general standard deviation of the character is used.

‡ By simply joining the dots there will obviously be a departure from strict linearity in the regression. The deviation, however, of the plotted means from the regression line is not greater than the inevitable variation due to random sampling with relatively small numbers. Considering the size of the samples, there is no evidence that the law of relation between the two variables departs far from linearity, or sufficiently so to justify other assumptions.

Fig. 2.

MEAN HEAD BREADTHS.



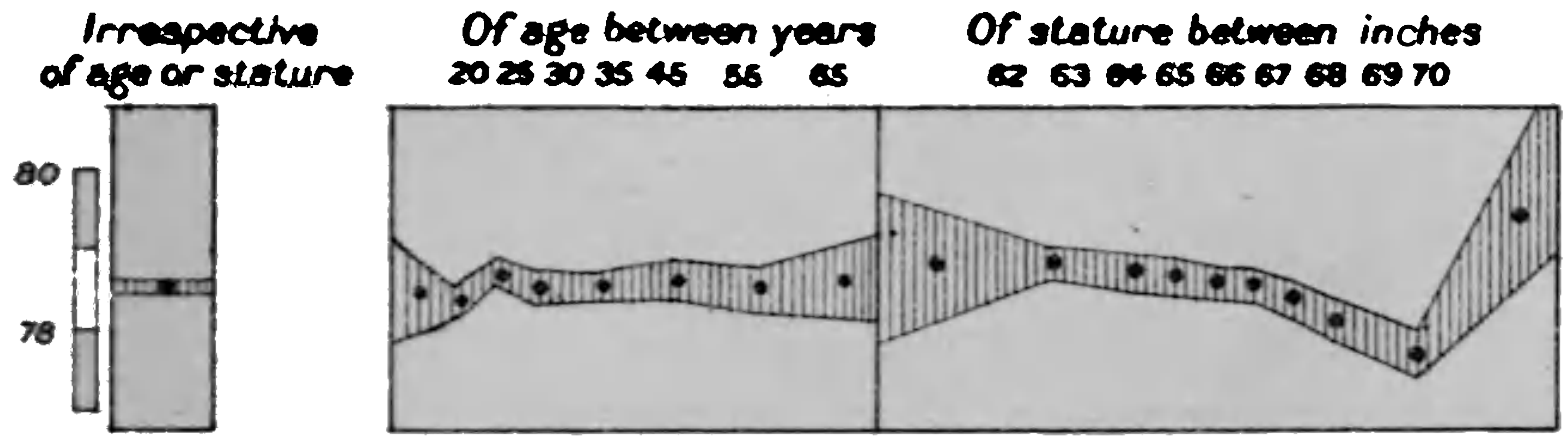
2093. 23341 322 (39) 2000 2 13

Malby & Sons Lith

Fig. 3. **MEAN HEAD INDICES.**

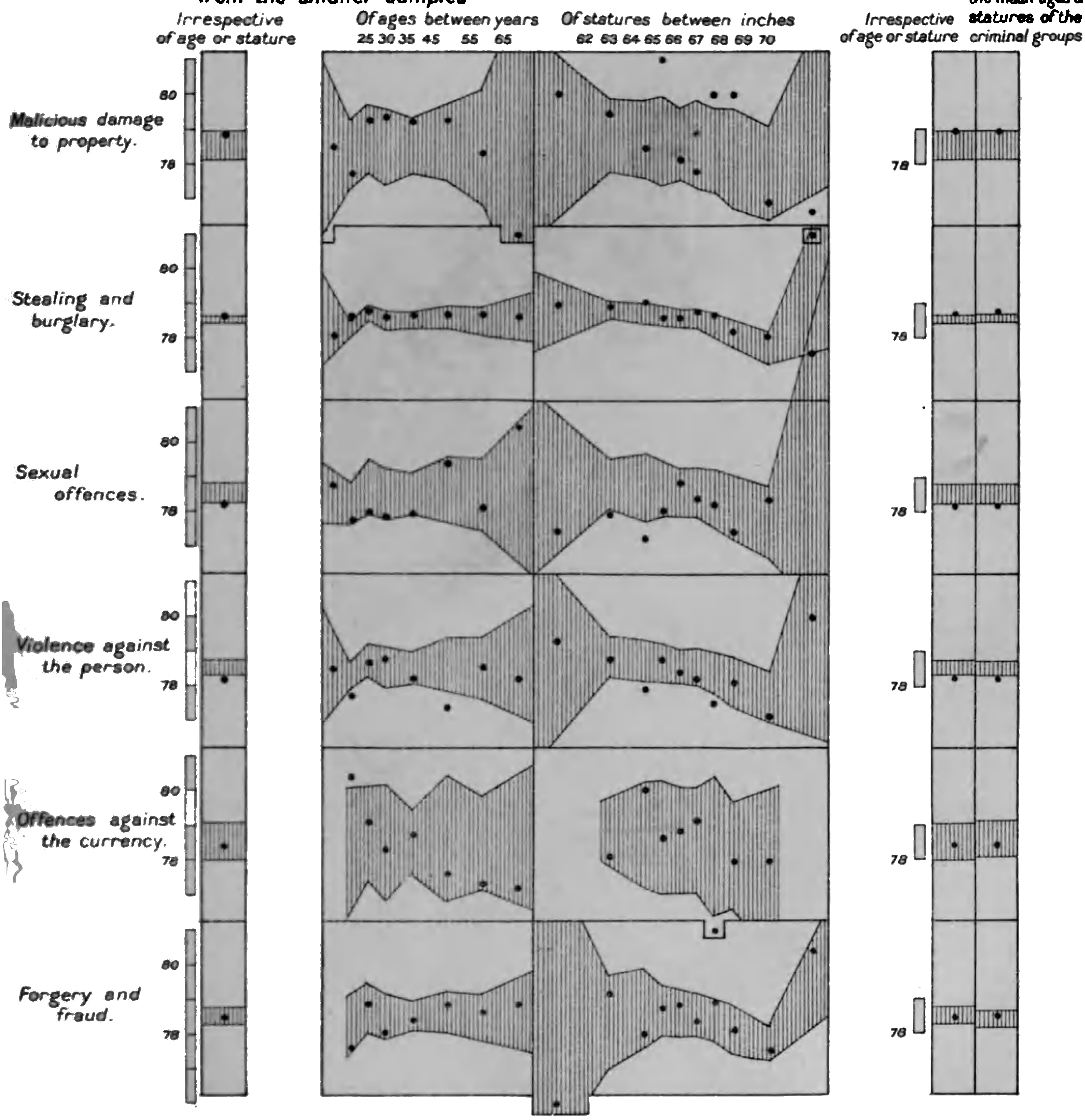
OF ALL CRIMINALS IRRESPECTIVE OF CRIME.

With band showing on either side twice the probable error due to limited random sampling.



OF CRIMINALS DISTINGUISHED AS TO CRIME.

Set against the ranges to be expected, irrespective of crime, from the smaller samples

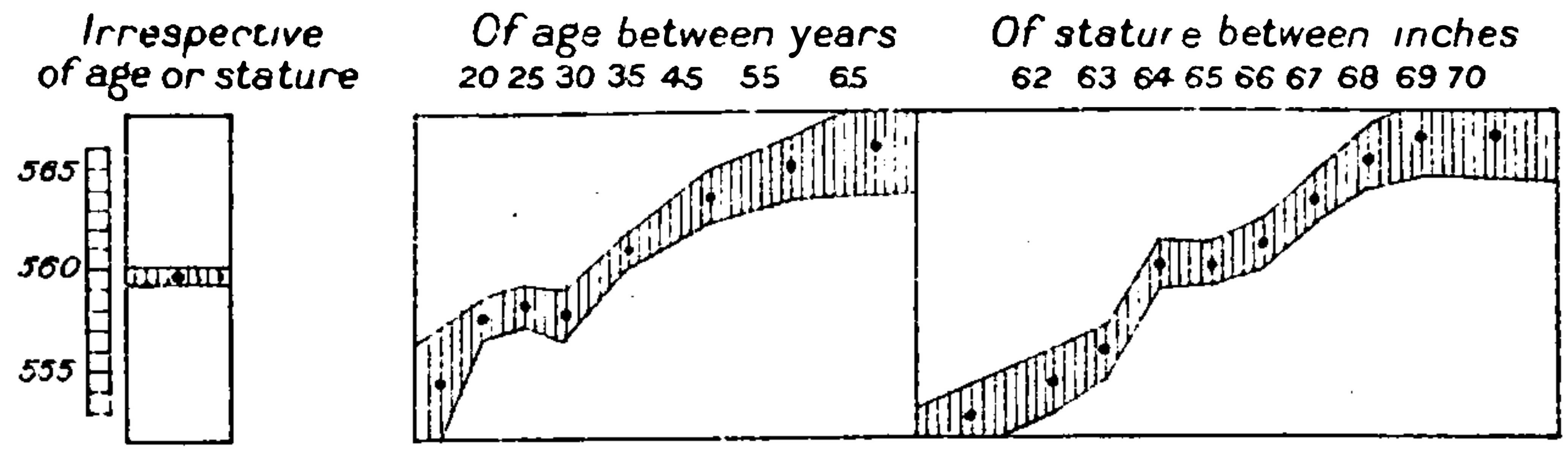


Malby & Sons. Lith.

Fig. 4. MEAN HEAD CIRCUMFERENCES.

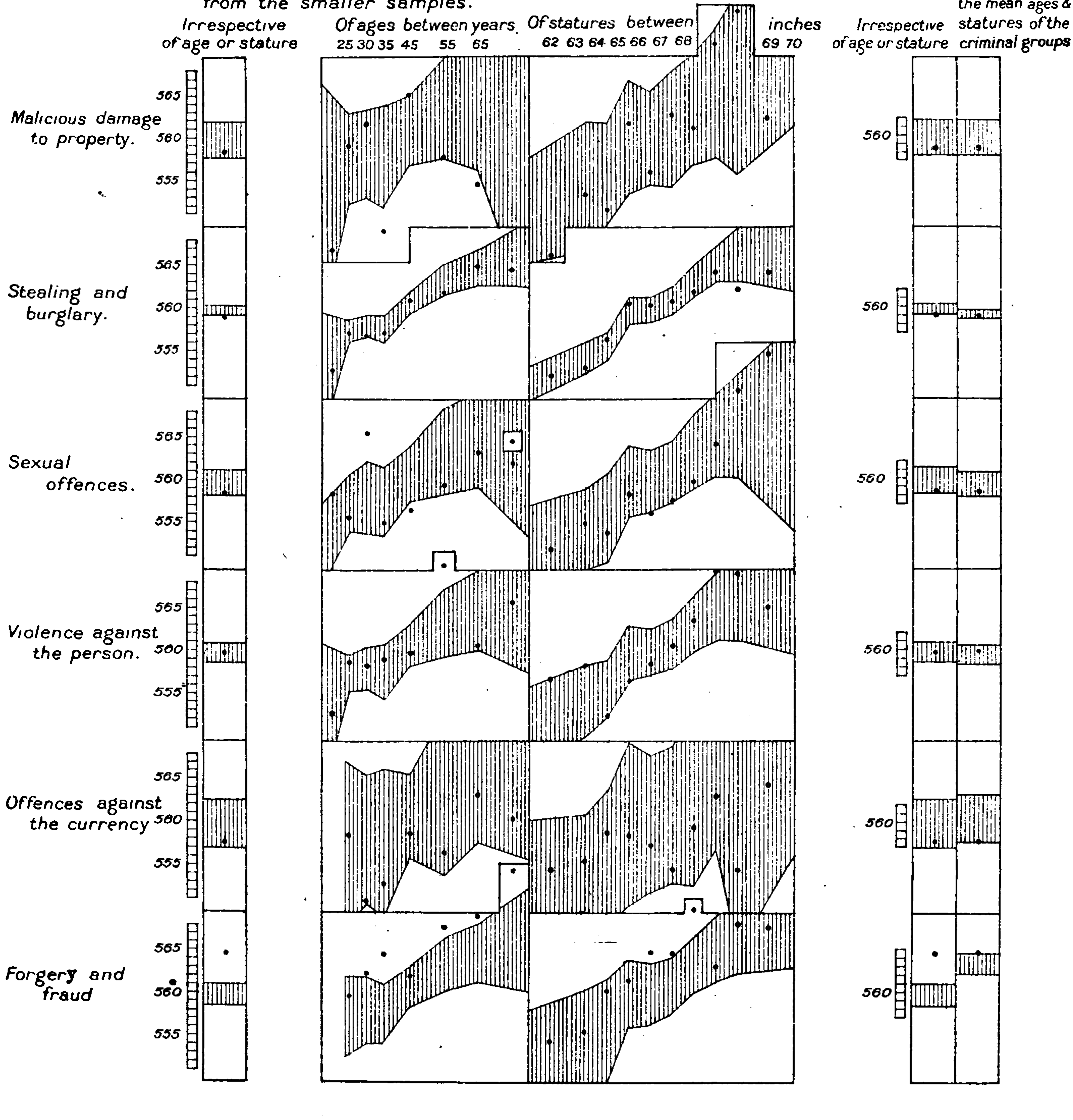
OF ALL CRIMINALS IRRESPECTIVE OF CRIME.

With band showing on either side twice the probable error due to limited random sampling



OF CRIMINALS DISTINGUISHED AS TO CRIME.

Set against the ranges to be expected, irrespective of crime, from the smaller samples.



2093 23341 322 (39) 2000 2 13

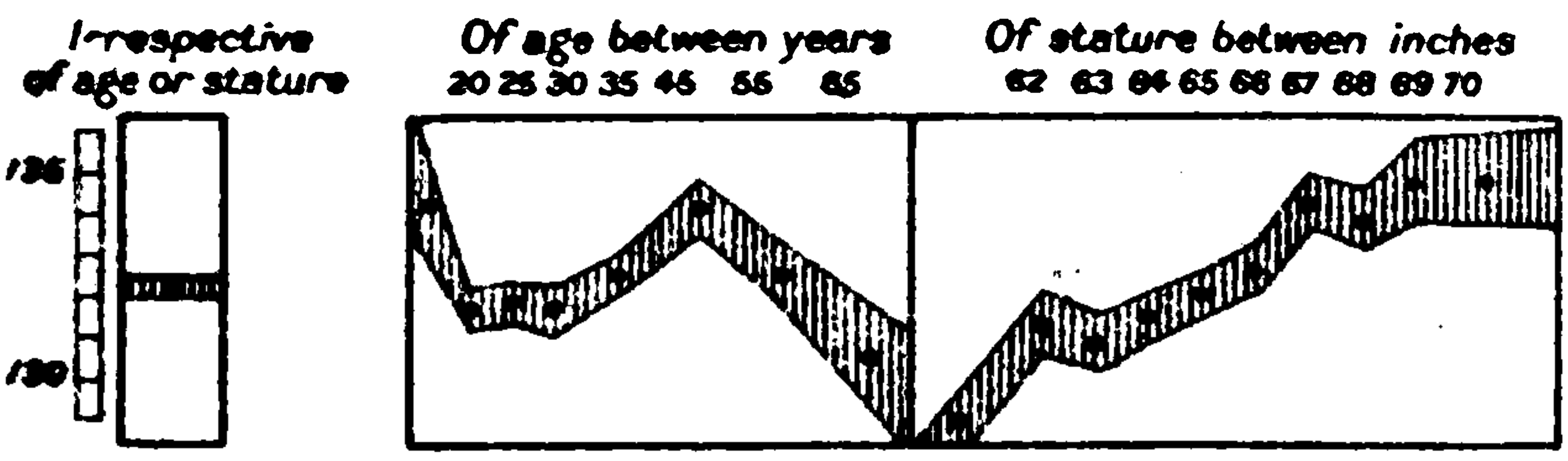
Malby & Sons. Lith.

Fig. 5.

MEAN HEAD HEIGHTS.

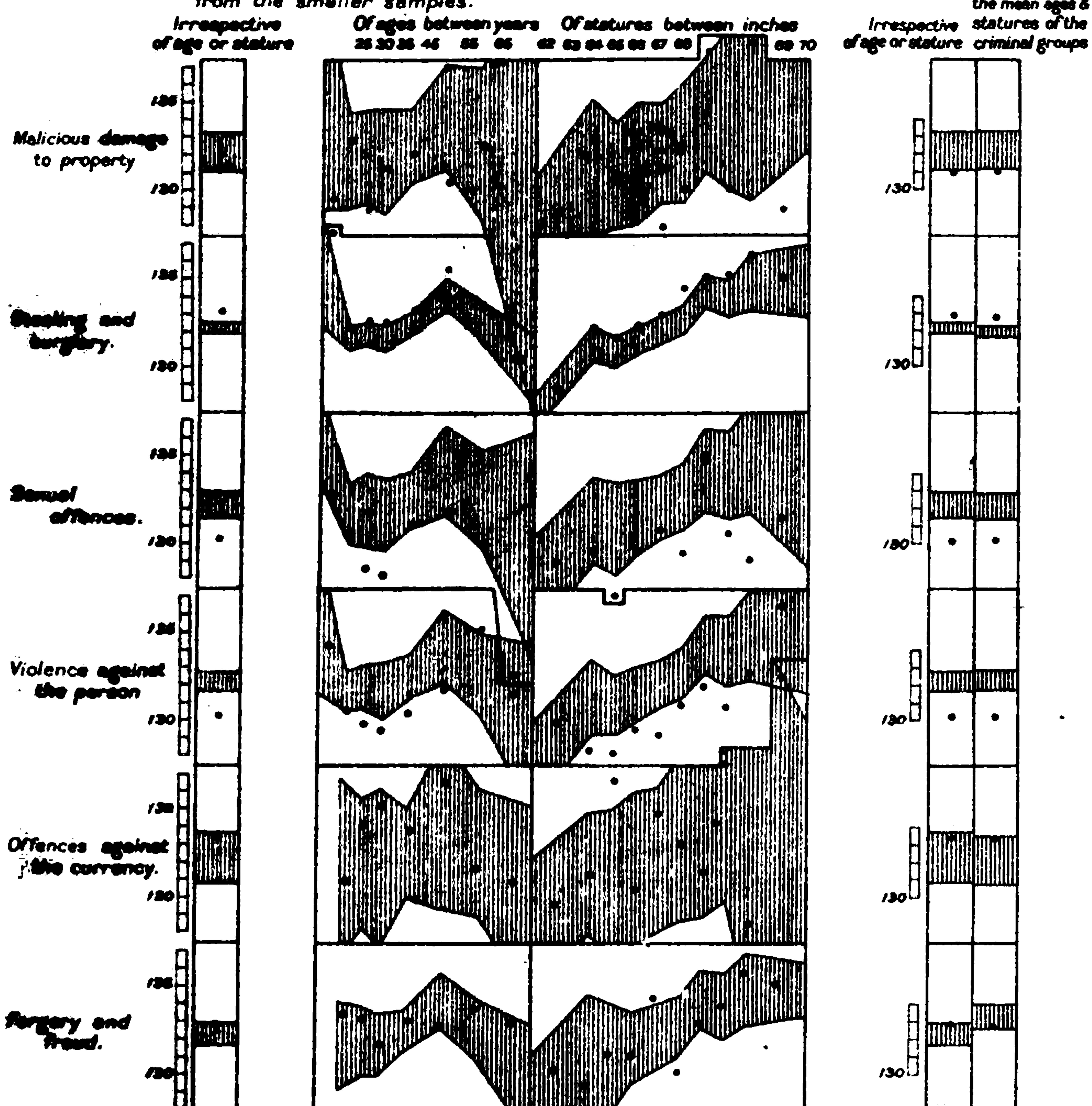
OF ALL CRIMINALS IRRESPECTIVE OF CRIME.

With band showing on either side twice the probable error due to limited random sampling.



OF CRIMINALS DISTINGUISHED AS TO CRIME.

Set against the ranges to be expected, irrespective of crime, from the smaller samples.



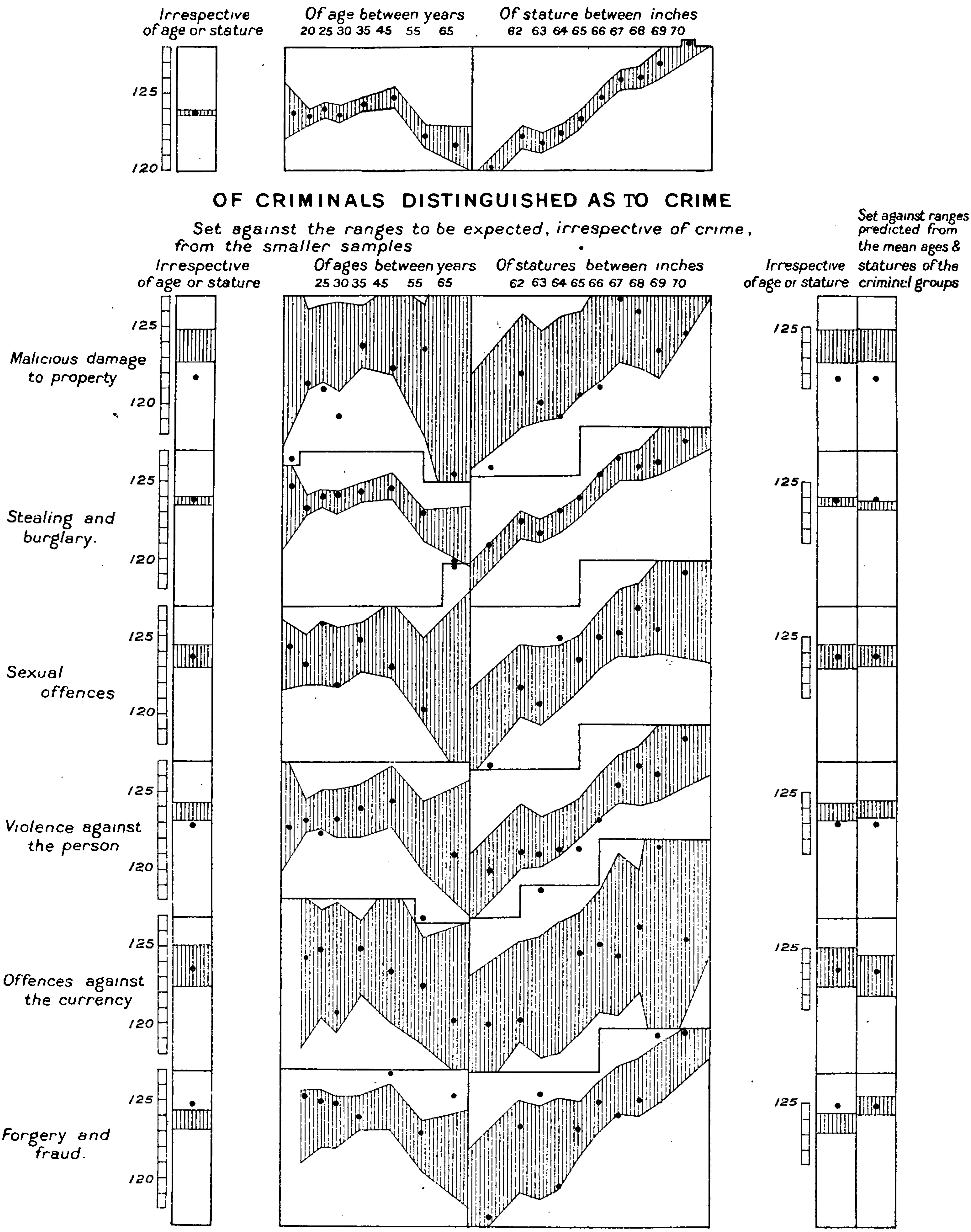
Malby&Sons.Lith

Fig. 6.

MEAN FACIAL LENGTHS.

OF ALL CRIMINALS IRRESPECTIVE OF CRIME.

With band showing on either side twice the probable error due to limited random sampling



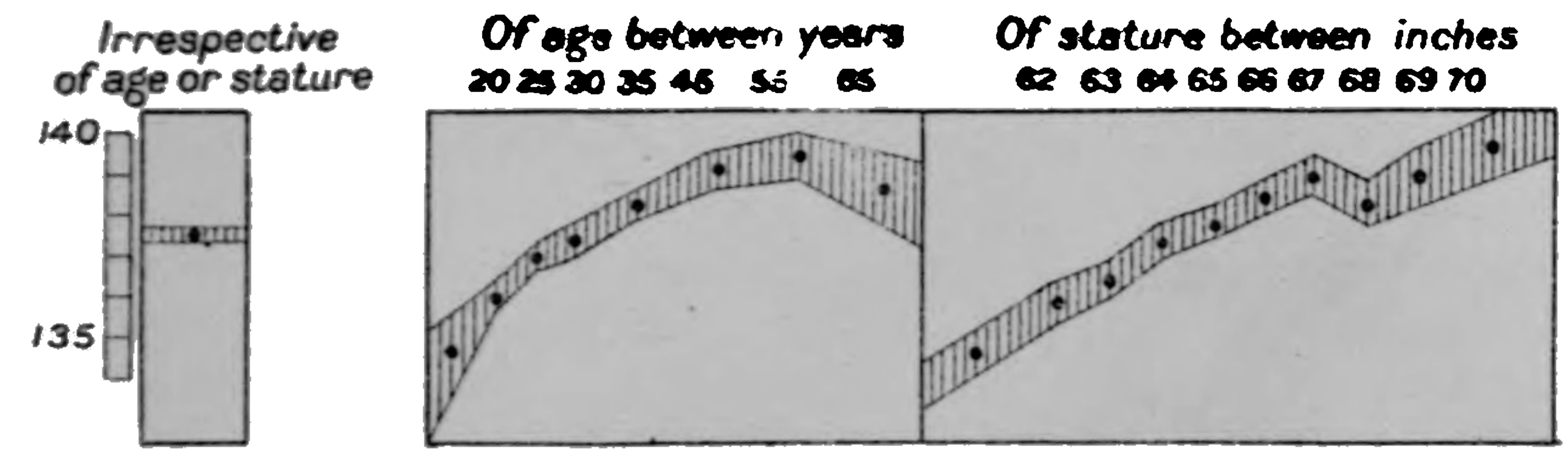
2093 23341 322 (39) 2000 2 13

Malby & Sons Lith

Fig. 7. **MEAN FACIAL BREADTHS.**

OF ALL CRIMINALS IRRESPECTIVE OF CRIME.

With band showing on either side twice the probable error due to limited random sampling.



OF CRIMINALS DISTINGUISHED AS TO CRIME.

Set against the ranges to be expected, irrespective of crime, from the smaller samples.

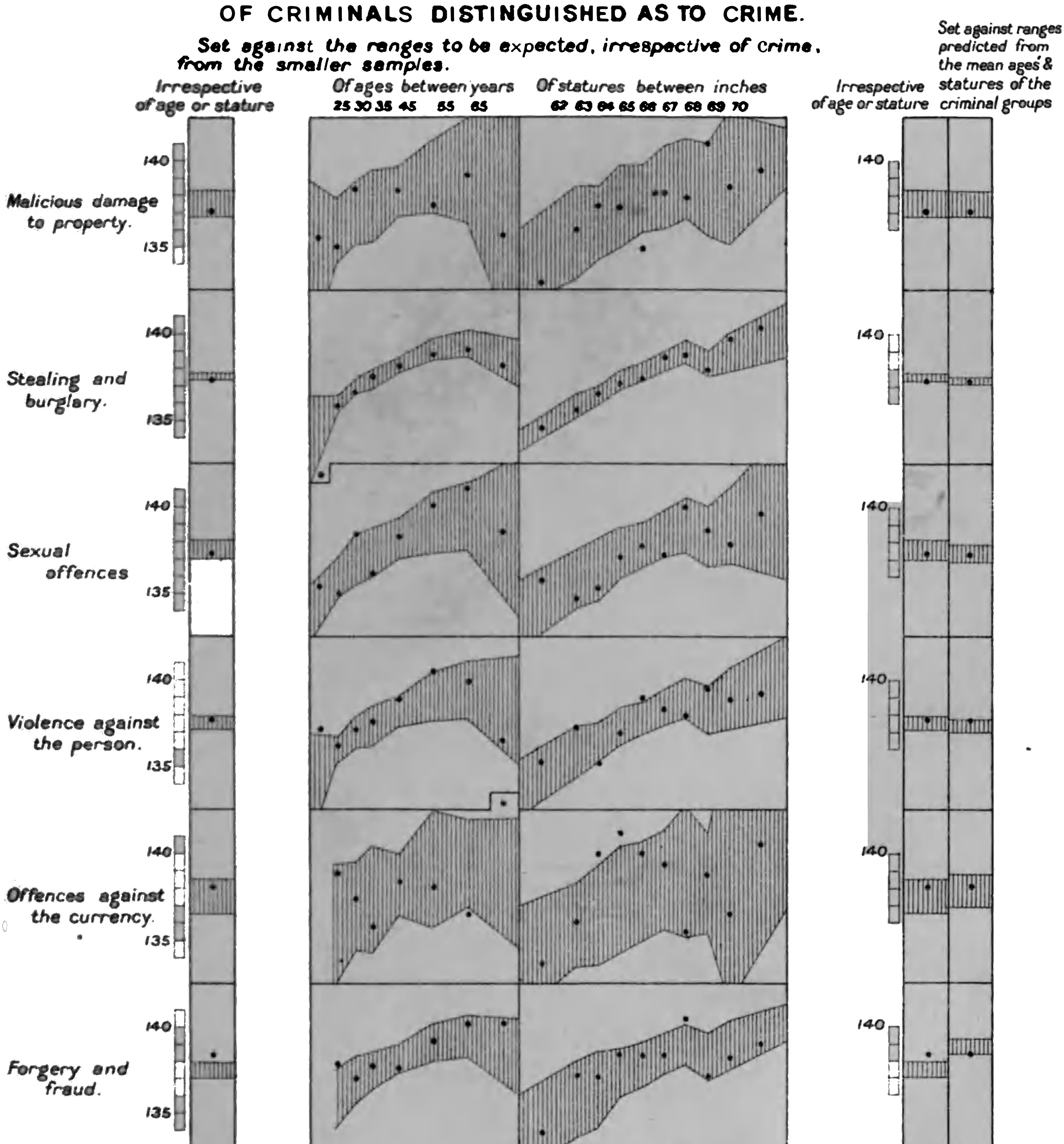
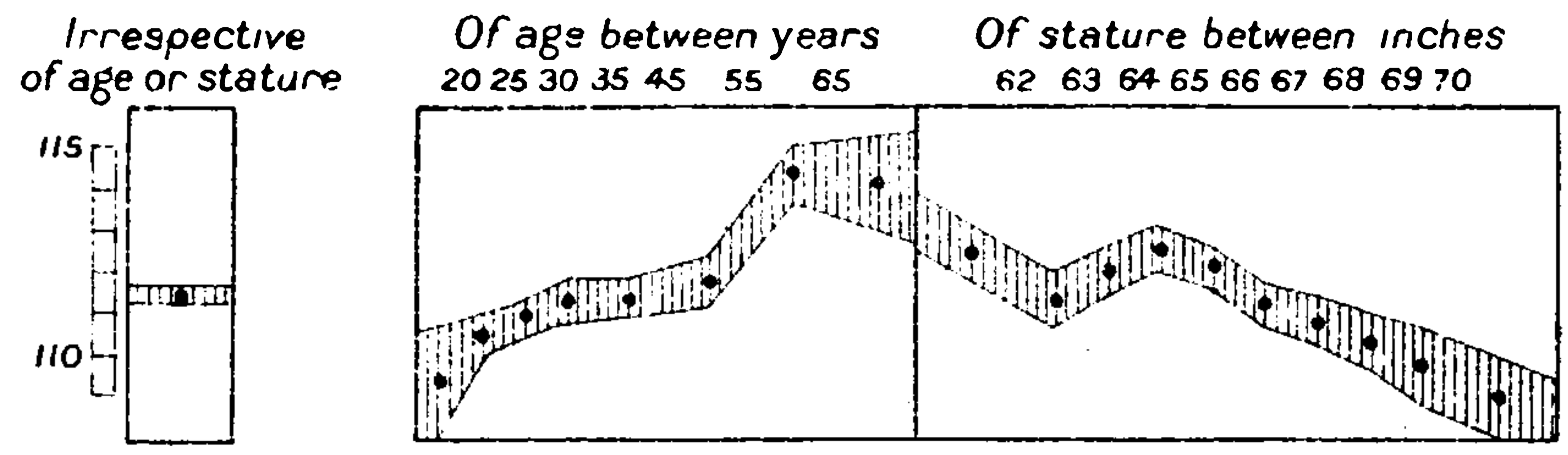


Fig. 8. MEAN FACIAL INDICES.

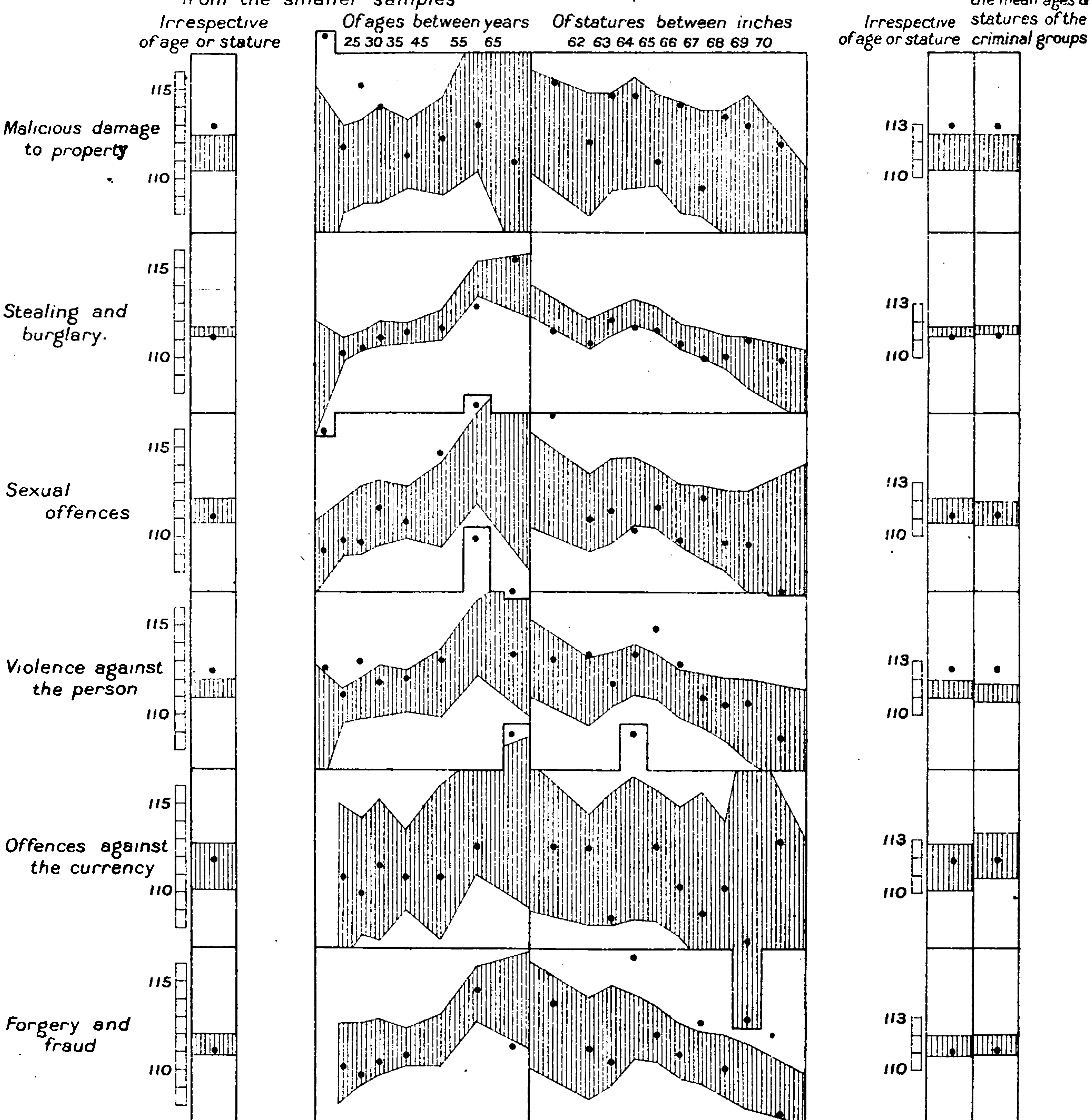
OF ALL CRIMINALS IRRESPECTIVE OF CRIME.

With band showing on either side twice the probable error due to limited random sampling



OF CRIMINALS DISTINGUISHED AS TO CRIME.

Set against the ranges to be expected, irrespective of crime, from the smaller samples



2093 23341 322 (39) 2000 2 13. Malby & Sons Lith

mean value upon the basis of one known character, as described on p. 37, is of the form:—

$$y = \bar{y} + r_{xy} \frac{\sigma_y}{\sigma_x} (x - \bar{x})$$

where r_{xy} is the correlation coefficient of the predicted character (y) upon its associated variable (x). In the present inquiry, we had to correct a mean value of head-length, upon the basis of its association with two known characters, age and stature. The formula extended to these requirements becomes:—

$$\lambda = \bar{l} + {}_s\rho_{la} \frac{{}_s\sigma_l}{{}_s\sigma_a} (a - \bar{a}) + {}_a\rho_{ls} \frac{{}_a\sigma_l}{{}_a\sigma_s} (s - \bar{s})$$

where (λ) is the corrected prediction of mean head-length for any sub-group of criminals, and is equal to:—

($\bar{l}$) *i.e.*, the mean head-length of total criminals,
+ a correction for the mean age (a) of the sub-group,
+ a correction for the mean stature (s) of the sub-group—

the values of the corrections depending upon the variabilities ${}_s\sigma_l$, ${}_s\sigma_a$, and the correlation coefficient ${}_s\rho_{la}$ of head-length and age for constant stature, and upon the variabilities ${}_a\sigma_l$, ${}_a\sigma_s$ and the correlation coefficient ${}_a\rho_{ls}$ of head-length and stature for constant age: these determining the coefficients—of the deviations in age ($a - \bar{a}$) and stature ($s - \bar{s}$) from the general means—peculiar to the criminal group under consideration. The formula, cleared of the partial correlation coefficients and variabilities, becomes:—

$$\lambda = \bar{l} + \frac{r_{la} - r_{ls}\, r_{as}}{1 - r^2_{as}} \cdot \frac{\sigma_l}{\sigma_a} (a - \bar{a}) + \frac{r_{ls} - r_{la}\, r_{as}}{1 - r^2_{as}} \cdot \frac{\sigma_l}{\sigma_s} (s - \bar{s})$$

where r_{la}, r_{ls}, r_{as}, and σ_l, σ_a, σ_s are now the correlation coefficients and variabilities found direct from the data.* Most of these values—the mean and standard deviation of head-length ($\bar{l}$ and σ_l), the mean and standard deviation of age ($\bar{a}$ and σ_a), the mean and standard deviation of stature ($\bar{s}$ and σ_s), of total criminals, and the correlation coefficient of head-length with age and stature (r_{la} and r_{ls})—are given in Table 1; the correlation coefficient of age with stature (r_{as}) is given with the Correlation Table 181, and the mean ages and statures of the six criminal sub-groups are given in Table 182. When these values are introduced into the formula, the regression equation of head-length upon age and stature, from which the corrected predictions for each criminal sub-group were determined, is as follows:—

Mean head-length in mm. $(\lambda) = 192{\cdot}45 + {\cdot}077(a - 36{\cdot}235) + {\cdot}643\,(s - 65{\cdot}445)$;

and when the value of (a) the mean age, and of (s) the mean stature, of a sub-group are substituted, we obtain the following values of the expected means of head-length, and the differences from these of the actual means, of the criminal groups, together with twice their probable errors.†

Criminal groups.	$a =$	$s =$	Expected (λ)	Actual (l).	Diff. $\pm$ 2 p.e.
Damage to property	35·851	65·520	192·46	191·15	− 1·31 ± ·82
Stealing and burglary	35·725	65·113	192·19	192·07	− ·12 ± ·15
Sexual offences	33·873	65·438	192·26	192·36	·10 ± ·55
Violence to the person	33·520	65·600	192·34	192·64	·30 ± ·40
Offences against the currency ...	42·845	64·921	192·62	192·53	− ·09 ± 1·06
Forgery and fraud	42·679	66·947	193·91	194·53	·62 ± ·46

* The variability of head-length from this determination is, of course, less than the variability (σ_l) of head-length with the uncorrected mean; it is the variability of head-length for constant age and stature (${}_{as}\sigma_l$) and =

$$\sigma_l \times \sqrt{\frac{1 - r^2_{la} - r^2_{ls} - r^2_{as} + 2\, r_{la}\, r_{ls}\, r_{as}}{1 - r^2_{as}}}$$

† The probable error of the *difference*, between the mean of a sub-group and the mean of the whole group, is given by Professor Pearson (Biometrika, Vol. V., p. 182) as

$${\cdot}67449 \times \sqrt{\frac{\Sigma^2}{N} + \frac{\sigma^2}{n}\left(1 - \frac{2n}{N}\right) - \frac{n(M-m)^2}{N(N-n)}}.$$

In regard to the characters dealt with in this chapter, the differences between the means of the sub-groups and the whole group ($M-m$) are small compared with the standard deviations (σ) of the sub-groups, which themselves do not differ widely from the standard deviation of the entire group (Σ). Neglecting $M-m$, and putting $\sigma = \Sigma$, the formula becomes ${\cdot}67449\Sigma\sqrt{\frac{1}{n} - \frac{1}{N}}$ where n, N are the numbers in the sub-group and total group. This form gives precisely the probable error of the difference where the selection is purely random instead of by some character (as "nature of crime") whose association with head-length is under examination.

These results will be found tabulated in the columns to the right of Table 1, and are represented diagrammatically by the dots and bands in the two outer columns of Fig. 1, whose construction we were originally discussing (p. 43).

It will be seen that the chief result of correcting for the combined effect of age and stature, upon head-length, has been the transferring of the mean head-length of fraudulent criminals to the very margin of the insignificant zone. And, applying our test as to the association of head-length with criminal proclivity—a test which, if such relation were existent, should be answered by a deviation from the predicted zone of more than one out of six of the actual means of head-length—applying this test, we find that the mean of only one of our six sub-groups (the "damage" group) does so deviate; and we consequently conclude that, upon the evidence of our statistics, there is very little. if any, relation, apart from associated effects due to age and stature, between crime and head-length. But, to formulate this conclusion with precise exactitude, and to fully appreciate, in the above Table 1, the significance of all the figures, "en bloc," and to comprehend with the least effort the ultimate relation between crime and head-length (a relation we can only roughly apprehend from examination of the diagrams in Fig. 1), we must measure this relation on the correlation scale between 0 and 1.

The relationship we want to measure is the extent to which criminals, convicted of different types of crime, are distinguished by differences in their mean head-length. And we desire to measure the correlation upon a scale between 0 and 1, so that it may be comparable with correlation coefficients and all other associations measured upon the same scale.* But, "nature of crime" not being a measurable character, the correlation coefficient calculated by product moments is inadmissible for the purpose we have in hand. Consequently, the proper measure of the association between head-length and crime, and the one we shall adopt for measuring the associations with crime of all the characters investigated in this work, is the correlation ratio (η), which is defined as the ratio of the deviation† (from the general mean of the total group) of the means of the sub-groups, to the standard deviation of the total group of criminals; *i.e.*,

$$\eta = \frac{\text{deviation of means of sub-groups}}{\text{standard deviation of total group.}}$$

In this formula the expression *deviation of the means* is to be interpreted as the square root of the mean square of all the sub-group deviations (*e.g.*, mean head-length of thieves, incendiaries, &c. from mean head-length of all criminals), weighted by the number of individuals in each sub-group respectively. It is clear that when each of the deviations of the sub-group means from the total mean $= O$—*i.e.*, when the means of the sub-groups have, all of them, the same value as the mean of the total group—the correlation ratio will equal zero: which would imply that criminals classified by the nature of their crimes are not differentiated in mean length of head; or, in other words, that head-length and crime are not co-related.

Now, if $N =$ the total number of criminals, and also equals $n_1 + n_2 + n_3 + n_4 + n_5 + n_6$, the number of criminals committing specified crimes; and if $\bar{l}$ equals the mean head-length of the total group, and $l_1, l_2, l_3, l_4, l_5, l_6$, are the means of head-length of the several sub-groups; and if σ is the standard deviation of the total group—we have:

$$\eta = \sqrt{\left[\left\{ n_1 (l_1 - \bar{l})^2 + n_2 (l_2 - \bar{l})^2 + \dots \right\} / N\right]} / \sigma_l$$

and closely associated with this is $\sqrt{1 - \eta^2}$, which may be shown to be the ratio of the standard deviation of individuals from the means of their respective arrays to the standard deviations of these individuals from the general mean; *i.e.*

$$\sqrt{1 - \eta^2} = \frac{\text{standard deviation from means of sub-groups}}{\text{standard deviation from mean of total group}}$$

where we define the value in the numerator as the square root of the mean square of the deviations of all the individual head-lengths each from its particular group mean.

From this it follows that η can have the value unity (or $\sqrt{1 - \eta^2}$ the value zero) only when, the standard deviation of every individual from his group mean being zero, the deviations of the means of the sub-groups are equal to the standard deviation of the total group: in other words, a correlation ratio of unity would imply that criminals, classified by the nature of their crimes, are differentiated by an exact and invariable length of head.

* *See* page 92, and footnote part 2 Ch. VI., p. 311.

† Defined as the square root of the mean square of these deviations weighted in number to equal the individuals in the group.

We see, then, that, at one extreme, we have the correlation ratio zero measuring absolute dissociation, and, at the other extreme, unity correlation ratio signifying perfect association. Thus, to whatever degree the means of the sub-groups, may differ from the mean of the total group, the correlation ratio will express this relation precisely, upon a scale between 0 and 1.*

The formula given above for evaluating η, as it stands, will give us, however, a measure only of the crude relationship between crime and head-length before effects, due to age and stature upon head-length, have been eliminated. To measure the relationship when these effects have been duly allowed for, the correlation ratio η is similar in form to that given above ; but, in the formula, the deviations of the sub-group means from the crude general mean must be replaced by their deviations from the corrected mean of the array, as determined by the regression equation, *see* p. 46. That is to say $(l-\bar{l})$ must be replaced by $(l-\lambda_1)$, &c. (where (λ_1), &c. are the means of head-length determined by the means of age and means of stature of the various sub-groups) ; and the standard deviation (σ_l) must be replaced by $({}_{as}\sigma_l \times {}_{as}\sigma_c/\sigma_c)$, which is the standard deviation of head-length for constant age and stature multiplied by the ratio of the variability of crime (σ_c) to its variability for constant age and stature $({}_{as}\sigma_c)$. The corrected deviation thus obtained in the numerator is less than the value of the crude deviation previously calculated, but, at the same time, the variabilities of both head-length and crime, entered in the denominator, are also constricted by the limitations of age and stature. The formula finally obtained (*see* Note †, below) is :

$$ {}_{as}\eta_{lc} = \frac{\sqrt{[\{n_1(l_1-\lambda_1)^2 + n_2(l_2-\lambda_2)^2 + \ldots\}/N]}}{{}_{as}\sigma_l \times {}_{as}\sigma_c/\sigma_c} $$

$$ \text{where } {}_{as}\sigma_l = \sigma_l \sqrt{(1-r^2_{la}-r^2_{ls}-r^2_{as}+2r_{la}r_{ls}r_{as})} \,/\, \sqrt{(1-r^2_{as})} $$

$$ \text{and } {}_{as}\sigma_c/\sigma_c = \sqrt{(1-r^2_{ca}-r^2_{cs}-r^2_{as}+2\,r_{ca}r_{cs}r_{as})} \,/\, \sqrt{(1-r^2_{as})} $$

In the present investigation, the values, in the above formula, of r_{ca} and r_{cs}, being indeterminable for categoric variables (such as c = " nature of crime "), have been approximated to by η_{ca} and η_{cs}, and have been given *like* signs ; and thus (r_{as} being negative), an extreme value of ${}_{as}\eta_{lc}$ has been obtained, the numerator being larger and the denominator smaller than would be given were c to become measurable. The actual numerical values of η_{ca} and η_{cs}, found from Table 182, are ·213 and ·221 ; and, r_{as}, found from Table 181, has the small value −·019 : hence, ${}_{as}\sigma_c/\sigma_c = {·951}$; and ${}_{as}\sigma_l$, when evaluated from the data on Table 1, is found to be 6·084 mm. The values of $l_1-\lambda_1$, &c. are the excesses of the actual means of head-length of the several sub-groups, above their expected means duly corrected for age and stature, *see* p. 46. Entering the values into the formula we have :

$$ {}_{as}\eta_{lc} = \frac{\sqrt{[\{97\times(-1{·}31)^2+1352\times(-{·}12)^2+204\times({·}10)^2 + 358\times({·}30)^2+58\times(-{·}09)^2+279\times({·}62)^2\}/2348]}}{6{·}084\times{·}951} = {·}065 \pm {·}014 $$

the probable error being calculated by the formula $\dfrac{{·}67449\,(1-\eta^2)}{\sqrt{N}}$

The measure of the correlation between the " nature of crime " and head-length, after making due allowance for differences in age and stature, is therefore quite small, and the result admits of only one conclusion : that the wide differences we have found in the means of head-length of various criminal groups, are due solely to the different ages and statures of individuals within the groups, or to errors of sampling ; and that the head-length of the criminal is not directly related to the type of crime he commits.

TABLE 2, *see* page 56.

Mean head-breadth.—Turning now to Figure 2, which has been constructed upon precisely the same plan as Figure 1, we find the closest correspondence between the diagrams in the two figures. It will be seen that the regression line of head-breadth with age has a gradient identical to that of head-length with age (·153 ± ·01), and that, just as in the case of its length, the head ceases to increase progressively in its breadth, after the age of 60. These synchronous changes in the two diameters are additional evidence for

---

* Values of the correlation ratio (η) are always numerically greater than the measure of linear correlation (r), $\sqrt{\eta^2-r^2}$ being a measure of the degree of departure from a linear regression when the second character is measurable, whilst from its nature η is signless.

† If l and c are two quantitative variables measured from their means, and if a and s are two correlated variables, the partial correlation coefficient between l and c for constant a and s is the same as the correlation coefficient between the regression residuals, $l-ha-ks$, and $c-h^1a-k^1s$, where h, k, h^1 and k^1 are the regression coefficients. But, by definition of the regression coefficients, the correlation coefficient of $l-ha-ks$ is zero with both a and s. Thus

$$ {}_{as}r_{lc} = \frac{\text{mean product}\,(l-ha-ks)\,.c}{{}_{as}\sigma_l \times {}_{as}\sigma} = \left(\frac{\text{mean product}\,(l-ha-ks)\,.c}{\sigma_{l-ha-ks} \times \sigma}\right) \times \frac{1}{{}_{as}\sigma_c/\sigma_c} $$

The first term can be approximated to when c is non-measureable by the correlation ratio $\eta_{l-ha-ks\,.c}$ and thence the expression in the text.

the view that the correlation between size of head and age is due to a continuous thickening of the skull up to 60, when senile atrophy of bone commences. With stature, the regression of head-breadth, like that of head-length, continues progressively to the end of the stature scale, without any final falling off, such as occurs with age; but the degree of correlation, or slope of the regression-line, of head-breadth with stature, is appreciably less than that of head-length. In other words, with increasing stature, there is a change in the shape of the head, which becomes relatively longer, or more dolicocephalic.

The variation in the means of the 48 crime-age and the 60 crime-stature sub-groups, and the relation of the plotted points, representing these means, to a range of expected variation corresponding to twice their probable error—as indicated by the shaded belts—are also very similar to the corresponding representations in Figure 1. And applying our tests as to whether the groups of criminals, selected by crime committed, show any significant differences in mean head-breadths, we find that 13 out of 108 of the plotted means fall outside the belt of probable error: which is eight less than might be expected on the theory that these sub-groups were pure random samples, *i.e.*, consisted of individuals selected entirely by chance. As in the case of head-length, we can consequently attribute no significant meaning to the wide variations of these plotted means. With regard to the above wide, but inevitable, variations, it is interesting to notice that those sub-samples which deviate most widely in mean head-length are not the same as those which show the greatest amount of deviation in mean breadth of head. Thus, the mean head-length of the violent sub-group, ages 45–55, falls widely beyond its expected range; whereas the mean breadth of head of the same sub-group is well within the range predicted. Now, as we have seen, when dealing with one character only, the means of 18 per cent. (or roughly one in five) of random samples are expected to fall outside a range of twice the probable error; consequently, in considering results for two characters taken in combination (*e.g.*, head-length and head-breadth), we should expect that at least in one sample out of twenty-five, or four in a hundred, the means of both characters would fall outside this range.* Actually, as will be evident from counting the dots in Figures 1 and 2, out of the twelve means of head-length and thirteen of head-breadth that fall outside the shaded band, only four, *i.e.*, 4 per cent. ap., correspond to the same sub-groups in the two cases. This proportion, then, is exactly what would be expected according to the theory of probability, and is a further interesting proof of thepurely random nature of the deviations of the means of head-length and bead-breadth of our criminal sub-groups.

The excess or defect of the actual head-breadth means, given by the data, from the predicted means, duly corrected for differences in age and stature of the sub-groups, is shown as before in the right-hand column of Table 2 and Figure 2—the values of the corrected predictions, with their probable errors, being calculated from the regression formula:

$$\text{Mean head-breadth in mm. } (\lambda) = 151{\cdot}02 + {\cdot}065\,(\text{age in years} - 36{\cdot}235) + {\cdot}323\,(\text{stature in inches} - 65{\cdot}445)$$

and, when the values of the mean ages and statures of the sub-groups are substituted, the residuals and their p.e.'s are:

Damage to property	$-{\cdot}28 \pm {\cdot}72$
Stealing and burglary	${\cdot}11 \pm {\cdot}13$
Sexual offences...	$-{\cdot}60 \pm {\cdot}48$
Violence to the person...	$-{\cdot}35 \pm {\cdot}35$
Offences against the currency...	$-{\cdot}45 \pm {\cdot}94$
Forgery and fraud	${\cdot}53 \pm {\cdot}41$

It will be seen that the effect of allowing for sub-group differences in age and stature has been to transfer the mean of the fraudulent group, and that of the group of sexual offenders, from their position outside, to a position within, the zone of insignificant variation. And by entering the values presented in the right outside columns of Table 2 into the appropriate formula, we find that the correlation ratio (η) of head-breadth with crime, at given age and stature $= {\cdot}062 \pm {\cdot}014$. Our conclusion is that, upon the evidence of these statistics, there is no appreciable relation between the breadth of a criminal's head and the type of crime he commits.

TABLE 3, *see* page 58.

Mean Cephalic Index.—We consider next the means of cephalic index, set forth in Table 3, and illustrated diagrammatically in Fig. 3. As might be expected, since cephalic index is the ratio $\dfrac{\text{head-breadth} \times 100}{\text{head-length}}$, our results here are mainly a repetition

* Since there is a small degree of correlation between head-length and breadth, the expected proportion would be rather more than the 4 per cent. stated above.

of the combined results obtained for head-length and head-breadth. We have seen that, with increasing age, both head-length and head-breadth increase synchronously; consequently, we would not expect to find any change in shape of head, *i.e.*, in its relative length or breadth, with increasing years. Our statistics of cephalic index bear out this expectation. The regression line of head-index with age is horizontal: the correlation coefficient is practically zero. With increasing stature, however, we have seen that head-length increases more rapidly than head-breadth. These facts are confirmed by the diagrams in Fig. 3, which shows, by the slight downward regression (correlation coefficient $-\cdot08$) of head-index with stature, that taller men are, on the average, rather more dolico-cephalic than their shorter brethren.*

The mean indices of 12 out of the 108 sub-groups diverge beyond the radius of the band representing twice the expected variation—an amount of deviation, which, according to our test based upon the laws of probability, is within reasonable expectation from random sampling. The danger of drawing conclusions from the mere irregularities of mean-values, without taking proper regard to the probable errors of the means, is particularly well illustrated in some of the diagrams under review. On the face-value, for instance, of the means plotted for the group of "coiners" and for the "malicious damage" group, the regression of head index with age shows a continuous downward gradient of 3 mm. in 40 years. This appearance of a slope in the regression line is, of course, entirely fallacious, being due solely to certain chance fluctuations in the means of small samples. As evinced by the large "stealing" and very large "total" group, when the samples dealt with increase in size, the array of means approximates more and more to a horizontal line.

Examining the combined effect of age and stature, upon the cephalic indices, through the medium of the regression formula, we get:

$$\text{Mean cephalic index } (\lambda) = 78\cdot52 + \cdot003 \text{ (age in years } - 36\cdot235) - \cdot091 \text{ (stature in inches } - 65\cdot445),$$

from which, by introducing their age and stature values, we get the following residual differences for the various criminal sub-groups:—

Damage to property	$\cdot35 \pm \cdot40$
Stealing and burglary...	$\cdot12 \pm \cdot07$
Sexual offences	$-\cdot36 \pm \cdot27$
Violence to the person	$-\cdot33 \pm \cdot20$
Offences against the currency...	$-\cdot19 \pm \cdot52$
Forgery and fraud	$\cdot05 \pm \cdot23$

As illustrated in the right-hand column of diagrams, Fig. 3, this correcting for age and stature has practically no effect upon the crude predictions. The correlation ratio, η, obtained as before, of cephalic index with crime, at given age and stature, $= \cdot073 \pm \cdot014$. We add to our previous conclusions with regard to its *length* and *breadth*, that there is also no appreciable relation between the *shape* of a criminal's dead and the type of crime he commits.

TABLE 4, *see* page 60.

Means of Head Circumference, presented numerically in Table 4, and pictorially in Fig. 4, have much the same variability in certain conditions, and show the same absence of ultimate significance in their differences, as were exhibited by the means of head-length, breadth and index already dealt with. The correlation coefficients, or slopes of the regression line, of circumference of head with both age and stature, are identical, within the range of probable error, to the correlations of head-length with these conditions. Not only in length and breadth, but presumably in its every diameter, the bead enlarges progressively with advancing age and increasing stature. Amongst the means of circumference we enumerate fifteen, out of the 108 plotted in the diagrams, as greater than their expected value by more than twice the probable error—a proportion rather larger than we found for the head diameters, but reasonably accounted for by random sampling. The regression formula,

$$\text{mean head circumference in m.m. } (\lambda) = 559\cdot72 + \cdot214 \text{ (age } - 36\cdot235) + 1\cdot523 \text{ (stature } - 65\cdot445),$$

gives the following as the residuals in mean circumference for the sub-groups:—

Damage to property	$-1\cdot32 \pm 2\cdot01$
Stealing and burglary...	$-\ \cdot12 \pm \ \cdot36$
Sexual offences	$-\ \cdot78 \pm 1\cdot35$
Violence to the person...	$\cdot58 \pm \ \cdot98$
Offences against the currency...	$-2\cdot67 \pm 2\cdot60$
Forgery and fraud	$1\cdot44 \pm 1\cdot13$

* In many animals, such as rabbits, dogs, &c., it has been noted that relative length of head is associated with length of limb. "Breeders believe that long limbs are almost always accompanied by an elongated head," says Darwin, in "The Origin of Species," Chap. I.

From which we see a more marked effect than was previously produced by correcting the crude predictions for age and stature. This correcting process brings the means of the "stealing" group within its predicted range, and that of the "fraudulent" group, which deviates markedly from the crude prediction, to within the margin of the zone in its corrected position. Introducing the above deviations in the expression, p. 48, for η together with the constants found on Table 4, we obtain $\eta = \cdot 055 \pm \cdot 014$; and we conclude, accordingly, that criminals committing different types of crime are not distinguished by any appreciable differences in the circumferences of their heads.

TABLE 5, *see* page 62.

Mean Head Height.—The values of mean height of head, presented in Table 5 and plotted in Fig. 5, are rather erratic in some of their sequences and relations to each other. First of all, in the sequence of means of total criminals at successive ages, there is an unexpected peak at ages 45–55 which, judging from our experience of other diameters, is probably an accidental variation of the present statistics, and does not correspond to reality.* It is highly improbable that at one particular decade (45–55) the real mean would have a value nearly 3 mm. greater than the value of mean head-height at either the preceding (35–45), or succeeding (55–65), decades. In fact, there is hardly any room for doubt that the real mean of head-height, for individuals aged 45–55, is 2 to 3 mm. less than the value given by our statistics; in which case the real regression line of head-height with age would be horizontal, or slightly sloping upwards, with a final downward declination after age 60.† The lower value of the correlation coefficient of head-height with age, compared with the coefficients of other diameters, is probably due to two causes. Firstly, increasing thickness of skull with age would not increase the vertical diameter of the head—which involves only one thickness of bone—to the same extent as it would increase the longitudinal and transverse diameters—which involve two thicknesses; and secondly, increasing baldness, associated with age, would, in view of the particular technique adopted in measuring head-height, influence the measurements of this diameter more than it would those of head-length, breadth and circumference. On the other hand, the increase in head-height with increasing stature, not being due to a growth of bone with age, but to the fact that tall people, at all ages, have larger heads than shorter people, is progressively continuous from the beginning to the end of the stature-scale: and the correlation coefficient (·19) has an intermediate value between that of head-length (·26), and head-breadth (·15).

Next, the general relation of the plotted means to the hatched bands in the central diagrams is more diverse in Fig. 5 than in previous figures; and the variation between the individual means is greater than would be accounted for by random sampling. Enumerating the dots, it will be found that 28 of them, or 7 more than the theory of chance would allow, fall outside the belt of twice the probable error. The facts that 13 of these belong to the violence group,‡ and that most of the means of the "stealing" group and of the group of "sexual offenders," although not actually outside the predicted zone, lie, the one set along its upper border, the other set along its lower margin§—these facts favour the conclusion that individuals committing crimes of violence, and sexual offenders, have lower heads, and that thieves have loftier heads, than criminals generally. This conclusion is confirmed by the left-hand column of diagrams (Fig. 5), which represents the relation of the actual means to their crude predicted values, and is fortified by the right-hand column of diagrams, where effects due to age and stature have been eliminated from the crude prediction. As already explained, the dots in the diagram are the mean values actually given by the data; the position of the hatched band being determined from the regression formula,

$$\text{mean head height in mm. } (\lambda) = 132 \cdot 29 + \cdot 019 \text{ (age } - 36 \cdot 235) + \cdot 574 \text{ (stature } - 65 \cdot 445),$$

yielding, for the respective sub-groups, the following residual deviations:—

Damage to property	$-1 \cdot 22 \pm 1 \cdot 05$
Stealing and burglary	$\cdot 95 \pm \cdot 19$
Sexual offences	$-1 \cdot 99 \pm \cdot 71$

* The assumption that the value of the mean of this sub-group, given by our statistics, represents a chance deviation, due to random sampling, would mean that we are here dealing with a case which could only be expected to occur once in a thousand times—that is to say, it would be a very unlikely occurrence.

† The regression of the head-diameters with age being due to a common cause—thickening and final atrophy of bone—any changes in the slope of the regression line at one particular period of age, if existent for one diameter, such as head-height, should also be represented in the corresponding regression, of other diameters, such as head-length, breadth and circumference.

‡ *i.e.*, at nearly all ages and statures the means of this group fall outside the range of their predicted values.

§ Variations due to random ampling do not all occur in one direction; they oscillate, rather, above and below a central mean value—in this case the centre of the hatched band.

Violence to the person	$-2{\cdot}04 \pm {\cdot}52$
Offences against the currency	$1{\cdot}29 \pm 1{\cdot}38$
Forgery and fraud	$-{\cdot}38 \pm {\cdot}60$

In four out of six of the criminal sub-groups, the excess of the actual, over the predicted, means, is greater than twice the probable error. These deviations, together with the constants given in the table, lead to $\eta = {\cdot}170 \pm {\cdot}014$. The value of this correlation ratio of head-height with crime, at given age and stature, expresses in one fraction, upon a scale between 0 and 1, the precise extent to which criminals committing different types of crime are, according to our statistics, differentiated by differences in the height of their head. How is this differentiation to be explained? Is head-height a veritable criminal characteristic, *i.e.*, an outward, physical condition associated organically with inward criminal proclivity? Or, is there any other condition, apart from age and stature already allowed for, associated at the same time both with height of head and crime, which is responsible for the apparent association measured by the correlation ratio we have reached? In the first place, let it be stated that if head-height be directly related to criminal proclivity, the intensity of this relationship is so small as to be quite valueless for practical deductive purposes. From our knowledge of a criminal's age, or of his married or unmarried state, we could make a better prediction as to the kind of crime he would commit than we could from a knowledge of the height of his head, based upon the value of the correlation ratio we have reached between head-height and crime. We may say generally that it would be waste of time to investigate elaborately the precise meaning of any correlation ratio less than ·1 in value. The value of the present ratio is ·16 For our own part, we have no doubt that much of this relation, greater though it be than the relation we have found for other diameters, is due to the fact that the measuring of head-height, as explained on p. 40, is particularly susceptible to influence by personal equation. Consequently, our statistics relating to different orders of criminals are at variance, because they have been subject to the personal equation of several observers. Were the correlation ratio of higher value, we would undertake the labour of reinvestigating this character from the statistics of one observer only (*e.g.*, records 1 to 1,000).* As it is, however, for the time being we may accept the view that, upon the evidence of our statistics, there is an apparent, although very slight, degree of association between auricular height of head and criminal proclivity.

TABLES 6, 7 AND 8, *see* pages 64, 66, 68.

Means of Facial Length, Breadth, and Index.—The statistical analysis of the data relating to the two facial diameters, and to the facial index, has given results which correspond so closely to those of the head-diameters, that they require only the briefest description. These results are set forth in Tables 6, 7, 8, and are illustrated diagramatically in Figs. 6, 7, 8.

One interesting point of difference, however, between the facial and head diameters, is that facial length, unlike head-length, does not change with increasing years. This is probably due to the fact that length of face, as measured with callipers, depends a great deal upon the condition of the teeth; absent and defective teeth tending, at all ages, to decrease the length of face, and to screen any continuous increase associated with age, and due to actual thickening of facial bone. This view—that facial length is determined mainly by dental conditions—is confirmed by the marked change in the regression line of this measurement with age, succeeding the period 45–55: a change which is coincident with the rapid loss of teeth attendant upon old age. On the other hand, changes in facial breadth with increasing years, depending solely upon thickening or other enlargement of the cheek-bones, occur in the same way, and to an almost identical degree, with similar changes in the breadth of head. As will be seen upon comparing the diagrams, the regression lines of head and facial breadth are identical in form, including the final fall in the gradient of the line when senile atrophy of bone commences.

It will be observed from a glance at the central diagrams of Figs. 6, 7, 8, that none of the differences in the means therein plotted are significant of any special influence, apart from those causes inherent in the sampling process.

The regression equations of facial length, facial breadth, and facial index, respectively, upon age and stature, are:

$$\text{Mean facial length in mm.} = 123{\cdot}73 \text{ mm.} - {\cdot}012\,(\text{age}-36{\cdot}235) + {\cdot}804\,(\text{stature}-65{\cdot}445).$$

$$\text{Mean facial breadth in mm.} = 137{\cdot}51 \text{ mm.} + {\cdot}085\,(\text{age}-36{\cdot}235) + {\cdot}502\,(\text{stature}-65{\cdot}445).$$

$$\text{Mean facial index} = 111{\cdot}42 + {\cdot}077\,(\text{age}-36{\cdot}235) - {\cdot}304\,(\text{stature}-65{\cdot}445).$$

* Since writing the above, this character has been re-investigated from the statistics of head-height, in records 1 to 1,000, collected by one observer only; and the results of the analysis will be found in Appendix Correlation Table No. 194, page 381. It will be seen that the correlation ratio with crime of the measurements therein tabulated is $\cdot 07 \pm \cdot 04$: which is to say, that, on the evidence of measurements which are free from personal error, there is no significant relation between head-height and crime.

Table 1.—Head Lengths.

Frequencies in all Criminals irrespective of Crime.

mm	Of age in years.													
	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
167·5—	1	—	—	1	—	—	—	—	—	—	—	—	—	—
171·5—	—	1	3	—	2	1	1	—	—	—	1	—	—	—
175·5—	1	9	9	5	4	1	—	1	1	—	—	—	—	—
179·5—	4	37	29	15	18	16	2	4	—	4	2	1	—	—
183·5—	13	74	76	59	33	28	19	9	7	12	9	2	—	—
187·5—	17	115	104	80	62	43	30	19	13	33	7	6	1	1
191·5—	11	96	110	84	82	61	42	36	19	28	7	3	3	2
195·5—	9	72	88	51	47	46	36	20	11	24	8	3	1	1
199·5—	3	22	30	34	27	20	6	14	10	13	9	3	1	1
203·5—	2	13	6	4	15	15	4	6	3	4	1	1	—	—
207·5—	—	3	4	1	4	3	2	3	2	4	—	1	—	—
211·5—	—	—	2	—	—	—	2	—	—	—	1	—	—	—
215·5—	—	—	1	1	—	—	—	—	—	—	—	—	—	—
Totals ...	61	442	462	335	294	234	144	112	66	122	45	20	6	5
M'ns 189·5 +	1·11	1·76	2·30	2·47	3·55		4·38		4·55			4·26		
Twice P.E. ±	1·10	·41	·40	·47	·38		·54		·63			·99		

mm.	Of stature in inches.																							Irrespective of age or stature
	48-	54-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-	
167·5—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	2
171·5—	—	—	1	—	—	—	—	1	3	1	1	1	—	—	1	—	—	—	—	—	—	—	—	9
175·5—	—	—	—	—	—	—	—	2	1	2	7	4	5	5	3	1	—	1	—	—	—	—	—	31
179·5—	—	—	—	—	1	—	2	6	13	20	20	18	23	13	9	5	—	1	—	—	—	—	—	131
183·5—	—	—	—	—	3	—	5	15	21	46	48	42	55	50	28	14	8	4	—	2	—	—	—	341
187·5—	—	1	1	—	—	2	7	16	26	51	72	76	83	75	46	44	17	8	2	3	—	1	—	531
191·5—	1	—	—	—	—	1	5	10	27	53	62	84	79	83	74	47	35	13	7	2	2	—	—	585
195·5—	—	—	—	1	—	—	1	7	13	22	41	46	67	56	60	49	31	13	4	4	2	—	—	417
199·5—	—	—	—	—	—	—	1	2	5	9	10	23	29	27	36	24	12	6	6	—	2	1	—	193
203·5—	—	—	—	—	—	—	—	—	2	3	3	9	16	14	6	9	4	6	1	—	—	—	1	74
207·5—	—	—	—	—	—	—	—	—	1	1	1	5	4	2	3	5	2	3	—	—	—	—	—	27
211·5—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	2	—	—	—	—	1	—	—	5
215·5—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	2
Totals ...	1	1	2	1	4	3	21	59	112	208	266	308	361	327	267	202	109	55	20	11	7	2	1	2,348
M'ns 189·5 +				·48					·60		1·26	2·75	2 97	3 09	4·34	5·25		5·98			6·31			2·95
Twice P.E. ±				1·50					·44		·53	·49	·45	·48	·53	·61		·64			1·88			·18

Mean head length 192·45 ± ·09 mm. Standard deviation 6·39 mm.

Correlation coefficient with age ·153 ±·014. Correlation coefficient with stature ·264±·013.

Prediction formula in mm. 192·45 + ·077 (age in years − 36·235) + ·643 (stature in inches − 65·445).

Frequencies in Criminals distinguished as to Crime.

Crime.	mm.	Of age in years.								Of stature in inches										Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted head length.
		15-	20-	25-	30-	35-	45-	55-	65-	48-	60-	63-	64-	65-	66-	67-	68-	69-	72-			
Malicious damage to property.	167·5 -	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1		
	171·5 -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	175·5 -	—	—	—	—	1	1	—	—	—	—	—	1	—	1	—	—	—	—	2		
	179·5 -	—	2	1	1	4	—	—	1	—	2	—	3	2	—	2	—	—	—	9		
	183·5 -	—	2	5	2	4	3	1	—	—	6	3	1	4	—	2	—	—	1	17		
	187·5 -	2	3	3	6	2	4	1	—	1	3	4	3	2	1	3	2	2	—	21		
	191·5 -	1	7	4	—	7	2	2	—	1	3	4	—	4	4	—	1	5	1	23		
	195·5 -	1	1	2	3	5	3	1	—	1	1	2	2	3	1	2	3	1	—	16		
	199·5 -	—	—	1	—	2	—	1	—	—	—	—	—	—	2	1	1	—	—	4		
	203·5 -	—	1	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	1	2		
	207·5 -	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	1		
	211·5 -	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1		
	215·5 -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	4	16	17	13	27	13	6	1	3	15	13	10	15	10	11	8	9	3	97	—	—
Means in mm	189·50 +	3·00	1·75	2·35	− ·92	2·52	·62	4·00	− 8·00	4·17	− 1·33	1·54	− 2·40	·53	5·20	2·54	2·50	5·33	5·83	191·15	192·46	− 1·31
Twice P.E. ..	±	4·31	2·16	2·09	2·39	1·66	2·39	3·52	8·63	4·98	2·23	2·39	2·73	2·23	2·73	2·60	3·05	2·88	4·98	± ·88	± ·83	± ·82

Frequencies in Criminals distinguished as to Crime—continued.

Crime.	mm.	Of age in years. 15-	20-	25-	30-	35-	45-	55-	65-	Of stature in inches. 48-	60-	63-	64-	65-	66-	67-	68-	69-	72-	Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted head length.
Stealing and burglary.	167·5-	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1		
	171·5-	—	—	2	—	3	—	—	1	1	3	—	1	—	—	1	—	—	—	6		
	175·5-	1	5	5	3	2	—	—	—	—	5	5	—	—	3	1	1	—	—	15		
	179·5-	1	20	20	10	17	2	4	1	2	27	10	7	13	6	6	3	—	—	74		
	183·5-	5	50	51	40	30	18	7	4	8	53	38	26	28	30	10	9	7	—	214		
	187·5-	2	60	77	58	50	35	28	12	6	59	48	61	53	40	24	27	13	2	[illegible]		
	191·5-	4	46	76	50	75	42	24	9	4	60	39	53	46	43	45	18	31	—	327		
	195·5-	4	42	84	30	60	33	20	9	1	30	25	26	42	36	31	20	20	2	342		
	199·5-	—	15	17	15	28	6	9	4	—	8	6	15	17	10	16	12	7	1	98		
	203·5-	1	5	2	1	13	6	5	—	—	3	2	5	8	5	2	5	3	—	35		
	207·5-	—	1	3	—	4	2	1	1	—	1	1	5	2	—	—	2	1	—	12		
	211·5-	—	—	—	—	—	1	—	1	—	—	1	—	—	—	—	1	—	—	2		
	215·5-	—	—	1	1	—	—	—	—	—	—	—	—	—	1	—	1	—	—	2		
Totals	—	19	260	338	304	378	145	98	42	22	207	175	189	269	184	142	107	72	5	1,362	—	—
Means in mm.	189·50+	·21	1·25	1·38	2·10	3·30	3·97	4·12	3·61	1·32	·42	1·21	3·20	3·18	3·63	3·61	3·72	3·11	3·60	193·07	193·19	−·12
Twice P.E. ..	±	1·35	·55	·40	·60	·63	·73	·87	1·26	1·64	·55	·65	·68	·60	·64	·73	·88	1·02	3·66	±·23	±·22	±·15
Sexual offences.	167·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	171·5-	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	1		
	175·5-	—	—	—	2	1	—	—	—	—	—	—	1	1	1	—	—	—	—	3		
	179·5-	1	3	1	1	3	1	—	1	—	2	3	—	3	2	1	—	—	—	11		
	183·5-	5	3	4	3	2	1	1	1	—	5	—	2	6	8	1	1	—	—	20		
	187·5-	13	17	3	7	10	2	3	—	2	9	4	9	10	9	7	1	3	—	54		
	191·5-	2	12	7	11	14	6	3	1	2	7	6	7	7	5	6	9	8	—	57		
	195·5-	3	3	7	3	9	5	6	1	—	6	3	5	4	6	6	6	2	1	38		
	199·5-	2	2	3	3	4	1	—	—	—	1	1	2	2	4	1	1	1	—	14		
	203·5-	1	—	1	—	2	—	—	—	—	2	—	—	—	—	1	—	1	—	4		
	207·5-	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	1	1	—	2		
	211·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	215·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	28	42	28	30	46	18	16	4	4	30	17	28	34	32	25	19	16	1	204	—	—
Means in mm.	189·50+	[illegible]	1·30	[illegible]	1·35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1·27	[illegible]	2·77	[illegible]	[illegible]	[illegible]	[illegible]	6·00	[illegible]	193·36	193·26	+·10
Twice P.E. ..	±	[illegible]	1·75	[illegible]	1·69	1·29	[illegible]	[illegible]	[illegible]	[illegible]	1·39	[illegible]	1·69	[illegible]	[illegible]	[illegible]	1·98	3·16	[illegible]	±·60	±·67	±·55
Violence against the person.	167·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	171·5-	—	1	1	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	2		
	175·5-	—	4	3	—	—	—	1	—	—	—	3	2	3	—	1	—	1	—	8		
	179·5-	2	9	4	3	7	—	—	—	1	4	7	6	3	3	—	1	—	—	26		
	183·5-	3	8	11	9	12	—	8	2	—	9	4	6	12	9	5	2	2	—	40		
	187·5-	—	26	12	9	12	3	3	3	1	15	10	7	12	7	7	4	2	—	65		
	191·5-	4	21	17	9	22	9	6	—	—	7	9	16	12	18	11	8	7	—	88		
	195·5-	2	22	15	11	7	6	1	2	—	8	6	8	8	6	12	7	11	1	68		
	199·5-	1	2	8	5	15	6	2	2	1	4	2	1	7	6	6	3	3	1	34		
	203·5-	—	8	3	—	3	3	—	—	—	—	1	2	5	1	—	8	3	—	15		
	207·5-	—	2	—	—	1	1	2	—	—	1	—	—	1	1	1	2	—	—	6		
	211·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	215·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	12	60	71	48	74	38	32	8	3	46	42	48	60	58	43	30	30	2	368	—	—
Means in mm.	189·50+	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4·50	2·17	1·72	·20	1·30	3·28	3·67	4·65	3·53	3·21	3·60	193·64	193·34	+·30
Twice P.E. ..	±	2·40	·87	1·02	1·10	1·00	1·08	1·38	[illegible]	[illegible]	1·37	1·28	1·34	1·00	1·18	1·31	1·57	1·60	3·10	±·46	±·43	±·40
Offences against the currency.	167·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	171·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	175·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	179·5-	—	—	2	—	2	—	—	—	—	1	—	1	1	1	—	—	—	—	4		
	183·5-	—	2	1	1	1	—	1	2	—	4	1	1	1	1	—	—	—	—	8		
	187·5-	—	—	2	2	5	2	1	—	—	3	3	1	—	2	1	2	2	—	14		
	191·5-	—	2	2	2	4	2	5	—	—	7	2	1	3	1	1	2	—	—	17		
	195·5-	—	—	1	—	3	1	—	—	—	1	1	—	1	—	1	1	—	—	5		
	199·5-	—	1	1	—	2	—	—	2	—	1	—	2	1	—	1	2	1	—	8		
	203·5-	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	1		
	207·5-	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1		
	211·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	215·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	—	5	9	6	18	5	9	5	—	17	7	6	7	7	4	7	3	—	58	—	—
Means in mm.	189·50+	—	2·40	·50	4·00	3·70	3·20	1·78	3·60	—	1·41	1·71	3·67	3·66	4·00	6·00	5·71	4·00	—	192·58	192·68	−·09
Twice P.E. ..	±	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	2·60	[illegible]	[illegible]	[illegible]	[illegible]	4·31	3·26	4·98	—	±1·13	±1·08	±1·06
Forgery and fraud.	167·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	171·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	175·5-	—	—	1	1	1	—	—	—	—	—	—	—	2	—	1	—	—	—	3		
	179·5-	—	3	1	—	1	3	—	—	—	3	—	1	1	1	—	1	1	—	8		
	183·5-	—	—	4	6	12	6	4	3	—	6	2	6	4	5	4	2	3	1	33		
	187·5-	—	5	8	3	17	3	8	1	1	4	3	6	6	7	4	8	6	2	46		
	191·5-	—	7	4	12	21	17	7	5	—	6	2	7	7	12	11	11	14	3	73		
	195·5-	—	3	9	5	10	8	6	1	—	1	4	5	9	6	8	2	14	2	50		
	199·5-	—	2	3	9	8	7	10	6	—	2	1	3	1	5	11	5	12	1	41		
	203·5-	—	1	—	3	10	1	2	3	—	—	—	3	3	6	3	1	4	—	19		
	207·5-	—	—	—	—	1	1	2	—	—	—	—	—	1	—	2	—	2	—	5		
	211·5-	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	1	—	1	2		
	215·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	—	21	31	38	87	47	39	16	1	22	12	30	34	41	44	31	55	10	279	—	—
Means in mm.	189·50+	—	3·26	3·65	5·00	4·09	4·35	3·77	7·00	·00	·36	3·67	3·50	3·68	3·27	6·82	4·64	7·20	6·00	194·53	193·91	+·62
Twice P.E. ..	±	—	1·80	1·65	1·49	·98	1·26	1·38	2·16	3·68	1·34	2·49	1·60	1·48	1·36	1·30	1·55	1·18	2·73	±·52	±·49	±·46

Correlation ratio of head length and crime at given age and stature ... ... 0·065 ± ·014

Table 2.—Head Breadths.

Frequencies in all Criminals irrespective of Crime.

mm.	Of age in years. 15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
130·5—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
133·5—	—	2	—	3	—	—	—	—	—	—	—	—	—	—
136·5—	1	10	7	7	2	1	—	—	—	—	1	—	—	—
139·5—	5	34	14	22	8	11	3	—	1	2	1	1	—	—
142·5—	5	57	46	31	26	18	14	4	4	12	4	1	—	—
145·5—	12	79	99	50	51	35	19	15	8	18	5	4	2	1
148·5—	19	104	93	73	60	58	33	28	20	25	10	3	1	1
151·5—	9	73	100	69	76	46	33	25	10	28	9	2	2	1
154·5—	6	41	52	37	33	31	25	17	12	15	9	6	1	2
157·5—	3	28	25	29	21	23	10	13	5	13	4	1	—	—
160·5—	1	13	17	10	13	6	7	7	4	5	2	2	—	—
163·5—	—	1	4	4	1	4	—	3	2	3	—	—	—	—
166·5—	—	—	4	—	2	1	—	—	—	1	—	—	—	—
169·5—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Totals ...	61	442	462	335	294	234	144	112	66	122	45	20	6	5
Means 150 +	—·34	—·33	·81	·62	1·51		2·38		2·33		1·93			
Twice P.E. ±	·94	·35	·35	·40	·32		·46		·54		·85			

mm.	Of stature in inches. 48-	54-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-	Irrespective of age or stature.
130·5—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
133·5—	—	—	—	—	—	—	—	—	1	—	1	—	1	2	—	—	—	—	—	—	—	—	—	5
136·5—	—	—	—	—	—	—	—	2	5	2	8	3	3	3	3	—	—	—	—	—	—	—	—	29
139·5—	—	—	1	—	—	—	1	5	5	12	11	14	16	13	9	9	3	1	2	—	—	—	—	102
142·5—	—	—	—	—	3	1	3	7	20	31	24	28	33	26	16	13	12	5	1	—	—	—	—	223
145·5—	—	1	—	—	1	1	3	16	17	32	58	53	60	60	39	28	17	5	4	2	1	—	—	398
148·5—	—	—	—	—	—	—	7	10	25	51	60	78	77	72	60	45	25	11	4	2	1	—	—	528
151·5—	—	—	—	—	—	—	6	8	19	42	54	59	74	56	61	52	23	17	5	1	3	1	—	481
154·5—	1	—	—	1	—	—	1	5	11	20	26	34	48	47	44	21	15	9	1	3	—	—	1	288
157·5—	—	—	1	—	—	1	—	5	7	12	14	24	28	32	19	18	10	1	1	2	—	—	—	175
160·5—	—	—	—	—	—	—	—	1	2	2	9	13	16	13	8	11	4	4	2	—	2	—	—	87
163·5—	—	—	—	—	—	—	—	—	—	3	1	—	5	1	6	4	—	—	—	1	—	1	—	22
166·5—	—	—	—	—	—	—	—	—	—	—	—	2	—	2	2	1	—	1	—	—	—	—	—	8
169·5—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
Totals ...	1	1	2	1	4	3	21	59	112	208	266	308	361	327	267	202	109	55	20	11	7	2	1	2,348
Means 150 +	—·73							—·36			·15	·97	1·26	1·30	1·91	2·03	1·70			4·86				1·02
Twice P.E. ±	1·29							·38			·45	·42	·39	·41	·45	·52	·55			1·62				·15

Mean head breadth 151·02 ± ·08 mm. Standard deviation 5·48 mm.

Correlation coefficient with age ·152 ± ·014. Correlation coefficient with stature ·153 ± ·014.

Prediction formula in mm. 151·02 + ·065 (age in years − 36·235) + ·323 (stature in inches − 65·445).

Frequencies in Criminals distinguished as to Crime.

Crime.	mm.	Of age in years. 15-	20-	25-	30-	35-	45-	55-	65-	Of stature in inches. 48-	60-	63-	64-	65-	66-	67-	68-	69-	72-	Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted head breadth.
Malicious damage to property.	130·5—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	133·5—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	136·5—	—	—	—	1	—	—	—	1	—	1	—	—	1	—	—	—	—	—	2		
	139·5—	—	1	—	—	1	1	—	—	—	2	1	—	—	—	—	—	—	—	3		
	142·5—	—	4	1	2	3	1	—	—	—	—	—	1	2	2	1	2	3	—	11		
	145·5—	1	5	3	1	5	1	2	—	—	1	4	3	6	1	—	—	1	2	18		
	148·5—	2	1	5	4	4	5	2	—	1	8	3	3	2	3	1	—	2	—	23		
	151·5—	—	4	4	2	6	2	1	—	—	1	4	1	2	1	6	2	2	—	19		
	154·5—	—	—	—	3	1	3	—	—	1	—	—	—	1	1	2	1	—	1	7		
	157·5—	1	1	2	—	4	—	1	—	1	1	1	1	—	1	1	2	1	—	9		
	160·5—	—	—	1	—	3	—	—	—	—	—	—	1	1	1	—	1	—	—	4		
	163·5—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1		
	166·5—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	169·5—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals ..	—	4	16	17	13	27	13	6	1	3	15	13	10	15	10	11	8	9	3	97	—	—
Means ..	150·0+	1·25	−1·69	2·47	−·23	2·00	·46	1·00	−12·00	5·00	−4·00	·00	·90	−1·20	1·50	3·00	3·75	−·67	·00	150·74	151·02	−·28
Twice P.E.	±	3·70	1·85	1·79	2·05	1·42	2·05	3·02	7·38	4·28	1·91	2·05	2·34	1·91	2·34	2·23	2·62	2·47	4·28	± ·75	± ·73	± ·72

Frequencies in Criminals distinguished as to Crime.—continued.

Crime.	mm.	Of age in years.								Of stature in inches.										Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted head breadth.
		15-	20-	25-	30-	35-	45-	55-	65-	58-	60-	62-	64-	65-	66-	67-	68-	69-	72-			
Stealing and burglary.	130·5-	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1		
	133·5-	—	1	—	2	—	—	—	—	—	—	—	—	1	2	—	—	—	—	3		
	136·5-	1	5	4	2	1	—	—	—	—	5	4	1	1	2	—	—	—	—	13		
	139·5-	1	16	9	11	11	1	1	2	1	15	5	7	7	6	6	2	3	—	52		
	142·5-	3	31	34	20	28	11	10	3	5	40	14	16	20	18	10	5	7	—	135		
	145·5-	2	42	67	37	37	20	11	6	5	41	35	30	32	30	23	17	9	1	223		
	148·5-	7	66	66	48	66	32	23	10	5	51	42	53	44	38	34	27	19	1	313		
	151·5-	4	43	65	46	66	37	22	7	5	49	42	40	41	38	34	33	12	2	291		
	154·5-	1	31	36	21	32	26	15	8	1	24	16	22	32	27	21	10	15	1	170		
	157·5-	—	16	14	18	20	8	8	4	—	16	8	12	17	17	8	7	3	—	88		
	160·5-	—	9	7	8	11	8	7	2	—	3	8	6	11	8	3	5	3	—	47		
	163·5-	—	—	1	1	4	2	1	—	—	2	1	—	3	1	2	—	—	—	9		
	166·5-	—	—	4	—	3	—	—	—	—	—	—	2	—	3	1	1	1	—	7		
	169·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals ..	—	19	260	308	204	278	145	98	42	22	247	175	189	209	184	142	107	72	5	1,352	—	—
Means ..	150·0+	-1·42	·14	·51	·46	1·07	2·28	1·30	1·79	-1·50	-·30	·70	1·13	1·02	1·20	1·41	1·88	1·54	1·80	150·90	150·88	+·11
Twice P.E. ..	±	1·60	·46	·43	·38	·44	·61	·74	1·15	1·58	·47	·56	·64	·51	·55	·62	·72	·87	3·31	±·26	±·20	±·13
Sexual offences.	130·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	133·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	136·5-	—	1	—	1	1	—	—	—	—	—	1	1	1	—	—	—	—	—	3		
	139·5-	3	7	—	4	—	1	—	—	1	1	1	2	4	3	2	1	—	—	15		
	142·5-	2	3	1	3	5	1	—	1	—	7	3	1	1	—	1	3	—	—	16		
	145·5-	5	9	9	2	13	5	3	—	1	7	4	6	6	12	4	4	2	—	46		
	148·5-	7	11	2	9	9	3	6	—	1	8	4	8	6	8	4	3	4	1	47		
	151·5-	3	5	7	6	7	1	3	1	—	4	2	2	10	3	5	3	4	—	33		
	154·5-	2	3	4	1	5	3	1	2	1	2	2	4	3	3	3	2	2	—	22		
	157·5-	3	1	1	3	4	2	1	—	—	3	—	1	2	3	3	—	3	—	14		
	160·5-	1	1	1	—	1	3	—	—	—	—	—	1	—	1	1	2	1	—	6		
	163·5-	—	—	1	—	—	—	1	—	—	—	—	—	1	—	—	1	—	—	2		
	166·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	169·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals ..	—	26	41	26	29	45	19	16	4	4	32	17	26	34	33	23	19	18	1	204	—	—
Means ..	150·0+	·12	-1·31	1·85	·73	·10	1·26	2·00	3·25	-1·50	-·60	-1·94	-·11	·26	-·19	1·50	1·10	3·56	·00	150·26	150·87	-·60
Twice P.E. ..	±	1·65	1·15	1·46	1·37	1·20	1·74	1·90	3·70	3·70	1·32	1·80	1·65	1·27	1·31	1·64	1·70	1·85	7·40	±·62	±·51	±·46
Violence against the person.	130·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	133·5-	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1		
	136·5-	—	4	1	—	1	—	—	—	—	2	2	1	—	—	1	—	—	—	6		
	139·5-	1	7	5	4	6	—	1	—	—	4	4	5	3	4	1	2	1	—	24		
	142·5-	—	17	7	1	3	4	2	1	1	3	6	6	7	3	3	3	3	—	35		
	145·5-	4	16	12	8	15	3	4	2	—	10	10	5	16	9	8	2	7	—	64		
	148·5-	3	22	15	18	13	6	6	3	—	10	10	9	17	12	13	6	3	—	80		
	151·5-	2	16	14	7	16	6	2	1	1	6	3	6	13	12	8	5	9	—	68		
	154·5-	2	4	8	7	15	2	3	—	—	6	3	4	3	7	5	3	5	—	36		
	157·5-	—	10	6	3	4	6	3	1	1	3	3	6	6	4	4	6	—	1	34		
	160·5-	—	2	6	2	2	1	—	—	—	2	—	3	3	2	—	1	1	1	13		
	163·5-	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	2	—	—	2		
	166·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	169·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals ..	—	12	99	71	45	74	28	31	8	3	46	42	48	62	56	43	30	29	2	358	—	—
Means ..	150·0+	-·35	-·31	·19	1·07	·16	2·00	1·14	·00	2·00	-·05	-2·07	·31	·77	1·07	·08	·10	·72	9·50	150·54	150·89	-·36
Twice P.E. ..	±	2·13	·74	·89	1·00	·86	1·30	1·60	3·00	4·20	1·09	1·14	1·07	·94	1·09	1·13	1·26	1·37	5·24	±·30	±·38	±·35
Offences against the currency.	130·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	133·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	136·5-	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1		
	139·5-	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	1		
	142·5-	—	—	1	1	1	—	3	—	—	5	—	1	—	—	—	—	—	—	6		
	145·5-	—	—	3	1	4	3	1	1	—	4	3	1	1	2	1	1	—	—	13		
	148·5-	—	2	2	—	4	1	1	2	—	3	—	2	1	2	1	1	2	—	12		
	151·5-	—	—	2	—	6	—	1	1	—	4	—	1	1	1	—	2	1	—	10		
	154·5-	—	3	—	1	3	—	2	1	—	1	2	—	3	1	—	3	—	—	10		
	157·5-	—	—	—	—	1	1	—	—	—	—	1	—	—	—	1	—	—	—	2		
	160·5-	—	—	1	2	—	—	—	—	—	—	1	1	—	1	—	—	—	—	3		
	163·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	166·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	169·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals ..	—	—	5	9	6	19	5	9	5	—	17	7	6	7	7	4	7	3	—	58	—	—
Means ..	150·0+	—	2·00	·35	1·50	2·42	·60	-1·67	1·20	—	-1·41	3·43	1·00	1·29	2·14	-1·50	3·00	1·00	—	150·83	151·28	-·45
Twice P.E. ..	±	—	2·30	2·06	2·05	1·60	2·30	2·46	3·30	—	1·8[illegible]	2·80	3·48	3·08	3·80	3·70	3·80	4·28	—	±·97	±·96	±·94
Forgery and fraud.	130·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	133·5-	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1		
	136·5-	—	—	2	2	—	—	—	—	—	1	1	—	—	1	1	—	—	—	4		
	139·5-	—	3	—	3	1	—	—	—	—	—	—	—	1	—	—	4	2	—	7		
	142·5-	—	3	2	4	9	1	1	1	1	3	1	3	3	3	1	—	6	—	20		
	145·5-	—	7	5	1	11	3	5	2	—	2	2	5	5	6	3	4	7	—	34		
	148·5-	—	3	2	4	23	14	7	—	—	6	1	4	7	9	7	8	10	1	58		
	151·5-	—	6	8	8	19	13	9	3	—	5	3	9	7	6	8	7	17	3	65		
	154·5-	—	—	7	4	10	8	6	8	—	3	3	3	6	8	13	2	3	2	43		
	157·5-	—	—	3	5	11	4	6	—	—	1	1	4	3	8	2	3	5	1	28		
	160·5-	—	1	1	3	2	3	2	2	—	—	—	1	1	—	4	2	5	1	14		
	163·5-	—	1	1	3	—	1	2	—	—	—	—	—	1	—	4	1	—	2	8		
	166·5-	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	1		
	169·5-	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	1		
Totals ..	—	—	21	31	38	87	47	39	16	1	22	12	29	34	41	44	31	56	10	279	—	—
Means ..	150·0+	—	-·35	1·94	2·13	1·90	3·78	4·31	4·31	-0·00	-·41	1·00	3·07	3·08	3·19	4·90	1·64	2·39	7·20	152·45	151·92	+·58
Twice P.E. ..	±	—	1·60	1·38	1·18	·79	1·06	1·18	1·79	7·40	1·56	2·14	1·37	1·27	1·16	1·11	1·38	1·00	2·34	±·44	±·43	±·41

Correlation ratio of head breadth and crime at given age and stature 0·062 ± ·014.

Table 3.—Head Indices.

Frequencies in all Criminals irrespective of Crime.

%	Of age in years.													
	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
66·95—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
68·95—	—	2	1	3	2	—	—	—	1	1	—	—	—	—
70·95—	—	12	13	4	4	6	4	1	1	3	1	1	—	—
72·95—	5	39	24	33	26	20	10	12	3	9	4	1	1	—
74·95—	12	106	88	58	51	47	29	13	13	24	8	5	2	1
76·95—	18	110	135	98	86	63	39	34	17	29	8	5	—	2
78·95—	19	88	109	69	71	55	39	24	22	35	14	5	3	2
80·95—	4	59	48	46	29	22	16	16	5	13	8	—	—	—
82·95—	2	16	29	18	18	12	6	10	3	4	—	3	—	—
84·95—	1	9	8	4	3	7	1	2	1	3	1	—	—	—
86·95—	—	1	5	1	4	1	—	—	—	1	1	—	—	—
88·95—	—	—	1	1	—	—	—	—	—	—	—	—	—	—
90·95—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Totals ...	61	442	462	335	294	234	144	112	66	122	45	20	6	5
M'ns 77·95 +	·49	·30	·79	·56		·57		·67		·53			·63	
Twice P.E. ±	·52	·19	·19	·22		·18		·25		·29			·46	

%	Of stature in inches.																							Irrespective of age or stature.
	48-	54-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-	
66·95—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
68·95—	—	—	—	—	—	—	—	—	1	2	—	1	2	—	3	1	—	—	—	—	—	—	—	10
70 95—	—	—	—	—	—	—	—	—	—	2	6	5	9	5	11	5	3	2	2	—	—	—	—	50
72·95—	—	—	—	—	—	1	2	5	10	13	18	34	32	23	14	16	11	3	3	2	—	—	—	187
74·95—	—	—	—	—	—	—	4	10	23	33	46	50	67	74	51	51	28	12	5	—	2	—	1	457
76·95—	—	1	—	—	3	1	6	16	25	58	78	82	93	91	79	50	34	18	5	3	1	—	—	644
78·95—	1	—	—	1	1	—	4	13	24	55	69	69	85	70	64	53	25	12	3	3	2	1	—	555
80·95—	—	—	1	—	—	1	5	11	17	28	28	39	43	33	26	15	7	8	1	2	—	1	—	266
82·95—	—	—	1	—	—	—	—	2	7	14	12	20	19	25	11	6	1	—	1	1	1	—	—	121
84·95—	—	—	—	—	—	—	—	2	4	2	6	2	6	5	7	5	—	—	—	—	1	—	—	40
86·95—	—	—	—	—	—	—	—	—	—	1	2	5	4	1	1	—	—	—	—	—	—	—	—	14
88·95—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	2
90·95—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
Totals ..	1	1	2	1	4	3	21	59	112	208	266	308	361	327	267	202	109	55	20	11	7	2	1	2,348
M'ns 77·95 +				·85					·87		·77	·71	·62	·62	·43	·19		−·24			1·43			·57
Twice P.E. ±				·70					·21		·25	·23	·22	·22	·25	·28		·30			·88			·08

Mean head index 78·52 ± ·04. Standard deviation 3·00

Correlation coefficient with age ·014 ± ·014. Correlation coefficient with stature − ·080 ± ·014·

Prediction formula 78·52 + ·003 (age in years − 36·235) − ·091 (stature − 65·445).

Frequencies in Criminals distinguished as to Crime.

Crime.	%	Of age in years.								Of stature in inches.										Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted head index.
		15-	20-	25-	30-	35-	45-	55-	65-	48-	60-	63-	64-	65-	66-	67-	68-	69-	72-			
Malicious damage to property.	66·95 -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	68·95 -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	70·95 -	—	—	1	—	1	—	—	—	—	—	—	—	—	—	1	1	—	—	2		
	72·95 -	1	2	1	1	1	1	—	—	—	1	2	—	3	—	—	—	1	—	7		
	74·95 -	1	4	2	2	6	1	2	1	1	2	4	—	2	3	—	—	5	2	19		
	76·95 -	—	5	3	2	4	5	1	—	—	3	—	2	5	5	3	—	1	1	20		
	78·95 -	1	4	6	5	7	3	3	—	1	6	4	3	3	2	3	5	2	—	29		
	80·95 -	—	1	2	2	4	1	—	—	—	2	2	3	—	—	2	1	—	—	10		
	82·95 -	1	—	1	—	3	2	—	—	1	—	1	2	2	—	1	—	—	—	7		
	84·95 -	—	—	—	1	1	—	—	—	—	—	—	—	—	—	1	1	—	—	2		
	86·95 -	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1		
	88·95 -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	90·95 -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	4	16	17	13	27	13	6	1	3	15	13	10	15	10	11	8	9	3	97	—	—
Means in mm.	77·95+	·50	−·25	1·29	1·38	1·26	1·23	·33	−2·00	2·00	1·47	·46	3·00	·13	−·20	2·00	2·00	−1·11	−1·33	78·86	78·51	+ ·35
Twice P.E. ..	±	2·02	1·01	·98	1·12	·78	1·12	1·65	4·04	2·33	1·04	1·12	1·28	1·04	1·28	1·22	1·43	1·35	2·33	± ·41	± ·41	± ·40

Frequencies in Criminals distinguished as to Crime—continued.

Crime.	Σ	Of age in years.								Of stature in inches.										Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted head index.
		15-	20-	25-	30-	35-	45-	55-	65-	[illegible]-	60-	[illegible]-	64-	65-	66-	67-	68-	69-	72-			
Stealing and burglary.	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	1	1	1	2	—	—	—	—	1	—	1	1	—	2	—	—	—	5		
	[illegible]-	—	5	8	1	3	2	2	2	—	2	4	3	4	3	4	3	1	—	28		
	[illegible]-	1	17	16	22	25	12	6	4	2	17	11	21	16	11	7	9	8	1	108		
	[illegible]-	7	61	68	24	43	25	14	7	1	42	20	35	41	49	30	28	13	1	244		
	[illegible]-	3	67	57	50	66	38	30	7	9	65	58	58	57	43	41	32	26	2	384		
	[illegible]-	6	47	70	42	65	35	20	15	4	61	44	40	46	34	32	26	13	—	309		
	[illegible]-	3	41	26	20	33	22	12	4	6	30	25	26	30	21	17	9	10	1	179		
	[illegible]-	—	18	20	12	15	9	5	1	—	17	9	6	11	19	7	2	1	—	74		
	[illegible]-	—	8	6	2	6	1	—	1	—	6	6	—	2	4	3	3	—	—	24		
	[illegible]-	—	1	—	—	2	—	—	1	—	—	1	2	—	1	—	—	—	—	4		
	[illegible]-	—	—	1	1	—	—	—	—	—	—	—	1	1	—	—	—	—	—	2		
	[illegible]-	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1		
Totals	—	19	189	286	204	276	146	98	42	22	247	175	189	209	184	142	107	72	5	1,362	—	—
Means in mm.	77·[illegible]+	·11	·[illegible]	·[illegible]	·05	·71	·73	·73	·67	1·00	·10	1·13	·05	·12	·04	·76	·28	·11	-·40	78·67	78·55	+ ·12
Twice P.E. ..	±	·36	·25	·20	·26	·34	·36	·41	·68	·88	·26	·31	·29	·28	·30	·34	·30	·46	1·81	± ·11	± ·11	± ·07
Sexual offences.	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	—	1	1	—	1	—	—	—	—	1	—	—	—	1	—	1	—	3		
	[illegible]-	3	4	2	3	7	1	1	—	1	3	—	5	2	3	3	4	—	—	20		
	[illegible]-	3	3	6	6	8	3	5	—	—	7	7	6	6	7	2	6	3	—	46		
	[illegible]-	10	12	4	11	16	2	5	1	2	13	5	4	9	10	10	4	4	—	61		
	[illegible]-	8	7	8	5	11	6	2	2	1	5	4	3	13	7	6	3	7	—	40		
	[illegible]-	1	3	3	2	2	2	1	—	—	4	—	3	1	3	—	1	1	—	13		
	[illegible]-	1	1	1	—	2	1	—	1	—	—	—	2	2	1	2	—	—	—	7		
	[illegible]-	1	—	—	1	—	2	1	—	—	—	—	1	1	1	—	1	—	1	5		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	29	41	28	30	46	18	16	4	4	32	17	28	34	32	28	19	16	1	204	—	—
Means in mm.	77·[illegible]+	·77	-·26	·30	-·14	-·04	1·04	·13	2·[illegible]	-·[illegible]	·[illegible]	-·7[illegible]	·[illegible]	·08	·14	·[illegible]	-·[illegible]	·37	8·00	78·16	78·52	- ·36
Twice P.E. ..	±	·70	·65	·70	·75	·60	·[illegible]	1·04	[illegible]	[illegible]	·[illegible]	·[illegible]	·[illegible]	·[illegible]	·[illegible]	·[illegible]	·[illegible]	1·01	4·04	± ·28	± ·28	± ·37
Violence against the person.	[illegible]-	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	1		
	[illegible]-	—	1	—	1	—	—	1	—	—	—	—	—	1	—	1	1	—	—	3		
	[illegible]-	—	6	2	—	3	1	—	—	—	—	1	2	2	3	2	—	2	—	12		
	[illegible]-	1	12	5	1	5	6	2	1	—	4	4	6	7	3	5	2	2	—	38		
	[illegible]-	1	24	14	9	19	5	8	3	1	9	11	6	11	10	11	9	8	—	78		
	[illegible]-	5	19	25	16	23	6	3	1	—	10	11	12	13	12	10	6	15	—	93		
	[illegible]-	4	20	16	9	18	6	6	3	1	11	12	10	13	14	9	7	2	2	81		
	[illegible]-	1	11	3	6	9	2	3	1	1	6	2	5	9	4	4	2	3	—	30		
	[illegible]-	—	2	5	4	3	—	1	—	—	3	—	6	1	2	—	2	—	—	14		
	[illegible]-	—	1	1	—	2	—	1	—	—	2	—	—	2	—	1	—	—	—	5		
	[illegible]-	—	—	2	—	1	—	—	—	—	—	1	1	2	—	—	—	—	—	4		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	12	99	71	46	74	30	27	8	3	40	48	48	60	58	48	30	39	2	368	—	—
Means in mm.	77·[illegible]+	·[illegible]	-·35	·70	·[illegible]	·77	-·37	·[illegible]	·[illegible]	1·[illegible]	·[illegible]	-·[illegible]	·70	·45	·[illegible]	-·46	·13	-·86	2·00	78·17	78·50	- ·33
Twice P.E. ..	±	1·23	·[illegible]	·[illegible]	·[illegible]	·[illegible]	·77	·[illegible]	1·[illegible]	2·[illegible]	·[illegible]	·[illegible]	·[illegible]	·[illegible]	·[illegible]	·[illegible]	·74	·75	2·[illegible]	± ·21	± ·21	± ·30
Offences against the currency.	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	—	—	1	—	—	1	—	—	—	—	—	1	—	1	—	—	—	2		
	[illegible]-	—	1	—	—	2	—	1	1	—	2	—	—	1	—	—	1	1	—	5		
	[illegible]-	—	—	2	—	3	3	2	2	—	4	1	2	—	—	2	3	—	—	13		
	[illegible]-	—	—	2	3	3	—	1	1	—	6	2	2	1	4	—	—	—	—	16		
	[illegible]-	—	1	3	1	3	2	4	—	—	2	2	—	3	2	1	2	2	—	14		
	[illegible]-	—	2	—	—	—	—	—	1	—	2	—	—	—	1	—	—	—	—	3		
	[illegible]-	—	1	—	1	2	—	—	—	—	1	2	—	—	—	—	1	—	—	4		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	—	1	—	1	—	—	—	—	—	—	1	1	—	—	—	—	—	2		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	—	8	9	8	19	6	9	5	—	17	7	6	7	7	4	7	3	—	58	—	—
Means in mm.	77·[illegible]+	—	2·00	1·11	·28	·74	-·[illegible]	-·07	-·[illegible]	—	·11	2·00	·07	·[illegible]	1·14	-2·00	·00	·00	—	78·40	78·59	- ·19
Twice P.E. ..	±	—	1·[illegible]	1·[illegible]	1·05	·[illegible]	1·[illegible]	1·[illegible]	1·[illegible]	—	·[illegible]	1·[illegible]	1·05	1·[illegible]	1·[illegible]	2·02	1·[illegible]	2·[illegible]	—	± ·[illegible]	± ·[illegible]	± ·52
[illegible]	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	—	—	1	—	—	1	—	—	2	—	—	—	—	—	—	—	—	2		
	[illegible]-	—	1	1	1	3	1	1	—	—	—	—	—	1	1	2	1	3	—	8		
	[illegible]-	—	3	1	6	6	1	2	—	—	1	1	3	3	6	—	—	5	1	19		
	[illegible]-	—	4	8	7	28	5	9	4	1	2	3	6	7	5	7	10	16	—	59		
	[illegible]-	—	6	6	8	17	8	7	5	—	2	4	9	8	11	15	8	13	1	71		
	[illegible]-	—	6	7	7	27	32	13	4	—	7	3	4	7	11	12	10	14	4	73		
	[illegible]-	—	1	8	6	4	9	3	2	—	6	1	2	3	4	3	1	3	2	25		
	[illegible]-	—	—	2	1	6	4	1	1	—	2	—	2	3	3	1	1	1	2	15		
	[illegible]-	—	—	1	—	1	—	2	—	—	—	—	1	1	—	2	—	—	—	4		
	[illegible]-	—	—	—	1	1	—	1	—	—	—	—	1	1	—	1	—	—	—	3		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	—	21	31	38	87	47	30	16	1	23	12	29	34	41	44	31	55	10	279	—	—
Means in mm.	77·[illegible]+	—	-·[illegible]	·[illegible]	·[illegible]	·44	·[illegible]	·67	·[illegible]	-2·[illegible]	·19	·00	·76	·[illegible]	·70	1·00	·12	-·44	2·40	78·45	78·40	+ ·05
Twice P.E. ..	±	—	·[illegible]	·[illegible]	·[illegible]	·[illegible]	·[illegible]	·[illegible]	1·[illegible]	4·04	·[illegible]	1·18	·75	·[illegible]	·[illegible]	·61	·73	·[illegible]	1·28	± ·24	± ·24	± ·23

Correlation ratio of head index and crime at given age and stature ... ... 0·073 ± ·014

TABLE 4.—HEAD CIRCUMFERENCES.

Frequencies in all Criminals irrespective of Crime.

mm.	Of age in years.													
	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
499·5—	—	—	1	—	1	1	—	—	—	—	—	—	—	—
509·5—	—	3	—	2	—	—	—	—	—	—	—	—	—	—
519·5—	3	9	9	10	6	5	1	—	—	1	1	—	—	—
529·5—	8	50	41	30	16	16	8	5	4	6	1	—	—	1
539·5—	14	65	82	57	47	29	21	12	6	15	7	6	—	—
549·5—	14	125	111	86	68	57	38	19	14	30	9	2	1	—
559·5—	12	96	119	71	75	61	33	34	13	24	9	5	1	1
569·5—	4	58	66	55	46	41	21	23	14	26	11	1	2	2
579·5—	6	27	23	19	26	14	16	12	13	12	2	5	2	1
589·5—	—	5	5	5	1	8	6	6	2	5	2	1	—	—
599·5—	—	3	3	—	7	1	—	—	—	2	2	—	—	—
609·5—	—	1	—	—	1	—	—	—	—	1	1	—	—	—
Totals ...	61	442	460	335	294	233	144	111	66	122	45	20	6	
M'ns 554·5 +	−·16	2·94	3·46	3·07	6·24		8·82		10·21		11·32			
Twice P.E. ±	2·71	1·01	1·00	1·16	·92		1·33		1·54		2·43			

mm.	Of stature in inches																							Irrespective of age or stature.
	48-	51-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-	
499·5—	—	—	1	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	3
509·5—	—	—	—	—	—	—	—	3	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	5
519·5—	—	—	—	—	1	—	1	1	4	2	11	3	7	7	4	2	—	2	—	—	—	—	—	45
529·5—	—	—	—	—	3	1	1	10	14	33	27	16	29	22	17	6	4	3	—	—	—	—	—	186
539·5—	—	—	—	—	—	—	7	13	26	37	49	63	58	46	31	18	9	1	2	1	—	—	—	361
549·5—	—	—	—	—	—	1	5	19	22	67	77	82	87	74	52	43	21	14	8	2	—	—	—	574
559·5—	1	1	—	1	—	—	3	7	25	37	57	63	84	89	75	53	33	15	3	3	3	1	—	554
569·5—	—	—	1	—	—	—	4	4	16	20	30	48	53	52	52	49	23	9	4	3	2	—	—	370
579·5—	—	—	—	—	—	—	—	2	3	9	11	21	31	26	24	21	15	8	3	2	1	—	1	178
589·5—	—	—	—	—	—	1	—	—	—	1	4	6	8	8	5	7	2	2	—	—	1	1	—	46
599·5—	—	—	—	—	—	—	—	—	—	—	—	3	2	3	6	2	1	1	—	—	—	—	—	18
609·5—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1	—	—	—	—	—	—	4
Totals ...	1	1	2	1	4	3	21	59	111	207	266	306	361	327	267	202	109	55	20	11	7	2	1	2,344
M'ns 554·5 +	−1·97									−·29	1 13	5·26	5 26	6 33	8 61	10 50	11 56	11 56						5·22
Twice P.E. ±	1·49									1·47	1 30	1·21	1 13	1·17	1·30	1·49	2·03	2 16						·44

Mean head circumference 559·72 ± ·22 mm. Standard deviation 15·73 mm.

Correlation coefficient with age ·173 ± ·014· Correlation coefficient with stature ·253 ± ·013.

Prediction formula in mm. 559·72 + ·214 (age in years − 36·235) + 1·523 (stature in inches − 65·445).

Frequencies in Criminals distinguished as to Crime.

Crime.	mm.	Of age in years.								Of stature in inches.										Irrespective of age or stature.	Predicted from mean age and stature of criminal groups.	Excess of actual over predicted head circumference.
		15-	20-	25-	30-	35-	45-	55-	65-	48-	62-	63-	64-	65-	66-	67-	68-	69-	70-			
Malicious damage to property.	499 5 -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	509·5 -	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1		
	519·5 -	—	—	—	1	2	—	—	1	—	1	—	—	1	1	1	—	—	—	4		
	529·5 -	—	1	3	3	2	1	2	—	5	1	3	—	1	—	1	—	—	1	12		
	539·5 -	3	3	2	—	2	3	1	—	1	—	3	2	4	2	2	—	—	—	14		
	949·5 -	1	5	1	4	5	4	—	—	2	3	3	4	3	1	2	—	1	1	20		
	559·5 -	—	5	6	2	3	3	2	—	1	2	3	1	2	3	1	1	2	5	21		
	569·5 -	—	—	3	2	7	—	—	—	1	1	1	1	3	—	1	4	—	—	12		
	579·5 -	—	1	1	—	4	2	1	—	—	—	—	2	1	2	2	1	—	1	9		
	589·5 -	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1		
	599·5 -	—	..	1	—	1	—	—	—	—	—	—	—	—	—	1	1	—	—	2		
	609·5 -	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	1		
Totals ..	—	4	16	17	13	27	13	6	1	10	8	13	10	15	10	11	8	4	8	97	—	—
Means ..	554·5 +	−7·50	4·38	7·06	−5·38	10·37	3·08	·00	−30·00	−8·00	−1·25	−3·08	7·00	1·33	8·00	6·36	16·25	20·00	7·50	558·42	559·74	−1·32
Twice P.E.	±	10·59	5·29	5·14	5·88	4·08	5·88	8·65	21·17	6·71	7·50	5·89	6·71	5·48	6·71	6·40	7·50	10·60	7·50	±2·15	±2·05	±2·01

Table 5.—Head Heights.

Frequencies in all Criminals irrespective of Crime.

mm.	Of age in years. 15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
98·5—	—	—	1	—	—	—	1	—	—	—	—	—	—	—
102·5—	—	2	2	—	—	3	—	—	1	—	1	1	—	—
106·5—	—	1	1	1	—	—	—	—	—	—	—	—	—	—
110·5—	—	4	4	—	—	1	—	1	2	3	—	—	1	—
114·5—	—	16	12	12	9	9	2	1	2	2	1	1	—	—
118·5—	1	22	28	28	18	10	6	3	4	2	5	1	—	—
122·5—	4	46	56	44	46	20	11	16	11	15	8	4	1	1
126·5—	12	108	105	71	53	52	30	16	13	24	10	5	3	1
130·5—	11	85	92	59	50	41	27	17	7	24	4	2	—	2
134·5—	19	75	67	58	49	44	24	25	8	30	5	2	1	1
138·5—	10	56	48	34	41	36	26	18	6	13	2	4	—	—
142·5—	4	14	28	17	13	10	7	8	7	3	6	—	—	—
146·5—	—	9	10	7	11	4	8	5	3	3	—	—	—	—
150·5—	—	3	8	3	2	2	1	1	1	3	1	—	—	—
154·5—	—	1	—	1	2	2	—	—	1	—	2	—	—	—
158·5—	—	—	—	—	—	—	1	1	—	—	—	—	—	—
Totals ...	61	442	462	335	294	234	144	112	66	122	45	20	6	5
M'ns 128·5 +	5·84	3·19	3·39	3·15	4·01		5·66		4·02		2·11			
Twice P.E. ±	1·38	·51	·50	·59	·47		·68		·79		1·24			

mm.	Of stature in inches. 48-	54-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-	Irrespective of age or stature.
98·5—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
102·5—	—	—	—	—	—	—	—	—	—	—	1	—	4	2	1	1	1	—	—	—	—	—	—	10
106·5—	—	—	—	—	—	—	—	—	1	—	1	—	—	1	—	—	—	—	—	—	—	—	—	3
110·5—	—	—	—	—	—	—	—	—	1	2	1	6	2	1	2	1	—	—	—	—	—	—	—	16
114·5—	—	—	1	—	—	—	1	3	3	7	14	6	13	7	3	6	—	2	—	—	1	—	—	67
118·5—	—	—	—	—	—	2	1	10	11	10	25	23	15	13	6	7	1	3	—	1	—	—	—	128
122·5—	—	—	1	1	2	1	3	8	21	28	32	39	45	46	28	16	6	3	1	—	1	1	—	283
126·5—	—	—	—	—	1	—	4	18	28	52	64	74	68	64	47	35	29	14	3	—	2	—	—	503
130·5—	—	—	—	—	—	—	2	8	22	44	42	57	65	58	42	50	20	4	4	3	—	—	—	421
134·5—	1	1	—	—	—	—	6	7	16	32	35	48	78	55	57	31	24	13	1	2	1	—	—	408
138·5—	—	—	—	—	1	—	3	3	6	21	30	34	50	50	43	21	10	10	5	4	2	—	1	294
142·5—	—	—	—	—	—	—	—	1	3	5	13	9	9	16	23	19	10	3	4	1	—	1	—	117
146·5—	—	—	—	—	—	—	—	—	—	6	6	5	9	10	7	12	2	2	1	—	—	—	—	60
150·5—	—	—	—	—	—	—	—	1	—	1	1	6	2	2	5	2	4	1	—	—	—	—	—	25
154·5—	—	—	—	—	—	—	—	—	—	—	1	—	1	2	1	1	2	—	1	—	—	—	—	9
158·5—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	2
Totals ...	1	1	2	1	4	3	21	59	112	208	266	308	361	327	267	202	109	55	20	11	7	2	1	2,348
M'ns 128·5 +	·59									2·88	2·38	3·03	3·60	4·21	5·80	5·39	6·31	6·33						3·79
Twice P.E. ±	·76									·75	·66	·62	·57	·60	·66	·76	1·04	1·10						·22

Mean head height 132·29±·11 mm. Standard deviation 8·01 mm.
Correlation coefficient with age ·027 ± ·014. Correlation coefficient with stature ·189 ± ·013.
Prediction formula in mm. 132·29 + ·019 (age in years − 36·235) + ·574 (stature in inches − 65·445).

Frequencies in Criminals distinguished as to Crime.

Crime.	mm.	Of age in years. 15-	20-	25-	30-	35-	45-	55-	65-	Of stature in inches. 48-	62-	63-	64-	65-	66-	67-	68-	69-	70-	Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted head height.
Malicious damage to property.	98·5 –	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	102·5 –	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	1		
	106·5 –	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	110·5 –	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1		
	114·5 –	—	2	1	—	4	—	—	—	2	—	—	1	1	2	—	—	—	1	7		
	118·5 –	—	—	—	3	1	—	—	1	—	—	—	—	2	—	—	1	—	2	5		
	122·5 –	1	1	3	2	1	4	2	—	2	1	3	1	2	1	2	1	—	1	14		
	126·5 –	2	3	5	2	5	4	—	—	2	2	6	5	1	1	1	2	1	—	21		
	130·5 –	—	2	4	3	2	2	2	—	1	2	1	1	3	2	1	1	1	2	15		
	134·5 –	1	4	2	—	4	2	1	—	2	2	1	—	5	3	—	—	1	—	14		
	138·5 –	—	2	—	—	5	—	—	—	—	—	1	1	—	1	3	—	—	1	7		
	142·5 –	—	2	1	1	2	1	1	—	1	1	1	1	—	—	2	1	—	1	8		
	146·5 –	—	—	—	2	1	—	—	—	—	—	—	—	—	—	2	1	—	—	3		
	150·5 –	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	154·5 –	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	1		
	158·5 –	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	4	16	17	13	27	13	6	1	10	8	13	10	15	10	11	8	4	8	97	—	—
Means	128·5+	1·00	4·25	·47	2·77	3·56	1·85	4·00	−8·00	·40	4·50	2·15	1·60	−·53	1·60	9·45	1·50	10·00	·50	131·10	132·32	− 1·23
Twice P.E. ..	±	5·41	2·70	2·62	3·00	2·08	3·00	4·42	10·81	3·42	3·83	3·00	3·42	2·80	3·42	3·26	3·83	5·41	3·83	± 1·10	± 1·08	± 1·05

Frequencies in Criminals distinguished as to Crime—continued.

Crime.	mm.	Of age in years. 16-	20-	25-	30-	35-	45-	55-	65-	Of stature in inches. [illegible]	[illegible]	63-	64-	65-	66-	67-	68-	69-	70-	Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted head height.
Stealing and burglary.	[illegible]	—	—	1	—	—	1	—	—	1	—	—	—	—	—	1	—	—	—	2		
	[illegible]	—	1	—	—	2	—	1	1	—	—	—	—	3	—	1	1	—	—	5		
	[illegible]	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1		
	[illegible]	—	3	1	—	—	1	—	—	1	1	1	1	—	1	—	—	—	—	5		
	[illegible]	—	9	6	3	6	1	1	2	3	1	11	3	7	1	—	2	—	1	20		
	[illegible]	—	13	20	14	15	3	3	4	20	7	14	13	5	6	2	4	—	1	72		
	[illegible]	1	19	32	25	26	9	14	6	28	17	16	25	19	13	13	3	2	—	134		
	[illegible]	1	65	74	40	32	24	17	16	38	33	38	37	45	36	27	17	11	9	269		
	[illegible]	1	50	50	31	57	21	18	6	17	30	35	38	35	34	20	29	6	2	243		
	[illegible]	3	47	45	29	46	30	20	3	18	30	24	33	48	35	29	14	11	6	238		
	[illegible]	5	38	37	34	42	22	11	4	9	17	24	24	31	36	25	12	7	8	198		
	[illegible]	5	9	19	11	14	8	7	3	3	4	8	6	6	11	14	14	6	2	74		
	[illegible]	—	5	8	5	8	12	3	—	—	5	5	4	7	6	4	9	—	1	41		
	[illegible]	—	3	7	2	3	2	3	—	1	1	—	4	2	3	5	1	2	1	19		
	[illegible]	—	1	—	1	5	—	—	2	—	—	1	—	1	2	1	1	1	—	7		
	[illegible]	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	1		
Totals	—	19	269	268	204	276	145	95	42	137	132	175	189	209	184	142	197	46	31	1,358	—	—
Means	1326+	3·65	3·74	4·16	4·08	4·61	7·17	5·02	2·60	·35	3·82	3·15	3·98	4·48	3·98	3·85	3·88	7·83	6·71	135·04	132·09	+·95
Twice P.E. ..	±	3·40	·67	·66	·76	·65	·90	1·00	1·67	·83	·94	·83	·70	·75	·80	·91	1·05	1·50	1·94	± ·29	± ·29	± ·19
Sexual offences.	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	1	—	—	—	—	1	—	—	1	—	—	—	—	—	1	—	2		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	1	—	—	—	1	—	—	—	—	1	1	—	—	—	—	—	2		
	[illegible]	—	1	1	2	2	1	—	—	—	2	—	—	2	1	1	1	—	—	7		
	[illegible]	1	4	1	4	1	1	—	—	1	1	4	3	—	2	—	—	—	1	12		
	[illegible]	3	8	3	6	11	3	3	1	4	—	3	2	7	10	3	4	3	1	37		
	[illegible]	4	11	6	7	10	4	4	1	6	6	4	10	6	6	2	4	3	1	47		
	[illegible]	10	5	10	5	5	4	3	1	3	8	2	4	7	6	6	5	1	—	43		
	[illegible]	5	4	2	3	3	2	3	—	1	8	1	5	4	3	5	3	3	—	27		
	[illegible]	4	7	—	1	5	1	1	—	1	—	1	—	6	3	3	2	—	1	19		
	[illegible]	—	1	1	1	2	1	—	—	—	—	1	—	1	1	1	—	1	1	6		
	[illegible]	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	1		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	1		
Totals	—	28	41	28	29	46	18	15	4	18	29	17	28	34	32	29	19	12	5	204	—	—
Means	1326+	4·72	1·35	·10	-·28	2·97	3·38	1·78	-6·50	[illegible]	1·20	-1·31	1·98	3·35	1·50	3·38	3·11	·67	3·20	130·25	133·24	-1·99
Twice P.E. ..	±	3·13	1·30	3·12	3·01	1·91	3·05	3·09	5·41	3·41	3·09	3·05	3·12	1·36	1·91	3·20	3·40	3·12	4·86	± ·76	± ·74	± ·71
Violence against the person.	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	1	1	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	2		
	[illegible]	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1		
	[illegible]	—	—	1	—	1	—	2	—	—	—	—	2	1	—	1	—	—	—	4		
	[illegible]	—	4	4	7	3	1	3	—	3	3	3	2	3	3	2	3	—	1	21		
	[illegible]	—	5	7	4	6	3	1	1	3	3	8	6	7	3	3	1	—	—	37		
	[illegible]	—	16	13	6	14	4	3	2	3	5	10	9	14	7	3	7	—	—	57		
	[illegible]	6	28	9	6	10	5	5	2	3	6	11	10	9	16	8	6	6	2	78		
	[illegible]	—	20	25	9	9	3	4	—	6	6	3	6	11	7	6	4	6	—	60		
	[illegible]	5	16	20	8	16	2	1	2	4	4	6	6	11	6	10	2	5	4	57		
	[illegible]	1	7	7	5	7	5	2	—	1	1	1	7	5	6	5	2	1	4	34		
	[illegible]	1	—	2	1	1	1	—	—	—	—	1	—	—	1	2	2	—	1	7		
	[illegible]	—	2	2	—	3	1	1	—	—	—	1	—	1	4	1	2	—	1	10		
	[illegible]	—	1	—	—	—	—	—	1	—	—	1	1	—	—	—	—	—	—	2		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	12	80	71	46	74	28	22	8	25	25	42	46	62	55	48	30	18	13	350	—	—
Means	1326+	3·69	3·62	1·24	·20	1·64	3·14	-·28	3·00	2·10	-·16	-·20	1·90	·77	2·42	3·44	3·27	4·22	6·00	130·28	132·32	-2·04
Twice P.E. ..	±	3·12	1·00	1·26	1·61	1·36	2·05	2·30	3·62	2·26	2·12	1·67	1·30	1·37	1·49	1·65	1·88	2·55	3·60	± ·57	± ·56	± ·52
Offences against the currency.	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	—	—	1	—	1	—	1	—	—	1	—	—	—	—	—	—	2		
	[illegible]	—	—	1	1	4	1	1	1	3	3	—	—	—	1	2	—	—	—	9		
	[illegible]	—	1	2	1	3	—	3	2	—	1	2	3	2	3	—	1	1	—	13		
	[illegible]	—	1	—	1	1	—	—	1	—	1	—	—	1	—	1	1	—	—	4		
	[illegible]	—	1	4	—	3	2	2	—	2	1	2	1	3	2	—	1	—	—	—		
	[illegible]	—	—	2	2	5	1	—	1	1	2	2	1	—	1	—	3	—	1	11		
	[illegible]	—	1	—	1	1	1	1	—	—	—	1	—	1	—	1	1	—	1	6		
	[illegible]	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	1		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	—	5	9	6	19	5	9	5	7	10	7	6	7	7	4	7	1	2	48	—	—
Means	1326+	—	3·60	3·19	6·67	3·20	3·00	3·11	2·40	1·14	2·20	3·00	3·00	6·29	4·57	3·00	3·14	·00	14·00	133·40	132·11	+1·29
Twice P.E. ..	±	—	3·84	3·61	4·08	2·65	4·84	3·81	4·84	3·60	3·43	4·60	4·42	4·09	4·09	5·41	4·09	10·80	7·65	± 1·42	± 1·39	± 1·38
Forgery and fraud.	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	[illegible]	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1		
	[illegible]	—	—	—	1	—	—	2	1	—	—	—	2	—	—	1	—	—	—	3		
	[illegible]	—	—	1	—	1	—	1	—	—	1	—	—	—	1	—	—	—	—	3		
	[illegible]	—	—	—	3	4	2	1	—	—	—	2	1	1	3	1	1	1	—	10		
	[illegible]	—	2	4	5	10	6	3	2	—	2	—	2	2	14	5	1	1	4	22		
	[illegible]	—	5	9	6	17	9	5	4	2	6	5	9	5	4	9	5	7	7	58		
	[illegible]	—	7	6	16	17	12	4	1	2	1	1	6	6	7	7	10	6	7	57		
	[illegible]	—	3	4	8	20	10	10	4	4	2	2	5	7	6	13	11	4	7	50		
	[illegible]	—	2	2	2	13	5	6	1	1	1	1	1	6	3	5	1	3	7	30		
	[illegible]	—	1	4	2	3	3	1	3	—	—	1	2	1	3	3	1	3	3	17		
	[illegible]	—	1	—	—	1	—	2	—	—	—	—	—	1	—	—	—	2	1	4		
	[illegible]	—	—	1	1	1	—	1	—	—	—	—	1	—	—	—	1	2	—	4		
	[illegible]	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	1		
	[illegible]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	—	21	32	38	87	47	30	16	11	12	12	30	34	41	44	31	35	37	270	—	—
Means	1326+	—	3·75	3·62	3·16	4·52	3·17	3·18	4·50	3·18	1·50	2·67	2·00	3·00	1·08	4·45	3·42	7·20	6·70	132·90	133·27	-·38
Twice P.E. ..	±	—	3·35	3·37	1·70	3·10	1·90	3·15	3·70	3·25	3·19	3·13	3·01	1·65	1·60	1·60	1·94	3·06	1·70	± ·65	± ·64	± ·60

Correlation ratio of head height and crime at given age and stature ... 0·170±·014.

Table 6.—Facial Lengths.

Frequencies in all Criminals irrespective of Crime.

mm.	Of age in years.													
	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
101·5—	1	2	5	1	—	—	—	1	1	—	2	1	—	—
105·5—	—	8	11	5	3	3	3	4	3	4	1	1	—	1
109·5—	4	30	19	21	20	18	9	3	6	9	5	1	1	—
113·5—	10	62	57	34	29	22	14	7	6	22	4	3	—	1
117·5—	12	83	86	67	57	37	22	22	17	23	7	6	2	2
121·5—	14	100	104	78	67	54	33	29	12	26	10	2	1	1
125·5—	5	68	76	63	51	38	30	15	9	18	5	3	1	—
129·5—	5	42	53	44	36	31	16	11	8	10	8	3	—	—
133·5—	6	30	23	12	19	22	7	13	2	7	2	—	—	—
137·5—	1	9	20	5	8	5	6	4	1	3	1	—	—	—
141·5—	3	4	6	2	2	2	4	3	1	—	—	—	1	—
145·5—	—	4	2	1	2	2	—	—	—	—	—	—	—	—
149·5—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
153·5—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
Totals ...	61	442	462	335	294	234	144	112	66	122	45	20	6	5
Means 123·5+	·20	—·15	·41	·18	·82		1·23		—1·34		—1·84			
Twice P.E. ±	1·34	·49	·49	·57	·45		·65		·75		1·21			

mm.	Of stature in inches																							Irrespective of age or stature.
	48-	54-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-	
101·5—	—	—	1	—	—	—	2	1	—	—	1	2	4	1	1	1	—	—	—	—	—	—	—	14
105·5—	1	—	—	1	1	1	—	5	2	5	8	11	3	3	3	2	—	—	1	—	—	—	—	47
109·5—	—	—	—	—	—	1	—	8	13	20	27	18	27	13	12	3	1	2	1	—	—	—	—	146
113·5—	—	1	—	—	2	1	6	8	21	32	41	39	44	33	17	17	7	2	—	—	—	—	—	271
117·5—	—	—	—	—	—	—	6	12	25	41	54	70	78	60	42	34	11	7	3	—	—	—	—	443
121·5—	—	—	—	—	1	—	4	15	23	52	59	77	72	67	58	48	34	12	4	1	3	—	1	531
125·5—	—	—	1	—	—	—	1	6	17	31	36	37	57	69	58	34	18	7	5	3	—	2	—	382
129·5—	—	—	—	—	—	—	1	2	5	10	21	37	41	45	33	27	22	15	4	2	2	—	—	267
133·5—	—	—	—	—	—	—	—	—	2	10	14	12	23	23	17	23	9	4	1	4	1	—	—	143
137·5—	—	—	—	—	—	—	1	2	2	2	4	4	7	7	20	7	5	2	—	—	—	—	—	63
141·5—	—	—	—	—	—	—	—	—	—	4	1	—	5	6	5	3	1	1	—	1	1	—	—	28
145·5—	—	—	—	—	—	—	—	—	2	1	—	—	—	—	1	3	1	2	1	—	—	—	—	11
149·5—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
153·5—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
Totals ...	1	1	2	1	4	3	21	59	112	208	266	308	361	327	267	202	109	55	20	11	7	2	1	2,348
Means 123·5+	−3·37									−1·35	−1·70	−1·10	−·20	1·27	2·35	2·53	3·38	4·75						·23
Twice P.E. ±	·73									·72	·64	·59	·55	·57	·64	·73	·99	1·06						·21

Mean facial length 123·73 ± ·11 mm. Standard deviation 7·70 mm.

Correlation coefficient with age − ·025 ± ·014. Correlation coefficient with stature ·277 ± ·013.

Prediction formula in mm. 123·73 − ·012 (age in years − 36·235) + ·804 (stature in inches − 65·445).

Frequencies in Criminals distinguished as to Crime.

Crime.	mm.	Of age in years								Of stature in inches.										Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted facial length.
		15-	20-	25-	30-	35-	45-	55-	65-	48-	62-	63-	64-	65-	66-	67-	68-	69-	70-			
Malicious damage to property.	101·5-	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1		
	105·5-	—	—	1	1	—	1	1	—	2	—	2	—	—	—	—	—	—	—	4		
	109·5-	—	1	1	2	2	1	—	—	1	1	—	2	1	2	—	—	—	—	7		
	113·5-	1	4	4	3	7	2	—	1	3	3	2	3	5	3	—	2	1	—	22		
	117·5-	1	3	—	2	3	2	—	—	—	—	2	1	3	1	2	1	—	1	11		
	121·5-	—	5	7	2	5	1	3	—	—	2	4	2	3	—	3	2	2	5	23		
	125·5-	1	2	4	2	3	5	1	—	3	—	3	2	2	2	4	1	—	1	18		
	129·5-	—	—	—	1	2	—	—	—	—	—	—	—	—	1	—	—	1	1	3		
	133·5-	—	1	—	—	4	—	1	—	—	2	—	—	1	1	1	1	—	—	6		
	137·5-	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	1		
	141·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	145·5-	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	1		
	149·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	153·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals ..		—	4	16	17	13	27	13	6	1	10	8	13	10	15	10	11	8	4	8	97	—
Means ..	123·5+	−7·00	−2·25	−2·59	−4·31	·30	−1·23	·00	−8·00	−7·60	−1·50	−3·38	−4·40	−2·93	−2·40	3·27	2·50	·00	1·00	121·64	123·80	−2·16
Twice P.E.	±	5·20	2·60	2·52	2·68	2·00	2·88	4·25	10·36	3·28	3·68	2·88	3·28	2·68	3·28	3·13	3·68	5·20	3·68	±1·05	±1·01	±·99

Frequencies in Criminals distinguished as to Crime—continued.

Crime.	mm.	Of age in years.								Of stature in inches.										Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted facial length.
		16-	20-	25-	30-	35-	40-	50-	60-	48-	62-	63-	64-	65-	66-	67-	68-	69-	70-			
Stealing and burglary.	101·5-	—	2	4	1	—	—	1	1	3	—	1	1	1	1	1	1	—	—	9		
	105·5-	—	5	7	1	1	3	1	3	4	3	5	8	3	—	1	2	—	—	21		
	109·5-	3	14	7	12	25	7	4	4	9	13	18	10	12	8	3	2	—	1	78		
	113·5-	1	30	37	17	19	15	15	5	28	19	30	22	19	14	8	6	1	1	148		
	117·5-	2	46	61	38	51	29	26	11	30	29	35	40	45	33	25	17	6	6	266		
	121·5-	6	50	70	48	64	29	21	10	33	29	35	53	46	36	30	26	16	5	307		
	125·5-	2	44	53	45	49	27	10	4	17	19	24	25	38	43	30	18	12	7	253		
	129·5-	1	19	36	27	35	16	10	4	6	8	13	25	34	25	18	18	8	4	147		
	133·5-	2	21	14	10	21	9	6	—	1	5	11	9	15	16	10	11	2	3	83		
	137·5-	1	6	15	4	8	6	3	—	4	2	3	2	4	7	15	4	—	2	43		
	141·5-	1	2	4	1	2	4	1	—	—	4	—	—	3	1	3	2	1	1	15		
	145·5-	—	2	1	—	1	—	—	—	2	1	—	—	—	—	—	—	—	1	4		
	149·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	153·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals ..	—	19	241	309	204	276	145	98	42	137	132	175	195	209	184	142	107	46	31	1,353	—	—
Means ..	125·5+	1·26	−·14	·82	·65	·90	1·06	−·49	−3·63	−3·45	−1·08	−1·81	−·44	·50	1·88	3·04	2·43	2·70	4·13	128·88	128·47	+·41
Twice P.E.	±	2·39	·84	·69	·74	·82	·86	1·04	1·62	·89	·90	·78	·76	·73	·77	·87	1·00	1·58	1·67	±·36	±·27	±·18
Sexual offences.	101·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	105·5-	—	—	—	1	1	1	—	—	2	—	—	—	—	—	—	—	—	—	3		
	109·5-	1	3	1	2	4	1	3	—	3	2	2	—	4	—	2	—	—	—	15		
	113·5-	5	8	2	2	6	2	2	1	4	2	3	3	6	4	1	2	2	—	27		
	117·5-	5	5	3	7	6	1	4	—	2	2	3	7	4	5	5	2	1	—	31		
	121·5-	6	13	6	11	6	7	2	—	3	7	5	6	9	10	4	3	4	2	53		
	125·5-	2	4	5	3	9	3	3	1	—	6	1	8	3	7	5	5	1	—	30		
	129·5-	3	3	3	3	8	2	1	1	—	—	1	4	4	4	2	6	2	2	24		
	133·5-	2	3	2	—	2	1	—	—	—	—	1	1	2	—	2	1	2	1	11		
	137·5-	—	2	2	—	3	—	—	—	1	—	—	3	1	—	2	1	—	—	7		
	141·5-	2	—	—	—	—	—	—	1	—	—	—	—	1	2	—	—	—	—	3		
	145·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	149·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	153·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals ..	—	26	41	28	29	45	18	15	4	16	20	17	28	34	33	23	19	13	6	204	—	—
Means ..	125·5+	·92	−·39	2·31	−1·66	1·34	−·44	−2·70	6·00	−6·75	−1·90	−2·93	1·38	·50	1·50	1·74	3·37	2·00	5·60	128·74	128·75	−·01
Twice P.E.	±	2·04	1·92	2·04	1·98	1·55	2·45	2·69	6·30	2·60	2·32	2·52	2·04	1·78	1·64	2·17	2·38	3·00	4·06	±·73	±·70	±·67
	101·5-	—	—	—	—	—	1	—	1	—	—	—	—	2	—	—	—	—	—	2		
	105·5-	—	2	2	—	1	1	2	—	1	1	1	2	—	2	1	—	—	—	9		
	109·5-	—	10	10	2	1	1	6	2	4	2	6	5	7	3	3	—	1	1	32		
	113·5-	3	8	10	6	10	1	5	—	3	6	6	6	9	7	3	2	2	1	43		
	117·5-	4	23	13	11	19	7	4	1	6	6	11	13	19	11	4	9	3	1	82		
	121·5-	2	17	12	12	16	7	3	1	4	5	11	12	10	13	8	5	2	—	70		
	125·5-	—	16	9	6	13	2	2	—	3	4	3	3	4	8	12	4	4	2	47		
	129·5-	1	14	6	4	7	2	—	2	1	2	2	5	6	4	7	2	3	6	33		
	133·5-	2	6	4	1	6	3	—	1	1	1	2	1	3	2	3	5	2	1	21		
	137·5-	—	1	1	—	1	2	—	—	—	—	1	—	1	—	1	2	—	—	5		
	141·5-	—	1	2	1	1	1	—	—	—	—	—	—	1	3	1	—	—	1	6		
	145·5-	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	1	1	—	2		
	149·5-	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1		
	153·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals ..	—	12	99	71	45	74	28	21	8	23	26	42	48	62	53	43	30	18	13	358	—	—
Means ..	123·5+	−·87	−·28	−1·13	−·18	·54	1·00	−0·67	−2·30	−3·48	−2·46	−2·48	−2·17	−2·19	−·34	1·95	3·20	2·67	4·93	122·90	123·89	−·99
Twice P.E.	±	3·00	1·04	1·24	1·55	1·21	1·96	2·27	3·86	2·17	2·04	1·60	1·60	1·32	1·43	1·56	1·90	3·45	2·88	±·55	±·53	±·49
Offences against the currency.	101·5-	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1		
	105·5-	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	1		
	109·5-	—	—	—	1	1	1	—	1	2	1	—	—	1	—	—	—	—	—	4		
	113·5-	—	1	—	1	1	—	1	—	1	1	1	—	—	1	—	—	—	—	4		
	117·5-	—	—	2	2	4	—	1	3	1	3	—	3	1	3	1	1	—	—	12		
	121·5-	—	2	1	—	6	3	2	—	1	5	1	—	1	—	2	3	—	1	14		
	125·5-	—	1	1	1	2	—	3	—	1	—	2	1	2	—	—	1	—	1	8		
	129·5-	—	1	3	1	3	—	1	1	1	—	2	1	2	1	1	1	1	—	10		
	133·5-	—	—	1	—	1	1	—	—	—	—	—	—	—	2	—	1	—	—	3		
	137·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	141·5-	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	1		
	145·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	149·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	153·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals ..	—	—	5	9	6	19	5	9	5	7	10	7	6	7	7	4	7	1	2	58	—	—
Means ..	125·5+	—	·70	1·33	−2·07	1·47	·00	−·70	−3·20	−3·43	−3·20	5·14	5·33	1·14	1·71	1·00	2·86	6·00	2·00	123·57	123·23	+·34
Twice P.E.	±	—	4·65	3·46	4·25	2·38	4·65	3·46	4·65	3·93	3·20	3·93	4·25	3·93	3·93	5·20	3·93	10·38	7·34	±1·36	±1·31	±1·19
Forgery and fraud.	101·5-	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	1		
	105·5-	—	—	1	2	2	1	2	—	1	1	—	4	—	1	1	—	—	1	9		
	109·5-	—	2	—	1	5	1	3	—	3	—	—	1	2	—	4	1	—	1	12		
	113·5-	—	2	4	6	9	1	5	1	—	1	—	6	5	4	5	5	1	—	27		
	117·5-	—	4	7	7	11	5	5	2	4	2	3	7	6	7	6	4	1	2	41		
	121·5-	—	4	6	6	24	16	7	3	2	4	3	6	4	8	11	9	10	8	64		
	125·5-	—	1	5	6	14	6	5	4	1	2	3	3	9	9	7	6	1	6	46		
	129·5-	—	6	3	6	12	7	6	3	—	—	3	2	6	10	7	1	7	10	45		
	133·5-	—	—	2	1	7	6	2	1	—	2	—	1	1	2	1	4	3	5	19		
	137·5-	—	—	2	1	1	1	1	1	—	—	—	—	1	—	1	—	5	—	7		
	141·5-	—	1	—	—	—	2	—	—	—	—	—	—	—	—	1	1	—	1	3		
	145·5-	—	1	1	1	1	—	—	—	—	—	—	—	—	—	1	1	—	2	4		
	149·5-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	153·5-	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1		
Totals ..	—	—	21	31	38	87	47	39	16	11	12	12	29	34	41	44	31	28	37	279	—	—
Means ..	125·5+	—	1·90	[illegible]	1·67	·99	2·00	−·71	3·00	−5·82	·00	2·00	−3·86	−·12	1·56	·73	1·66	5·86	6·05	124·86	124·86	·00
Twice P.E.	±	—	2·27	[illegible]	1·69	1·11	1·98	1·66	2·60	3·13	3·00	3·00	1·86	1·78	1·62	1·67	1·87	1·96	1·71	±·62	±·60	±·56

Correlation ratio of facial length and crime at given age and stature 0·085 ± ·014.

Table 7.—Facial Breadths.

Frequencies in all Criminals irrespective of Crime.

mm.	Of age in years. 15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
114·5–	—	1	3	—	—	—	—	—	—	1	—	—	—	—
118·5–	—	4	3	1	—	—	—	2	—	—	—	1	—	—
122·5–	7	11	10	5	2	1	1	1	—	1	—	—	2	—
126·5–	9	53	35	34	20	21	10	3	4	4	4	1	—	1
130·5–	13	110	91	58	49	34	19	13	10	17	5	3	—	—
134·5–	16	117	134	96	91	63	36	31	16	27	10	5	—	1
138·5–	11	98	121	84	68	75	40	27	16	32	12	7	3	1
142·5–	2	37	54	41	43	25	28	24	14	30	9	3	1	2
146·5–	3	8	6	15	16	11	10	9	3	9	3	—	—	—
150·5–	—	3	5	1	4	3	—	2	3	1	2	—	—	—
154·5–	—	—	—	—	1	1	—	—	—	—	—	—	—	—
Totals ...	61	442	462	335	294	234	144	112	66	122	45	20	6	5
Means 136·5 +	−1·84	−·56	·42	·84	1·70		2·56		2·91		2·11			
Twice P.E. ±	·98	·36	·35	·42	·33		·48		·55		·87			

mm.	Of stature in inches. 48-	54-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-	Irrespective of age or stature.
114·5–	—	—	—	—	—	—	—	1	—	—	2	—	—	—	—	1	1	—	—	—	—	—	—	5
118·5–	—	—	1	—	—	—	1	1	—	1	3	1	1	—	1	—	—	1	—	—	—	—	—	11
122·5–	—	—	—	—	1	—	—	4	5	4	8	4	6	4	2	2	1	—	—	—	—	—	—	41
126·5–	—	—	—	—	1	—	8	5	19	29	23	28	31	20	18	11	3	2	1	—	—	—	—	199
130·5–	—	1	1	1	1	—	4	14	31	49	53	69	57	44	36	35	15	7	4	—	—	—	—	422
134·5–	1	—	—	—	1	1	3	21	26	61	83	70	109	93	61	54	29	17	5	5	2	1	—	643
138·5–	—	—	—	—	—	2	5	7	22	42	58	80	83	100	78	58	37	11	6	4	1	—	1	595
142·5–	—	—	—	—	—	—	—	5	7	20	29	48	52	48	51	25	14	8	2	1	2	1	—	313
146·5–	—	—	—	—	—	—	—	1	2	2	6	5	18	13	14	14	7	6	2	1	2	—	—	93
150·5–	—	—	—	—	—	—	—	—	—	—	1	3	4	5	5	2	1	3	—	—	—	—	—	24
154·5–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	2
Totals ...	1	1	2	1	4	3	21	59	112	208	266	308	361	327	267	202	109	55	20	11	7	2	1	2,348
Means 136·5 +					−1·90					−·67	−·11	·81	1·29	1·95	2·47	1·78	2·42			3·13				1·01
Twice P.E. ±					·53					·53	·47	·43	·41	·42	·47	·54	·73			·78				·16

Mean facial breadth 137·51 ± ·08 mm. Standard deviation 5·64 mm.

Correlation coefficient with age ·193 ± ·013. Correlation coefficient with stature ·232 ± ·013.

Prediction formula in mm. 137·51 + ·085 (age in years − 36·235) + ·502 (stature in inches − 65·445).

Frequencies in Criminals distinguished as to Crime.

Crime.	mm.	Of age in years. 15-	20-	25-	30-	35-	45-	55-	65-	Of stature in inches. 48-	62-	63-	64-	65-	66-	67-	68-	69-	70-	Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted facial breadth.
Malicious damage to property.	114·5–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	118·5–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	122·5–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	126·5–	—	3	—	3	2	1	—	1	1	2	—	—	3	1	2	1	—	—	10		
	130·5–	1	5	4	3	4	3	1	—	7	1	3	3	4	1	1	—	—	1	21		
	134·5–	3	4	6	4	7	3	2	—	2	2	5	3	6	3	2	1	2	4	29		
	138·5–	—	3	4	2	10	4	1	—	—	2	4	3	2	3	4	3	2	1	24		
	142·5–	—	1	2	—	2	2	2	—	—	1	1	1	1	2	1	1	—	1	9		
	146·5–	—	—	—	1	2	—	—	—	—	—	—	—	—	—	1	2	—	—	3		
	150·5–	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1		
	154·5–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	4	16	17	13	27	13	6	1	10	8	13	10	15	10	11	8	4	8	97	—	—
Means	136·5+	−1·00	−1·50	1·88	−1·23	1·78	·92	3·67	−8·00	−3·00	−·50	·92	·30	−1·00	2·00	1·95	[illegible]	[illegible]	[illegible]	137·08	137·88	−·44
Twice P.E. ..	±	3·80	1·90	1·84	2·11	1·46	2·11	3·10	7·50	2·40	3·00	2·11	2·40	1·36	2·40	2·29	[illegible]	[illegible]	[illegible]	± ·77	± ·74	± ·72

Frequencies in Criminals distinguished as to Crime—continued.

[illegible]	[illegible]

Correlation ratio of facial breadth and crime at given age and stature ... ... 0·046 ± ·014.

Table 8.—Facial Indices.

Frequencies in all Criminals irrespective of Crime.

%	Of age in years. 15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
84·95–	—	1	—	—	—	—	—	—	—	—	—	—	—	—
88·95–	—	1	2	1	—	—	—	—	—	2	—	—	—	—
92·95–	1	5	7	1	2	—	1	1	1	—	—	—	—	—
96·95–	7	20	35	15	16	14	8	9	—	3	2	—	1	—
100·95–	10	66	48	41	36	27	19	11	5	7	3	2	—	—
104·95–	13	96	97	72	60	54	24	16	11	20	8	5	1	1
108·95–	12	106	95	69	63	55	39	26	11	22	11	3	1	—
112·95–	8	72	87	72	57	41	19	21	16	24	6	3	2	—
116·95–	5	44	50	36	25	21	18	17	8	21	7	4	1	3
120·95–	4	19	24	19	26	10	9	5	9	13	2	1	—	—
124·95–	—	9	13	8	6	10	4	4	2	4	2	—	—	1
128·95–	1	3	3	1	3	1	2	1	—	5	3	1	—	—
132·95–	—	—	1	—	—	—	1	1	2	1	1	1	—	—
136·95–	—	—	—	—	—	1	—	—	1	—	—	—	—	—
140·95–	—	—	—	—	—	—	—	—	—	—	—	—	—	—
144·95–	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals ...	61	442	462	335	294	234	144	112	66	122	45	20	6	5
M'ns 110·95 +	–1·51	–·46	–·03	·36	·39		·81		3·40		3·16			
Twice P.E. ±	1·25	·47	·46	·54	·43		·61		·71		1·12			

%	Of stature in inches. 48-	51-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-	Irrespective of age or stature.
84·95–	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
88·95–	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	1	1	1	1	—	—	—	—	6
92·95–	—	—	—	—	—	—	—	2	—	2	3	2	2	1	1	4	2	—	—	—	—	—	—	19
96·95–	—	—	—	—	—	—	1	2	5	15	12	12	23	21	19	7	4	5	2	2	—	—	—	130
100·95–	—	—	1	—	—	—	5	3	9	23	27	28	36	40	39	33	16	11	—	3	1	—	—	275
104·95–	—	—	—	—	—	—	2	13	26	42	54	60	67	72	51	42	30	10	3	3	2	1	—	478
108·95–	—	—	—	—	3	—	6	11	23	39	50	70	72	80	53	52	26	14	8	2	3	—	1	513
112·95–	—	1	1	—	—	—	2	9	24	43	57	55	71	47	57	33	14	7	4	1	1	1	—	423
116·95–	—	—	—	—	—	1	—	11	14	28	31	41	45	30	24	19	10	5	1	—	—	—	—	260
120·95–	—	—	—	1	1	1	3	5	8	8	24	16	28	23	13	4	5	—	1	—	—	—	—	141
124·95–	1	—	—	—	—	—	—	2	2	5	7	16	12	6	7	3	1	1	—	—	—	—	—	63
128·95–	—	—	—	—	—	1	1	—	—	2	1	5	3	7	1	2	—	1	—	—	—	—	—	24
132·95–	—	—	—	—	—	—	—	1	—	1	—	2	1	—	1	2	—	—	—	—	—	—	—	8
136·95–	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
140·95–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
144·95–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals ...	1	1	2	1	4	3	21	59	112	208	266	308	361	327	267	202	109	55	20	11	7	2	1	2,348
M'ns 110·95 +					1·45					·35	1·02	1·57	1·16	·20	–·18	–·65	–1·25			–2·00				·47
Twice P.E. ±					·69					·68	·60	·56	·52	·54	·60	·69	·94			1·00				·20

Mean facial index 111·42 ± ·10· Standard deviation 7·26.

Correlation coefficient with age ·142 ± ·014· Correlation coefficient with stature – ·114 ± ·014·

Prediction formula 111·42 + ·077 (age in years – 36·235) – ·304 (stature in inches – 65·445).

Frequencies in Criminals distinguished as to Crime.

Crime.	%	Of age in years. 15-	20-	25-	30-	35-	45-	55-	65-	Of stature in inches. 48-	62-	63-	64-	65-	66-	67-	68-	69-	70-	Irrespective of age or stature.	Predicted from mean age and stature of criminal group.	Excess of actual over predicted facial index.
Malicious damage to property.	84·95–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	88·95–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	92·95–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	96·95–	—	—	—	—	2	2	—	—	—	1	—	—	1	1	1	—	—	—	4		
	100·95–	—	2	1	1	4	1	—	—	2	—	—	—	3	1	2	1	—	—	9		
	104·95–	1	2	1	1	4	1	1	—	1	1	1	2	1	1	1	1	1	1	11		
	108·95–	—	7	4	3	6	4	3	1	1	2	6	4	3	1	3	2	1	5	28		
	112·95–	1	2	5	5	5	—	1	—	2	2	2	—	5	1	4	1	1	1	19		
	116·95–	1	2	3	2	4	2	—	—	1	2	1	3	1	3	—	2	1	1	14		
	120·95–	—	1	2	—	1	3	1	—	1	—	3	1	1	1	—	1	—	—	8		
	124·95–	—	—	1	1	1	—	—	—	1	—	—	1	—	1	—	—	—	—	3		
	128·95–	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1		
	132·95–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	136·95–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals ..	—	4	16	17	13	27	13	6	1	10	8	13	10	15	10	11	8	4	8	97	—	—
Means ..	110·95+	7·00	·75	4·24	3·08	·30	1·23	2·00	·00	4·40	1·00	3·69	3·60	·00	3·20	–1·45	2·50	2·00	1·00	112·89	111·37	+ 1·52
Twice P.E. ..	±	4·90	2·45	2·38	2·72	1·89	2·72	4·00	9·81	3·10	3·46	2·72	3·10	2·53	3·10	2·96	3·46	4·90	3·46	±1·00	± ·98	± ·96

The three characters (1) *auricular nasal radius*, which measures the shortest distance between the ear and the root of the nose, (2) *auricular alveolar radius*, which measures the shortest distance between the ear and the most prominent portion of the upper jaw, and (3) *gnathic index*, which measures the extent to which the upper jaw projects in front of the root of the nose—these three have been separated from other characters in Group I, for the purely artificial reason that the results of the statistical reduction of these measurements are presented, as we have just explained. on a slightly different plan. The number of records dealt with is the same as before; and there is no material change in statistical treatment of the records, or in the nature of the results obtained from their analysis.

Auricular nasal radius.—The data for 2,342 convicts (Records 1 to 2,500, excluding omissions), and the results of their statistical analysis, are given in the following table No. 9.

TABLE 9.—AURICULAR-NASAL RADIUS.

Frequencies, distinguishing Crime, Age and Stature.

Mm.	Totals.	Crimes.					Ages in years.													
		D	S	R	V	F	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
96–	1	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—
99–	5	—	1	1	1	2	—	2	—	2	1	—	—	—	—	—	—	—	—	—
102–	30	2	22	—	5	1	—	13	6	4	3	2	—	—	—	2	—	—	—	—
105–	99	10	49	10	19	11	—	24	20	18	4	9	8	3	2	5	3	1	—	1
108–	211	11	112	22	47	19	9	51	44	26	28	15	9	5	5	8	8	2	1	—
111–	348	16	184	39	70	39	10	80	68	43	45	31	18	8	17	17	7	3	1	—
114–	512	26	281	41	102	62	14	99	109	83	62	43	22	18	16	31	8	4	3	1
117–	447	15	237	46	78	71	11	69	100	64	56	49	25	24	11	18	11	6	2	1
120–	356	8	186	26	72	64	10	67	57	51	49	42	36	14	7	18	5	—	—	—
123–	224	8	131	13	34	38	3	28	38	30	39	27	20	23	5	15	1	6	—	—
126–	73	3	37	3	16	14	3	9	6	14	11	10	5	6	3	5	—	—	—	—
129–	30	—	16	1	6	7	1	3	9	1	2	4	1	6	1	1	1	—	—	—
132–	5	—	3	1	—	1	—	—	1	1	2	1	—	—	—	—	—	—	—	—
144–	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals	2,342	99	1,259	203	451	330	61	446	459	337	292	233	144	107	67	120	44	21	7	3

Mm.	Totals.	Statures in inches																						
		48-	51-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68.	69-	70-	71-	72-	73-	74-	77-
96–	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
99–	5	—	—	—	—	—	—	—	—	—	—	1	—	1	2	—	1	—	—	—	—	—	—	—
102–	30	—	—	—	—	1	—	—	1	7	4	8	4	3	2	—	—	—	—	—	—	—	—	—
105–	99	1	—	1	—	—	1	2	8	6	12	14	14	9	12	6	10	—	3	—	—	—	—	—
108–	211	—	—	—	—	1	—	2	5	10	31	33	32	35	22	17	14	6	1	1	—	1	—	—
111–	348	—	1	—	—	—	—	3	16	25	36	47	42	47	47	33	30	12	5	2	1	1	—	—
114–	512	—	—	1	1	2	2	6	16	25	47	61	74	71	71	52	37	28	11	2	2	—	2	1
117–	447	—	—	—	—	—	—	3	11	19	43	42	57	83	63	53	38	17	9	8	1	—	—	—
120–	356	—	—	—	1	—	—	3	3	14	18	33	48	56	60	45	37	17	11	3	4	3	—	—
123–	224	—	—	—	—	—	—	1	—	4	14	18	28	35	33	40	19	17	9	3	2	1	—	—
126–	73	—	—	—	—	—	—	—	—	1	3	6	10	10	11	11	10	7	2	2	—	—	—	—
129–	30	—	—	—	—	—	—	—	—	—	—	2	—	6	3	7	6	3	3	—	—	—	—	—
132–	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	3	—	—	—	1	—	—
144–	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals	2,342	1	1	2	2	4	3	20	60	111	208	265	309	356	327	266	202	110	54	21	10	7	2	1

Mean auricular-nasal radius	$116{\cdot}40 \pm {\cdot}08$ mm.
Standard deviation	$5{\cdot}58$ mm.
Correlation ratio with crime	${\cdot}108 \pm {\cdot}014$.
Correlation coefficient with age	${\cdot}085 \pm {\cdot}014$.
Correlation coefficient with stature	${\cdot}239 \pm {\cdot}013$.

Predicted mean auricular-nasal radius of group of n individuals in mm. $116{\cdot}40 + {\cdot}191 \times (\text{mean age} - 36{\cdot}17 \text{ yrs.}) + {\cdot}505 \times (\text{mean stature} - 65{\cdot}45 \text{ ins.}) \pm 3{\cdot}638/\sqrt{n}$.

Criminal groups	Predicted mean auricular-nasal radius.	Actual means.	Excess of actual.	Twice prob. error.
Malicious damage to property	116·40 + ·08 + ·04	116·40 − 1·68	− 1·80	± ·73
Stealing and burglary	116·40 − ·01 − ·16	116·40 + ·03	+ ·19	± ·21
Sexual offences	116·40 − ·51 + ·01	116·40 − ·78	− ·28	± ·51
Violence to the person	116·40 − ·68 + ·00	116·40 − ·19	+ ·49	± ·34
Forgery, coining and fraud	116·40 + 1·26 + ·57	116·40 + 1·14	− ·69	± ·40

Correlation ratio of auricular-nasal radius with nature of crime, for constant age and stature, ·102±·014.

Referring to these tabulated results, we find the mean auricular nasal radius—

(1) for all criminals ... ... = 116·40 ± ·08 mm.
(2) for those convicted of malicious damage ... ... = 114·72 ± ·36 mm.
(3) for those convicted of stealing and burglary ... = 116·43 ± ·10 mm.
(4) for those convicted of sexual offences ... ... = 115·62 ± ·25 mm.
(5) for those convicted of violence ... ... = 116·21 ± ·17 mm.
(6) for those convicted of fraud, &c. ... ... = 117·54 ± ·20 mm.
and, the standard deviation (σ) for all criminals ... ... = 5·58 mm.

Inserting these values into the formula,

$$\eta = \sqrt{\frac{n_1(l_1-\bar{l})^2 + n_2(l_2-\bar{l})^2 + \ldots}{N\sigma^2}},$$

$$\text{we have } \eta = \sqrt{\frac{99\,(114{\cdot}72-116{\cdot}40)^2 + 1259\,(116{\cdot}43-116{\cdot}40)^2 + \ldots}{2342 \times (5{\cdot}58)^2}}$$

$$= {\cdot}108$$

The correlation ratio (η) of auricular nasal radius with crime is ·108: that is to say, the extent of relationship between this character in a criminal and the type of crime he commits is represented, on a scale between 0 and 1, by the fraction $\frac{1}{10}$th.

This value ·108 of the correlation ratio is independent of the different distributions of age and stature of the various sub-groups of criminals, but, as the evaluation of the figures in the above correlation tables show, the auricular nasal radius is correlated with age (coefficient ·085), and with stature (coefficient ·239). To obtain a true value, therefore, of the correlation ratio between the auricular nasal radius and crime, we must determine this ratio when our sub-groups have been reduced to a standardized age-stature basis. We must allow, as before, through the agency of the multiple regression equation, for the combined effects upon the character under investigation, due to differences in the ages and statures of the sub-groups. That is to say, we predict that, if our criminal sub-groups, when reduced to a common standard of age and stature, correspond, in so far as the auricular nasal radius is concerned, to samples taken entirely at random, the mean auricular nasal radius of each group will be equal to—

the mean radius of all criminals,
+ a correction for the mean age of the sub-group,
+ a correction for the mean stature of the sub-group;

i.e. $\lambda = 116{\cdot}40 + {\cdot}191 \times (\text{age}—36{\cdot}17 \text{ years}) + {\cdot}505 \times (\text{mean stature}—65{\cdot}45 \text{ ins.}) \pm 3{\cdot}638/\sqrt{N}.$

Putting into this formula the mean age and stature of each sub-group in turn, we obtain a series of predicted means which, contrasted with the actual means given by the data, are shown in the table at the foot of the previous page. It will be seen that, when age and stature are allowed for, the "fraud" and the "damage" groups have slightly smaller mean values of auricular nasal radius than would be expected on the assumption that they were random samples of total criminals.* For both these groups, the excess of the actual over the expected mean is appreciably greater than twice the probable error of the prediction. Entering the ratios of figures of the fourth and fifth columns into the correlation ratio formula as stated in note, p. 53, we have :—

$$_a\eta = 1{\cdot}349 \times \sqrt{\left\{\left(\frac{1{\cdot}80}{{\cdot}73}\right)^2 + \left(\frac{{\cdot}19}{{\cdot}21}\right)^2 + \left(\frac{{\cdot}28}{{\cdot}51}\right)^2 + \left(\frac{{\cdot}49}{{\cdot}34}\right)^2 + \left(\frac{{\cdot}69}{{\cdot}40}\right)^2\right\}/2342.}$$

$$= {\cdot}102.$$

Apart from age and stature, the correlation ratio of auricular nasal radius with nature of crime is ·102, and rather less than the value previously found. Upon the evidence of the value of this ratio, we conclude that there may be a small, but hardly appreciable, association, between the auricular nasal radius of a criminal and the type of crime he commits.

Auricular Alveolar Radius and Gnathic Index.—The data of 2,341 convicts, and the statistical results of their reduction, are given in tables No. 10 and No. 11.

---

* If our total criminals had been divided into five sub-groups, entirely at random, only in one case in the average would the figures in the fourth column of the above Table be greater than those in the fifth column.

Table 10.—Auricular-alveolar Radius.

Frequencies in Criminal Groups.

mm.	Totals.	Crimes. Damage to Property.	Stealing and Burglary.	Sexual Offences.	Violence to the Person.	Forgery and Fraud.
96–	1	—	1	—	—	—
99–	4	—	2	1	—	1
102–	28	—	16	2	7	3
105–	85	3	50	7	20	5
108–	216	15	109	16	40	36
111–	345	20	167	36	74	48
114–	489	24	266	45	91	63
117–	444	18	242	43	82	59
120–	371	8	197	32	73	61
123–	234	6	34	14	44	36
126–	79	3	47	8	12	9
129–	33	2	19	—	6	6
132–	8	—	4	—	2	2
135–	3	—	2	—	—	1
138–	1	—	1	—	—	—
Totals	2,341	99	1,257	204	451	330
Mean and excesses	116·64	−1·18	+·16	−·47	−·25	+·38
Twice p.e.	±	·77	·21	·53	·36	·42

Mean auricular-alveolar radius ... ... 116·64 ± ·08 mm.
Standard deviation ... ... 5·65 ± ·06 mm.
Correlation ratio with crime ... ... ·063 ± ·014
*Correlation coefficient with age ... ... ·103 ± ·014
*Correlation coefficient with stature ... ... ·052 ± ·014

Table 11.—Gnathic Index.

Frequencies in Criminal Groups.

%	Totals.	Crimes. Damage to Property.	Stealing and Burglary.	Sexual Offences.	Violence to the Person.	Forgery and Fraud.
74–	1	—	—	—	—	1
80–	2	—	—	—	1	1
86–	1	—	1	—	—	—
88–	7	—	4	1	1	1
90–	18	1	7	4	1	5
92–	67	—	32	3	13	19
94–	169	7	77	16	40	29
96–	246	8	137	15	49	37
98–	279	22	156	18	53	30
100–	947	38	511	87	173	138
102–	269	8	138	28	60	35
104–	193	8	113	16	32	24
106–	95	4	51	14	20	6
108–	28	2	19	2	4	1
110–	10	2	7	—	1	—
112–	4	—	1	—	2	1
114–	1	—	—	—	1	—
116–	1	—	1	—	—	—
120–	1	—	1	—	—	—
Totals	2,339	100	1,256	204	451	328
Mean and excesses...	100·47	+·28	+·16	+·25	−·05	−·80
Twice p.e.	±	·49	·14	·34	·23	·27

Mean gnathic index ... ... 100·47 ± ·05
Standard deviation ... ... 3·61 ± ·04
Correlation ratio with crime ... ... ·093 ± ·014
*Correlation coefficient with age ... ... −·083 ± ·014
*Correlation coefficient with stature ... ... −·042 ± ·014

* The tables are omitted.

For the auricular-alveolar radius we have :—

$\eta = \cdot 063.$

For the gnathic index :—

$\eta = \cdot 093.$

The correlation ratios of both these characters with crime are less than ·1 ; and since the regression of these characters with age and stature is so very slight (correlation coefficients range from 0·04 to ·10), no appreciable effects upon the values of the correlation ratios would result from allowing for age and stature. We conclude that criminals committing different kinds of crime are not distinguished to any appreciable extent by the projection or recession of their upper jaw.

Group II. These are the two head projections, and the length of the right and left ears. The examination of these characters was carried out upon the same individuals, and the reduction of the data concerning them has been pursued by the same method employed for the head, face and jaw measurements. But we have put these characters into a special group because, for reasons already stated, it has been necessary to allow for the influence of the personal equation of different observers. The plan adopted, in dealing with these characters, has been, accordingly, first to find values of (η)—that is to say, measures of the association of these characters with different types of crime—upon the evidence of more numerous data collected by a number of observers ; and, secondly, to repeat the whole investigation upon the evidence of fewer data collected by one observer only. In the former case, the influence of differences in the age and stature of the sub-groups is allowed for. In the latter case, the predicted means are corrected, not only for differences of age and stature, but for differences of intelligence also.

TABLE 12.—OCCIPITAL PROJECTION.

Frequencies in Criminal Groups.

mm.	Total.	Crime.				
		D	S	R	V	F
75–	1	—	—	—	—	1
78–	4	1	3	—	—	—
81–	10	1	3	2	2	2
84–	31	2	17	2	4	6
87–	26	1	13	3	5	4
90–	123	5	76	5	16	21
93–	135	7	85	7	21	15
96–	178	8	122	7	23	18
99–	318	11	178	28	71	26
102–	254	7	149	16	48	29
105–	214	14	108	20	38	25
108–	221	12	100	22	37	51
111–	226	6	109	26	51	34
114–	219	11	110	24	47	27
117–	135	4	58	18	28	22
120–	80	7	21	8	27	17
123–	42	3	20	2	14	3
126–	13	2	5	1	1	3
129–	9	2	3	—	2	2
132–	3	—	2	—	1	—
135–	1	—	—	—	1	—
Totals ...	2,341	90	1,287	205	480	330
Mean and excesses	105·69	+1·15	−1·08	+1·61	+1·39	+·30
Twice p.e.	±	1·25	·35	·67	·59	·69

	mm.
Mean occipital projection	... 105·69±·12
	mm.
Standard deviation	9·22±·09
Correlation ratio with crime ...	·129±·014
*Correlation coefft. with age ...	·066±·014
*Correlation coefft. with stature	·057±·014

TABLE 13.—OCCIPITAL PROJECTION.

Frequencies in Criminal Groups.

mm.	Total.	Crime.				
		D	S	R	V	F
72–	1	—	—	—	—	1
81–	2	—	—	—	1	1
87–	7	1	2	2	1	1
90–	5	—	1	—	2	2
93–	12	2	5	1	2	2
96–	15	1	5	1	4	4
99–	58	3	21	10	18	6
102–	61	3	27	2	16	13
105–	107	12	50	17	14	14
108–	146	9	66	17	34	20
111–	167	7	75	20	39	26
114–	177	11	65	18	57	26
117–	109	4	48	15	23	19
120–	77	6	26	6	23	16
123–	33	3	13	2	13	2
126–	9	—	3	1	3	2
129–	8	2	2	—	2	2
132–	2	—	1	—	1	—
135–	1	—	—	—	1	—
Totals ...	997	64	433	112	234	154
Mean & excesses	111·48	−·33	+·10	−·68	+·52	−·43
Twice p.e.	±	1·27	·49	·96	·67	·82

	mm.
Mean occipital projection	... 111·48±·16
	mm.
Stan. dev. of do.	7·55±·11
Correlation ratio with crime ...	·052±·021
*Cft. of correl. with age ...	·019±·021
* Do. do. with stature ...	·111±·021
* Do. do. with intelligence	−·036±·021

The occipital projection.—Table No. 12 records the data, the statistical treatment of the data, and the resulting statistical constants, of 2,341 convicts (records 1 to 2,500, collected by several observers) ; and table No. 13 gives the same information for 997 convicts (records 1 to 1,000, chronicled by one observer only). Referring to table 12

* The tables are omitted.

it will be seen that the correlation ratio with crime is ·129; and that, from the small values of the coefficients of correlation with age and stature (·06 and ·05 respectively), this correlation ratio will not be appreciably modified by allowing for the age and stature differences of the sub-groups. Thus, according to the statistics recorded in this table, there is a very small, but an appreciable, association, between occipital projection and crime. The intensity of this association is greater than ·1—is of the same order, in fact, as the relationship we found between height of head and crime. Can we find any simple explanation of this association? As we have stated, the technique adopted in obtaining the measurements of head-projection was complicated; and, moreover, it involved the co-operation of the subject, who, when being measured, had to keep his head in a fixed position. It follows, therefore, that inevitable variations in their technique will lead to disparity in the recorded values of the same measurements, made by different observers; and that, in measurements made by the same observer, there will be a similar disparity according to the intelligence of the subjects measured—it being assumed that intelligence may be correlated with capacity for effective co-operation in the measuring process. Moreover, the particular penal settlement to which a convict is sent is determined to some extent by the man's intelligence:* consequently, since crime and intelligence are correlated,† the location of a prisoner is indirectly associated with the nature of his crime; also, the records of our investigations from different prisons have in every case been made by different observers. The suggestion occurs, therefore, that possibly the estimate we have obtained from our total observations of the intensity of association between occipital projection and crime may have been augmented by accidental association between the intelligence of a convict, the crime he has committed, the prison wherein he is confined, and the personal equation of the different observers by whom he has been measured. To obtain the correct value of a correlation ratio between occipital projection and crime, the effect of these associations upon the measurements must be allowed for: that is to say, we must allow for differences in the mean intelligence of our subjects, and must limit attention to the observations recorded by one observer only.

Data of occipital projection recorded by one observer, and the results of their analysis upon the lines indicated, will be found, as already stated, in table No. 13, which accordingly differs from the preceding table No. 12 in the following points:—(1) the measurements refer to 997, instead of to 2,341 convicts; (2) a correlation table, and its resulting coefficient of occipital projection with intelligence,‡ are given in addition to the tables and coefficients with age and stature; (3) differences in the mean intelligence, as well as differences in the mean age and stature of the sub-groups, are allowed for in the regression equation; (4) the correlation ratio gives the degree of relationship between the occipital projection of criminals and the kind of crime they commit—the intensity of the association being calculated, not only upon a standardized age and and stature basis, but also for constant degree of intelligence of the sub-groups, and from data subject to only one personal equation.

It will be seen that the correlation coefficient of occipital projection with intelligence is only ·04.§ The intensity of this relation is nearly 200 per cent. less than that between occipital projection and stature (·11); but, as shown by the regression equation, correcting for differences of intelligence in the sub-groups produces a greater modification in the predicted mean of occipital projection than is produced by correcting for differences in stature. The reason for this is that the criminal sub-groups differ more widely in their average intelligence than in their average stature (*see* Appendix, Table 185).

* The population at Parkhurst prison—where our records 1 to 1,000 were obtained by one observer—is very heterogeneous compared with that at other stations. Parkhurst is the station for the weak-minded, the epileptic, the insane, the tubercular, the diseased generally; there is also a large population of star-class convicts at Parkhurst; and all the Jews are located there.

† The correlation ratio of type of crime committed with the intelligence of the perpetrators is ·45. *See* App., Table 185. The relatively high value of this association should be carefully borne in mind. It emphasises the importance of eliminating, as we shall frequently have to do, effects due to intelligence, before interpreting any character apparently associated with crime, as a criminal characteristic, *i.e.*, as a character organically associated with criminal proclivity.

‡ This correlation coefficient, obtained by the fourfold table method, involves the assumptions of a normal distribution of intelligence in any random population, and the linearity of its regression with associated variables. The justification for these assumptions is given in Part 2, Chap. IV., p. 250. *See* also Part 2, Chap. VII., p. 341 *et seq.*, with regard to the fourfold table.

§ The value of the coefficient is obviously much less than we had anticipated it might be. In fact, the coefficients of correlation of occipital projection with age, stature, and intelligence, are all of them so small, that it would generally not be worth while to correct a mean value of occipital projection for the age, stature, and intelligence, of samples. We make the correction here in order to keep the investigation of each character as uniform as possible.

The combined effects of age, stature, and intelligence, upon the occipital projection, are given by the regression equation presented in the middle of page 76. Since this is the first time we have allowed for the influence of three known characters upon any measurement, and because we shall frequently be repeating this operation, it is necessary to explain at length how this equation has been reached. We start upon the principle, already explained, that, in contrasted populations, whose characters are being measured in units equal to their standard deviation, the amount of difference between the means of any one character will determine 'r' times this amount of difference between the means of any other associated character. For instance, if 'r' equals the correlation coefficient of occipital projection with age, the differences between the mean ages of any two samples, expressed in terms of the standard deviation of age, will determine 'r' times this amount of difference between the mean occipital projection of these two samples, expressed in terms of the standard deviation of occipital projection. Expressed symbolically, this principle is given by the regression equation :—

$$x = \bar{x} + r_{xa} \frac{\sigma_x}{\sigma_a} (a - \bar{a})$$

where (x and a) are the associated variables, occipital projection and age, and ($\sigma_x\ \sigma_a$) are their respective standard deviations. This formula gives us the effect upon occipital projection (x) of differences in one associated variable (a). In the present inquiry, we want to trace the combined effect upon the mean occipital projection of total criminals, due to differences in three associated variables—age (a), stature (s), and intelligence (i). The formula, extended to these requirements, becomes :—

$$x = \bar{x} + {}_{si}\rho_{xa} \frac{{}_{si}\sigma_x}{{}_{si}\sigma_a} (a - \bar{a}) + {}_{ai}\rho_{xs} \frac{{}_{ai}\sigma_x}{{}_{ai}\sigma_s} (s - \bar{s}) + {}_{as}\rho_{xi} \frac{{}_{as}\sigma_x}{{}_{as}\sigma_i} (i - \bar{i})$$

where (x) = the modified mean of occipital projection and is equal to :—

($\bar{x}$) *i.e.* the original mean of occipital projection for total criminals,
\+ a modification due to a change in their mean age,
\+ a modification due to a change in their mean stature,
\+ a modification due to a change in their mean intelligence : the values of the modifications* depending mainly upon the partial correlation coefficients of occipital projection (x), with its associated variables a, s, and i. Thus ;

(1) the modification due to change of mean age depends upon (${}_{si}\rho_{xa}$), which is the coefficient of occipital projection with age for constant stature and intelligence ;

(2) the modification due to change of mean stature depends upon (${}_{ai}\rho_{xs}$), which is the coefficient of occipital projection with stature for constant age and intelligence ;

(3) the modification due to change of mean intelligence depends upon (${}_{as}\rho_{xi}$), which is the coefficient of occipital projection with intelligence for constant age and stature.

First, then, we obtain from the data, and enter into the general formula, the respective values of the three correction coefficients $\left({}_{si}\rho_{xa} \times \frac{{}_{si}\sigma_x}{{}_{si}\sigma_a}\ \&c.\right)$ for age, stature, and intelligence. These values depend upon the inter-correlations of the four quantities—occipital projection ; age ; stature ; intelligence—which yield the following series of correlation coefficients :—

—	Age.	Stature.	Intelligence.	Occipital Projection.
Age	1	−·019	·131	·019
Stature	−·019	1	·129	·111
Intelligence	·131	·129	1	−·036
Occipital projection ...	·019	·111	−·036	1

* That is to say, omitting effects due to $\frac{{}_{si}\sigma_x}{{}_{si}\sigma_a}$, &c., which represent the restriction in the standard deviation of occipital projection for constant age, stature, and intelligence.

These coefficients give the following determinant Δ :—

$$\begin{array}{cccc} 1 & -\cdot019 & \cdot131 & \cdot019 \\ -\cdot019 & 1 & \cdot129 & \cdot111 \\ \cdot131 & \cdot129 & 1 & -\cdot036 \\ \cdot019 & \cdot111 & -\cdot036 & 1 \end{array}$$

leading to :—

$$-\Delta_{41} = \cdot027, \ -\Delta_{42} = \cdot114, \ -\Delta_{43} = -\cdot053, \ -\Delta_{44} = \cdot966, \ \Delta = \cdot957$$

from which

$$-\frac{\Delta_{41}}{\Delta_{44}} = \cdot028, \ -\frac{\Delta_{42}}{\Delta_{44}} = \cdot118, \ -\frac{\Delta_{43}}{\Delta_{44}} = -\cdot055$$

and thus the regression equation of occipital projection upon age (a), stature (s), and intelligence (i), which is,

$$x = \bar{x} - \frac{\Delta_{41}}{\Delta_{44}} \sigma_x \frac{a - \bar{a}}{\sigma_c} - \frac{\Delta_{42}}{\Delta_{44}} \sigma_x \frac{s - \bar{s}}{\sigma_s} - \frac{\Delta_{43}}{\Delta_{44}} \sigma_x \frac{i - \bar{i}}{\Delta_i} \pm \cdot67449 \sqrt{\frac{\Delta}{\Delta_{44}}} \sigma_x$$

becomes :—

$$x = \bar{x} + \cdot028\, \sigma_x \frac{a - \bar{a}}{\sigma_c} + \cdot118\, \sigma_x \frac{s - \bar{s}}{\sigma_s} + \cdot055\, \sigma_x \frac{i - \bar{i}}{\sigma_c} \pm \cdot67449 \times \cdot9953\, \sigma_x$$

The standard deviations of occipital projection, age, stature, and intelligence (σ_x, σ_a, σ_s and σ_i) are 7·55, 14·19, 2·73 and 1·22 respectively ; and, entering their values, the equation becomes :—

$$x = \bar{x} + \frac{\cdot028 \times 7\cdot5510}{14\cdot1870} (a - \bar{a}) + \frac{\cdot118 \times 7\cdot5510}{2\cdot7315} (s - \bar{s}) + \frac{\cdot055 \times 7\cdot5510}{1\cdot2240}$$
$$(i - \bar{i}) \pm \cdot67449 \times 7\cdot5155$$

And finally, entering the values of the mean occipital projection, the mean age, the mean stature, and the mean intelligence, for total criminals, into the formula, we have :

$$x = 111\cdot4795 + \cdot0149\,(a - 37\cdot2945) + \cdot3262\,(s - 65\cdot3954) - \cdot3393$$
$$(i - \cdot759) \pm 5\cdot0692\ ;$$

which is the regression equation, obtained from the data of total criminals, of occipital projection (x), upon age (a), stature (s), and intelligence (i) ; from which the mean occipital projection (x) for each criminal sub-group can be predicted, on the assumption that these sub-groups are random samples of total criminals.

The mean age, stature, and intelligence, for each of the criminal sub-groups, are recorded in Appendix, Table 185 ; and when these values are entered into the formula, we obtain the series of predicted means* which, recorded side by side, and contrasted with the actual means given by the data, are presented in Table 13. It will be seen from this table that, having regard to twice the probable error of the prediction, in no case is there any significant difference between the actual and expected means. That is to say, the figures in the 'excess' row are, for every sub-group, less than the figures in the adjacent row, which records the value of twice the probable errors.

The value of ${}_{asi}\eta_{xc}$, or the correlation ratio of occipital projection with crime, for constant age, stature, and intelligence, is obtained, as before, by entering the ratios of figures from the two rows, Table 13, into the correlation ratio formula ;

whence we obtain : ${}_{asi}\eta_{xc} = \cdot052$

The value of the relation between occipital projection and crime, previously obtained from observations gathered by several observers, was ·13. Eliminating much of the personal error in the data by confining attention to observations of one individual only, we find the value diminishes to ·05. This is the extent, upon the evidence of statistics that have been subjected to only one personal equation, to which criminals, committing different types of crime, are distinguished by differences in the projection of the back parts of their head. The amount of difference is little more than none at all : and we conclude that there is no appreciable relation between the kind of crime a criminal commits and the projection of the back of his head.

* That is to say, the means to be expected, on the assumption that crime is not associated with occipital projection ; and that, consequently, with regard to this character, our sub-groups of criminals are random samples of total criminals.

and, in Tables 18 and 19, will be found the corresponding statistics and results of measurements of the left ear. An examination of the figures in these tables will make it sufficiently clear that, when reduced to a standardized basis of age, stature, and intelligence, and when the influence of personal error upon the measurements has been, as far as possible, eliminated, there is no appreciable relation between ear length and criminal proclivity; that is to say, the amount of relation is inappreciable in so far as differences in the nature of crime are in any way a measure of difference in such proclivity.

TABLE 16.—LENGTH OF RIGHT EAR.

Frequencies in Criminal Groups.

mm.	Total.	Crime. D	S	R	V	F
50–	6	3	1	—	2	—
52–	13	1	6	2	2	2
54–	53	2	32	6	12	1
56–	96	6	47	8	28	7
58–	196	14	90	20	57	15
60–	324	11	185	33	59	36
62–	368	16	198	37	76	41
64–	406	15	209	39	83	60
66–	273	10	166	16	49	32
68–	232	9	121	18	39	45
70–	199	5	102	13	28	51
72–	103	3	59	8	12	21
74–	40	2	21	1	6	10
76–	14	—	10	1	—	3
78–	8	—	5	1	—	2
80–	6	—	5	—	—	1
88–	1	—	—	—	—	1
Totals	2,338	97	1,257	203	453	328
Mean and excesses	64·31	−1·37	+·13	−·75	−1·02	+1·77
Twice p.e.	±	±·62	·17	·43	·29	·34

Mean length of right ear	64·31 ± ·07 mm.
Standard deviation of right ear	4·88 ± ·10 mm.
Correlation ratio with crime	·160 ± ·013
Coefficient of correlation with age	·376 ± ·012
Coefficient of correlation with stature ...	·202 ± ·013

TABLE 17.—LENGTH OF RIGHT EAR.

Frequencies with Age, Stature, and Intelligence.

AB = weak-minded and imbecile. C = unintelligent. D = intelligent.

m.m.	Totals.	Crimes. D	S	R	V	F	Ages in years. 15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–
50–	7	3	1	—	3	—	—	4	1	1	—	1	—	—	—	—	—	—	—	—
52–	12	1	6	2	2	1	1	2	4	1	3	1	—	—	—	—	—	—	—	—
54–	30	1	16	4	7	2	2	10	8	3	2	3	2	—	—	—	—	—	—	—
56–	63	5	29	5	17	7	—	15	14	12	10	6	1	1	—	2	2	—	—	—
58–	117	12	48	11	37	9	7	26	29	19	20	8	2	4	1	—	1	—	—	—
60–	166	8	83	19	34	22	8	47	30	24	25	10	7	6	2	6	1	—	—	—
62–	180	11	78	20	40	31	2	37	34	36	23	15	10	3	5	12	2	1	—	—
64–	150	7	67	23	38	15	1	22	32	17	23	16	6	9	8	11	3	1	1	—
66–	89	7	38	8	20	16	1	15	15	13	8	10	6	4	4	8	3	1	—	1
68–	84	5	30	8	18	23	—	8	6	10	14	15	4	5	4	7	4	4	2	1
70–	56	2	22	5	12	15	1	2	4	3	5	5	9	2	4	10	6	3	2	—
72–	21	—	8	4	5	4	—	—	2	2	—	2	1	2	3	2	3	2	—	2
74–	12	2	3	1	1	5	—	—	1	—	2	—	3	1	—	2	1	1	1	—
76–	7	—	3	1	—	3	—	—	—	—	—	—	—	—	2	2	2	1	—	—
78–	2	—	—	1	—	1	—	—	—	—	—	—	—	1	—	1	—	—	—	—
80–	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals	997	64	433	112	234	154	23	188	180	141	135	92	51	38	33	63	28	14	7	4

TABLE 17—*continued.*

mm.	Totals.	Statures in inches.																						Intelligence.		
		49-	54-	55-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-	AB	C	D
50—	7	—	—	—	—	—	—	1	—	1	1	1	1	1	—	1	—	—	—	—	—	—	—	2	1	4
52—	12	1	—	—	—	—	—	—	2	2	—	1	2	2	1	1	—	1	—	—	—	—	—	4	5	3
54—	30	—	—	—	—	—	2	1	3	5	5	2	4	2	3	2	1	1	—	—	—	—	—	3	11	16
56—	63	—	1	—	—	—	2	1	3	10	11	12	5	6	5	5	1	1	—	—	—	—	—	16	26	21
58—	117	—	—	—	1	—	1	6	8	18	14	14	21	13	7	7	4	1	—	1	1	—	—	42	30	45
60—	166	—	—	—	—	—	3	4	6	12	31	27	23	18	19	18	9	1	1	—	—	—	—	53	53	60
62—	180	—	—	1	—	—	2	4	14	12	25	22	24	31	15	14	9	5	1	—	—	1	—	48	57	75
64—	150	—	—	—	—	2	1	3	6	7	16	15	28	31	20	13	7	1	—	—	—	—	—	43	52	55
66—	89	—	—	—	—	—	—	1	1	6	8	8	16	17	13	7	4	5	1	—	1	—	1	25	32	32
68—	84	—	—	—	—	—	—	3	4	4	4	18	5	9	7	12	8	7	2	—	1	1	—	18	27	39
70—	56	—	—	—	—	—	1	—	1	3	5	6	10	12	7	7	—	3	—	1	—	—	—	8	19	29
72—	21	—	—	—	—	—	—	—	2	2	3	2	4	3	1	3	—	—	1	—	—	—	—	3	7	11
74—	12	—	—	—	—	—	—	—	—	—	1	2	1	1	2	2	1	—	—	—	—	—	—	2	6	4
76—	7	—	—	—	—	—	—	—	1	—	2	—	1	—	—	1	1	1	—	—	—	—	—	1	1	5
78—	2	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	2
80—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Totals	997	1	1	1	1	2	13	23	51	82	126	130	145	146	100	89	45	36	6	4	3	2	1	268	327	402

Mean length of right ear ... ... 62·99 ± ·10 mm.
Standard deviation of right ear ... ... 4·81 ± ·07 mm.
Correlation ratio with nature of crime ... ... ·176 ± ·021
Coefficient of correlation with age ... ... ·448 ± ·017
Coefficient of correlation with stature ... ... ·234 ± ·020
Coefficient of correlation with intelligence (grouping AB, CD) + ·103 ± ·021

Predicted mean length of right ear in random sample of n : 62·99 + ·152 (mean age − 37·29) + ·424 (mean stature − 65·40) + ·047 (mean intelligence − ·759) ± 2·788/$\sqrt{n}$ mm.

Measures in the Criminal Groups.

—	Corrections upon the mean for			Predicted mean.	Actual mean.	Excess.	Twice p.e. ±
	Age.	Stature.	Intelligence.				
Damage to property	−·17	+·16	−·06	62·93	61·94	−·99	·70
Stealing and burglary	−·04	−·15	−·01	62·79	62·70	−·10	·27
Sexual offences	−·38	−·07	−·01	62·54	63·25	+·71	·53
Violence to the person	−·54	−·02	+·01	62·42	62·47	+·05	·36
Forgery and fraud	+1·27	+·43	+·05	64·74	64·85	+·11	·45

Correlation ratio of length of right ear with nature of crime for constant age, stature, and intelligence ... ... ·099 ± ·021

TABLE 18.—LENGTH OF LEFT EAR.—*Frequencies in Criminal Groups.*

mm.	Total.	Crime.				
		D	S	R	V	F
50-	5	2	2	—	1	—
52-	28	2	16	2	7	1
54-	56	4	29	3	17	3
56-	122	8	54	15	35	10
58-	189	14	88	20	50	17
60-	357	16	185	39	82	35
62-	335	6	185	30	67	47
64-	390	21	210	34	67	58
66-	275	10	159	17	49	40
68-	237	8	127	22	41	39
70-	174	6	92	12	24	40
72-	87	1	53	5	5	23
74-	58	1	36	2	7	12
76-	17	—	13	1	—	3
78-	6	—	4	1	—	1
80-	5	—	4	—	—	1
Totals	2,341	99	1,257	203	452	330
Mean and excesses	64·08	−1·70	+·31	−·71	−1·33	+1·60
Twice p.e.	±	·62	·17	·43	·29	·34

Mean length of left ear ... ... 54·08 ± ·07 mm.
Standard deviation of left ear ... ... 5·00 ± ·10 mm.
Correlation ratio with crime ... ... ·192 ± ·013
Coefficient of correlation with age ... ... ·367 ± ·012
Coefficient of correlation with stature ... ·194 ± ·013

Table 19.—Length of Left Ear.

Frequencies with Age, Stature, and Intelligence.

AB = weak-minded and imbecile. C = unintelligent. D = intelligent.

mm.	Totals.	Crimes. D	S	R	V	F	Ages in years. 15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
50-	4	2	2	—	—	—	—	1	1	1	—	1	—	—	—	—	—	—	—	—
52-	18	2	7	2	6	1	1	5	5	3	3	1	—	—	—	—	—	—	—	—
54-	40	3	20	2	14	1	2	11	12	5	5	2	2	1	—	—	—	—	—	—
56-	80	5	31	11	24	9	2	23	17	16	11	5	1	—	2	3	—	—	—	—
58-	118	12	54	13	27	12	4	26	25	22	20	10	4	4	1	1	1	—	—	—
60-	202	11	93	24	50	24	9	49	36	30	32	15	9	7	2	10	2	1	—	—
62-	150	6	68	15	33	28	1	30	33	25	17	12	8	2	6	11	3	1	—	1
64-	142	9	66	16	30	21	2	21	28	15	17	23	6	8	7	8	5	1	—	1
66-	96	7	39	10	24	16	1	16	14	12	15	8	8	8	2	7	2	2	1	—
68-	72	5	26	8	16	17	1	6	6	9	11	11	6	2	6	5	4	2	1	2
70-	46	1	18	5	7	15	—	—	2	2	3	5	4	2	4	10	7	4	3	—
72-	15	—	6	3	2	4	—	—	—	2	1	—	1	1	3	3	2	2	—	—
74-	6	1	1	—	1	3	—	—	—	—	—	—	2	2	—	2	—	—	—	—
76-	6	—	2	1	—	3	—	—	—	—	—	—	—	—	1	1	2	1	1	—
78-	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
80-	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
Totals	997	64	433	112	234	154	23	188	179	142	135	93	51	37	34	62	28	14	7	4

mm.	Totals.	Statures in inches. 48-	54-	55-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	75-	Intelligence. AB	C	D
50-	4	—	—	—	—	—	—	1	—	1	—	1	1	—	—	—	—	—	—	—	—	—	—	3	—	1
52-	18	1	—	—	—	—	—	—	3	4	1	1	4	1	1	2	—	—	—	—	—	—	—	4	6	8
54-	40	—	—	—	—	—	3	—	1	6	9	6	4	2	2	3	2	2	—	—	—	—	—	6	16	18
56-	80	—	1	—	—	—	1	2	6	12	9	11	10	11	8	7	1	1	—	—	—	—	—	18	31	31
58-	118	—	—	—	1	—	3	5	7	17	21	10	21	12	8	4	6	1	—	1	1	—	—	38	35	45
60-	202	—	—	—	—	2	2	6	8	17	28	33	26	28	20	19	11	1	1	—	—	—	—	65	60	77
62-	150	—	—	1	—	—	1	4	11	7	21	20	19	30	14	12	7	2	—	—	—	1	—	42	52	56
64-	142	—	—	—	—	—	1	2	7	6	19	17	28	24	14	12	6	4	1	—	—	—	1	40	44	58
66-	96	—	—	—	—	—	—	1	2	4	6	11	12	19	13	9	7	7	3	—	1	1	—	30	30	36
68-	72	—	—	—	—	—	—	2	4	3	6	11	7	8	8	12	5	3	1	1	1	—	—	15	30	27
70-	46	—	—	—	—	—	1	—	—	3	5	5	7	8	8	4	1	1	1	2	—	—	—	5	15	26
72-	15	—	—	—	—	—	—	—	—	2	—	2	4	3	2	2	—	—	—	—	—	—	—	2	4	9
74-	6	—	—	—	—	—	—	—	1	—	—	1	—	—	1	2	1	—	—	—	—	—	—	—	3	3
76-	6	—	—	—	—	—	—	—	1	—	1	1	1	—	—	1	—	1	—	—	—	—	—	—	1	5
78-	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
80-	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Totals	997	1	1	1	1	2	12	23	51	82	126	130	145	146	100	89	47	23	7	4	3	2	1	268	327	402

Mean length of left ear ... ... 62·40 ± ·10 mm.
Standard deviation of left ear ... ... 4·69 ± ·07 mm.
Correlation ratio with nature of crime ... ... ·189 ± ·021
Coefficient of correlation with age ... ... +·452 ± ·017
Coefficient of correlation with stature ... ... +·229 ± ·020
Coefficient of correlation with intelligence (grouping AB, CD) +·110 ± ·021

Predicted mean length of left ear in random sample of n: 62·40 + ·150 (mean age − 37·29) + ·403 (mean stature − 65·40) + ·080 (mean intelligence − ·759) $\pm 2{\cdot}717/\sqrt{n}$ mm.

Measures in the Criminal Groups.

	Correlations upon the mean for Age.	Stature.	Intelligence.	Predicted mean.	Actual mean.	Excess.	Twice p.e. ±
Damage to property	−·17	+·16	−·10	62·29	61·37	−·92	·68
Stealing and burglary	−·04	−·14	−·01	62·21	62·14	−·07	·26
Sexual offences	−·36	−·07	−·02	61·96	62·82	+·86	·51
Violence to the person	−·53	−·02	+·01	61·86	61·71	−·14	·35
Forgery and fraud	+1·25	+·41	+·09	64·15	64·30	+·16	·44

Correlation ratio of length of left ear with nature of crime for constant age, stature, and intelligence ... ... ·111 ± ·021

Distance between Eyes.—The correlations of distance between eyes (*see* Table 20) with age and with intelligence are so small that differences between the sub-groups, in the distribution of the two latter characters, would have no appreciable effect upon the measurements of the former character; and, consequently, we have not made allowance for differences in either age or intelligence in determining the relationship (η) of distance between eyes with crime. Of the different criminal groups, prisoners convicted of wilful damage to property have eyes set closer together, and those convicted of violence to the person have eyes set farther apart, than have criminals generally. Considered, however, in relation to the probable errors, the differences are barely significant; and from the value of (η), less than ·1, we can only conclude that different orders of criminals are not distinguishable by the set of their eyes.

TABLE 20.—DISTANCE BETWEEN EYES.

Frequencies with Crime, Age, and Intelligence.

m.m.	Totals.	Crime.					Age.														Intelligence.			
		D.	S.	X.	V.	F.	16-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	Weak-minded.	Unintelligent.	Fairly intelligent.	Intelligent.
97-	1	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
100-	2	—	2	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	1	1	—
103-	10	2	5	—	1	2	—	1	2	3	1	—	1	—	—	1	1	—	—	—	5	1	1	3
106-	36	3	16	3	5	9	—	6	7	9	2	2	1	1	—	1	6	—	1	—	10	9	9	8
109-	76	5	30	10	17	14	2	11	17	11	9	7	6	5	2	2	1	2	—	1	15	17	19	25
112-	121	9	56	11	25	20	3	16	29	16	20	8	11	3	5	2	4	3	1	—	22	28	34	37
115-	98	10	46	12	18	12	—	17	18	15	12	13	2	5	2	5	4	4	—	—	25	22	29	22
118-	86	5	29	11	20	21	—	18	17	13	10	9	9	6	4	1	3	—	1	—	13	15	29	29
121-	53	2	26	3	16	6	—	7	10	7	9	2	9	2	2	3	1	—	—	—	7	18	11	16
124-	13	1	4	—	4	4	—	2	4	3	2	—	1	—	1	—	1	—	—	—	1	4	5	4
127-	3	—	2	—	—	1	—	—	—	—	1	1	1	—	—	—	—	—	—	—	—	—	1	2
	499	37	217	50	106	89	5	78	104	79	66	42	41	22	17	15	21	10	3	1	98	115	139	147

Mean distance between eyes...	114·83±·15 mm.	Correlation ratio with nature of crime	·089±·030
Standard deviation of ditto	4·92±·10 mm.	Coefficient of correlation with age	−·025±·030
		Coefficient of correlation with intelligence (grouping WU : IF)	·057±·030

Measures in the Criminal Groups.

—	Mean.	Excess.	2 p.e.
Damage to property	114·05	−·78	1·09
Stealing and burglary	114·63	−·20	·45
Sexual offences	114·62	−·21	·94
Violence to the person	115·60	·77	·64
Forgery and fraud	114·85	·02	·70

Group III.

So far, we have been dealing with graduated characters which, having been measured upon a finely divided scale, have presented no difficulty in the calculating of means, standard deviations, &c., nor in the measuring of their coefficients of correlation, (r), with other graduated characters, nor in the calculating of their degrees of association, (η), with the categoric variate "crime."* We have now, however, to calculate the constants and measure the relations of characters which, although they be graduated variables essentially, *i.e.* are distributed in nature on a graduated scale—have not been, in this investigation, precisely measured. For instance, in our schedule, we have described the quality of lips within three divisions, as either thick, medium, or thin; the quality of eyebrows as either concurrent or non-concurrent: whereas the actually existing qualities of lips and eyebrows are those of extremes of thickness, and concurrency, merging into their opposite extremes by insensible gradations. When dealing statistically with the graduated characters in our schedule, thus roughly described within alternative or triple categories, we have been confronted with the following problem. How, from the numbers recorded within the categories, are we to calculate the constants of the whole series—the mean thickness of lips, the standard deviation of concurrency of eyebrows, &c.; and how,

* Variables such as crime, occupation, &c., which, theoretically, cannot be graduated, (*i.e.*, those changing conditions and characters in which there exists no progressively changing quantitative relation between their multiple categories), are called categoric variates, to distinguish them from graduated variables, such as age and stature.

from the relative values of the means and standard deviations within the criminal sub-groups, are we to measure the value of (η)—the association between thickness of lips, concurrency of eyebrows, &c. and crime ?

In Biometrika, Vol. VII., p. 250, Professor Pearson describes a new method of determining correlation, when one variable is given by alternative or triple, and the other by multiple, categories. This is the method adopted in dealing with those of the remaining characters recorded in our schedule, which, although described within alternative or triple categories, it would nevertheless be reasonable to suppose are continuous variables. In other words, we have employed this method for the statistical reduction of data relating to those characters where we may assume that the categories employed for their description are not qualitatively separable from each other, but correspond to rough groupings on a scale which, in reality, is progressively continuous. The validity of our employing this method depends upon the assumption, whose truth is beyond question, that practically all the graduated human anatomical characters we have examined have a distribution sufficiently approximating to the normal, or Gaussian, type, to justify the calculating of their means, and other constants, by aid of tables of the probability integral ; these tables consisting of a compilation of the exhaustively studied general properties of all normal distributions.

In illustration of the method, we will take a modified form of Appendix Table 185, which gives statistics of stature—a graduated variable—distributed into series of quantitative groupings, within each of the independent sub-divisions of the categoric variate, "crime." If the 997 convicts, instead of being distributed with regard to their stature, as in Appendix Table 185, upon a scale of inches, are broadly classified into two groups of tall and short, these statistics of stature and crime might be represented as follows :—

—	Total.	Damage.	Stealing.	Sexual.	Violence.	Fraud.
Short (48 to 63 inches)	722	42	338	82	168	92
Tall (64 to 77 inches)	275	22	95	30	66	62
Totals	997	64	433	112	234	154

Let us suppose that the information given in this modified table is all we possess, and that from it we want to compare the mean statures of the criminal sub-groups, and to express the result as a correlation ratio (η) ; thus giving in one fraction, on a scale between 0 and 1, the extent of relationship between stature and crime. As shown on p. 47, the correlation ratio (η) is the ratio of the deviation of the means of sub-samples to the standard deviation of the whole population. When dealing with statistics of stature, such as those in Appendix Table 185, distributed upon a graduated scale of inches, the means and standard deviations are calculated in inches by ordinary arithmetical processes. But from the data in the above table, the various mean amounts of stature cannot be expressed in units of this kind : all that can be done is to express these mean values in terms of (*i.e.*, as a ratio of) the standard deviation of stature. However, expressed thus, in standard deviation units, the relative differences between the means are as clearly defined as if they were expressed in units of one inch ; and from them the value of η can be calculated, as Pearson proves in his description of the special method referred to, from the formula :

$$\eta = \left[\frac{\frac{1}{N}\left\{n_1\left(\frac{x_1}{\sigma_1}\right)^2 + n_2\left(\frac{x_2}{\sigma_2}\right)^2 + \ldots\right\} - \left(\frac{\bar{x}}{\sigma_x}\right)^2}{1 + \frac{1}{N}\left\{n_1\left(\frac{x_1}{\sigma_1}\right)^2 + n_2\left(\frac{x_2}{\sigma_2}\right)^2 + \ldots\right\}}\right]^{\frac{1}{2}}$$

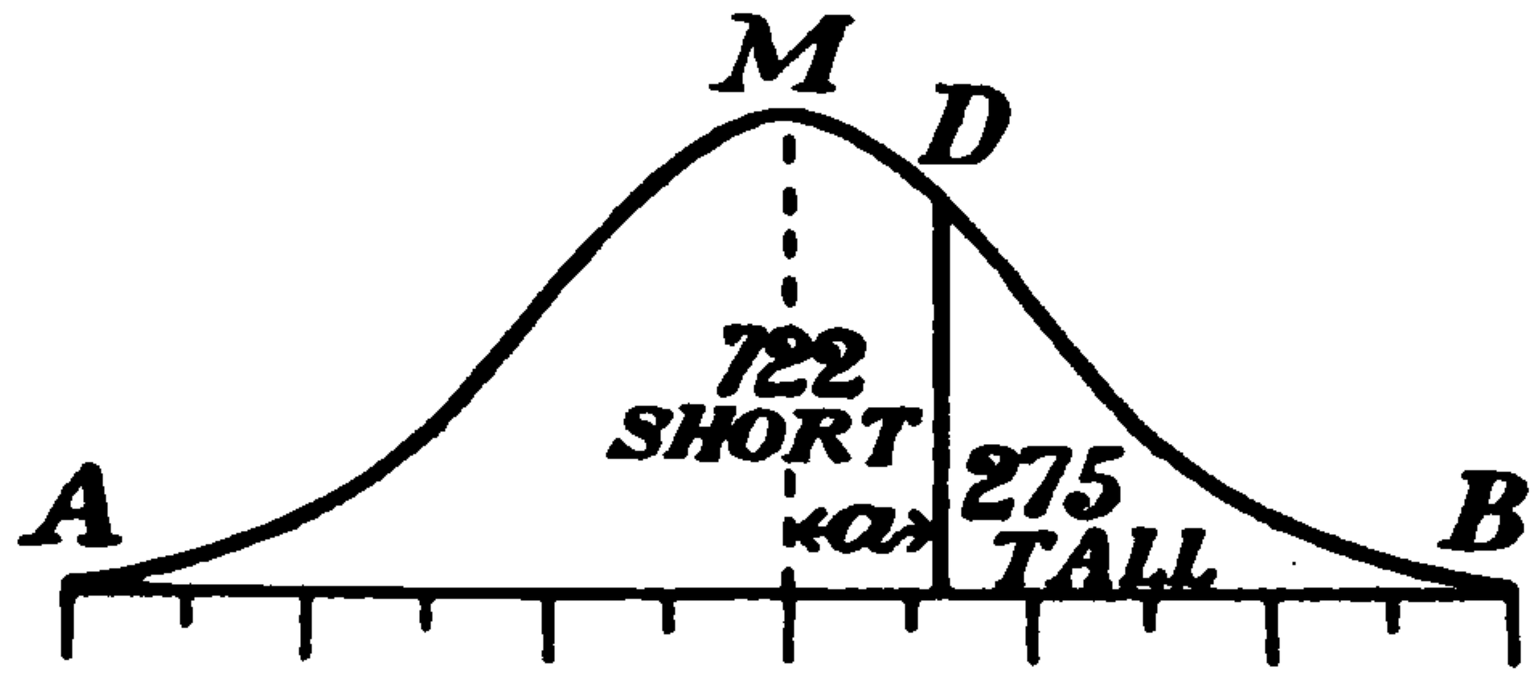
where N = the total population, and n_1, n_2, &c. = the number of individuals in the various arrays or sub-groups of the population ; and where $\frac{x_1}{\sigma_1}$, $\frac{x_2}{\sigma_2}$, &c., are the means of the sub-groups, and $\frac{x}{\sigma_x}$ is the mean of the total group, expressed in terms of their particular standard deviations.

From the figures in the above table, then, we have to calculate the mean stature of total criminals, and the mean of each of the sub-groups, in terms of their standard deviations. Assuming stature to have an approximately normal distribution, these values may be obtained by aid of Sheppard's Probability Tables,* wherein are recorded the general relation between the constants of all normal distributions, on the one hand, and the proportional frequency of any part of the distribution, on the other. Referring to the

* Published in Biometrika, Vol. I.

table above, we see that out of a total of 997 convicts, 275 are tall, and 722 are short. Assuming the normal distribution of stature. these statistics are described by the following diagram :—

Fig. iv.



AMDB is a normal curve, representing, by its total area, the distribution of stature amongst 997 convicts. This area is divided into two parts by the dividing line D, the segment of area on the right of this line representing the contingent of 275 individuals described as tall, the area of the left-hand segment being equal to the 722 individuals described as short. The scale along the axis is divided into standard deviation units, set off at equal intervals to the right and left of the mean, M, which = 0 : the scale-length of this unit being determined from the general property of all normal distributions, which is, that 68 per cent. of the total number of individuals in any normal series (*i.e.* an area = 68 per cent. of the total curve), will be distributed within a range, on either side of the mean, equal to the standard deviation of the series. Now, the dividing line D marks a fixed point on the scale, which is the same for each criminal sub-group—that is to say, within each group, individuals over a definitely stated height (in the present case, all those over 64 inches), are described as tall, and those below this mark as short. Consequently, as the proportion of tall to short individuals in the whole distribution varies, or, in other words, as the area on the right of the dividing line increases, or decreases, relatively to the area on the left of the line, it is obvious that the mean of the distribution —provided the standard deviation remains unchanged—will similarly increase or decrease in value ; or, which amounts to the same thing, the distance—marked (a) in the above diagram—between the mean and the fixed dividing line will vary in an opposite direction. Now, a characteristic of all normal or Gaussian distributions is that the mean of the series—expressed as the distance between the mean and any dividing line—is invariably related to the segment of area cut off from the whole distribution by this dividing line. The value of the latter, in fact, determines the value of the former ; so that when one of the values is known, the other can be ascertained by consulting tables of the probability integral already referred to. Consulting these tables, we find that for our 997 convicts, 275 of whom are described as tall, the value of mean stature in standard deviation units is ·596 : that is to say, the mean of the distribution of stature amongst total criminals is ·596, or three-fifths of the standard deviation of stature, less than 67 inches : which is the degree of stature we have arbitrarily selected for distinguishing tall and short. Similarly, for the 64 individuals within the "damage" sub-group of convicts, of whom the proportion of tall to short is 22 to 42, we find that the mean of stature is at a distance of ·402 standard deviation units from the same line of demarcation, or, compared with the mean of total criminals, is nearer to 67 inches by nearly one-fifth of the standard deviation of stature. Finally, from the relative proportions of tall and short within the remaining sub-groups, we find by the probability tables that the mean stature of the "stealing" group is ·774, of the "sexual offenders" is ·619, of the "violence group" is ·577, and of the sub-group of criminals convicted of fraudulence is ·247 standard deviation units from the mark on the stature scale (67 inches) dividing short from tall. We thus see that the distance between the mean stature and the fixed point on the scale (67 inches) decreases : which is to say that the degree of mean stature gradually increases, as we pass from the "stealing" to the "sexual," "violence," "damage," and "fraudulent" groups, in order. Moreover, it will be seen, by comparing the respective figures, that the relative differences in mean stature, expressed in standard deviation units, between the sub-groups, are of precisely the same magnitudes as those recorded, in Appendix Table 185, in units of one inch. And by applying the formula given above we have :—

$$\eta^2 = \frac{\frac{1}{997}\left\{64\times(\cdot402)^2+433(\cdot774)^2+\ \ldots\ \right\}-(\cdot596)^2}{1+\frac{1}{997}\left\{64(\cdot402)^2+433(\cdot774)^2+\ \ldots\ \right\}} = \frac{\cdot4012-\cdot3547}{1\cdot4012}$$

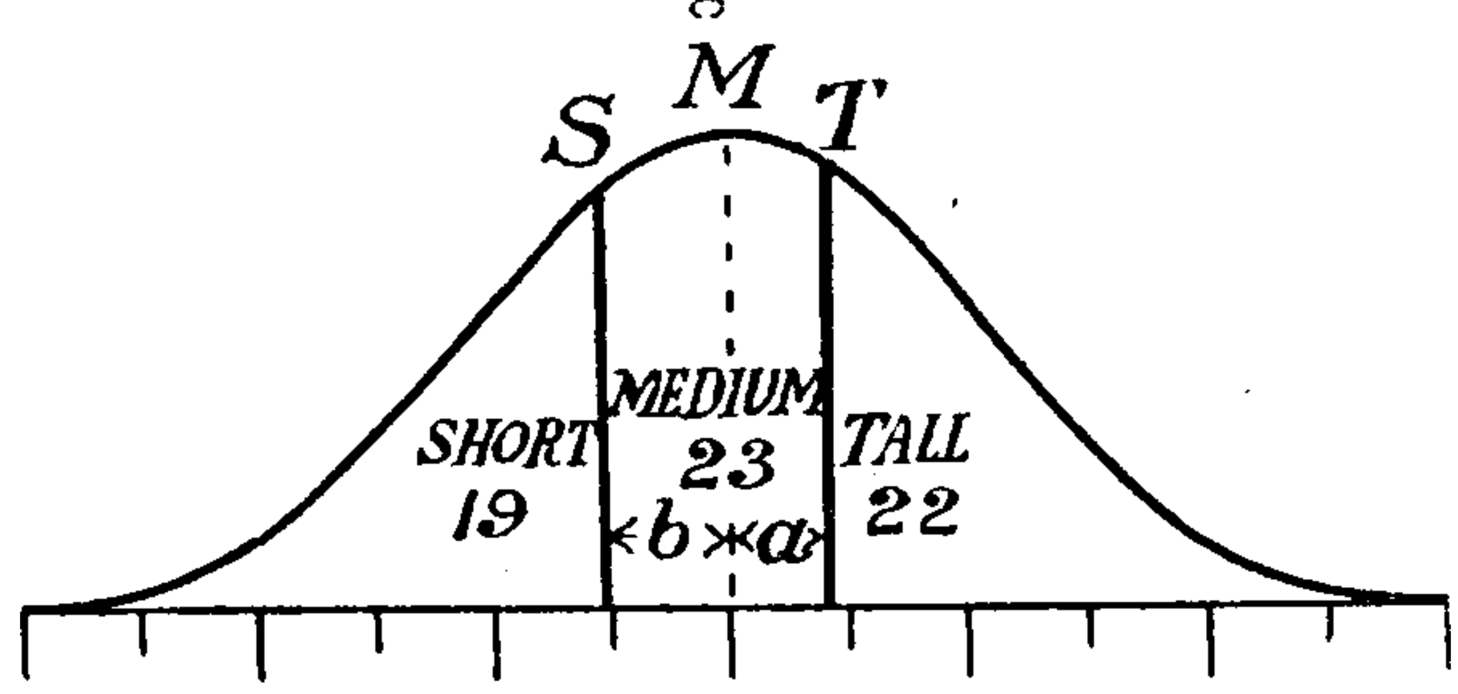
and $\eta = \cdot182$: which, again, is almost the same value as that (·172) given by the more elaborate determination of η from the figures in Appendix Table 185.

It is important to emphasize the fact that the value of the above correlation ratio is based upon two assumptions: (1) that the character under investigation is sufficiently Gaussian in distribution to justify the use of probability tables for calculating the means—an assumption whose validity for human anatomical characters is beyond question; and (2) that the sub-groups are sufficiently homo-scedastic (*i.e.* are uniformly variable over a definite range) to permit of our taking the standard deviation of the sub-groups as equal, in the mean, to the standard deviation of the total group reduced to an extent given by the fraction $\sqrt{1-\eta^2}$. This latter assumption, however, is no longer necessary if, instead of being described in alternative categories, the character under investigation is grouped within three classes—when the standard deviation of the character for each sub-group can be directly calculated from the data. In illustration, we will again take Appendix Table 185, but, this time, with stature grouped within three classes, as follows:—

—	Total.	Damage.	Stealing.	Sexual.	Violence.	Fraud.
Short (under 64 inches) ...	300	19	146	36	72	27
Medium (64 to 67 inches) ...	422	23	192	46	96	65
Tall (over 67 inches)	275	22	95	30	66	62
Total... ...	997	64	433	112	234	154

To measure the relationship (of stature) with crime, from these data, the only assumption necessary is that the distribution of stature, within each of the sub-groups, is sufficiently Gaussian to justify the use of probability tables, in calculating the various means. For instance, to consider first the 'damage' group, whose distribution of stature may be illustrated as follows:—

Fig. v.



— using Sheppard's Tables, we find that the distance (a) of the mean (M) from the boundary of tall and medium (T) = ·4022 standard deviation units, and that the distance (b) of the mean (M) from the boundary of short and medium (S) = ·5334 standard deviation units. It follows, therefore, that the distance ($a+b$) between the two boundaries (S and T), or the range of medium stature, expressed in terms of standard deviation units, = ·4022 + ·5334 = ·9356. Now, this range is of course fixed, is one and the same, for all the sub-groups; in the present instance, as given in the above table, the range of medium stature for all cases extends between 64 and 67 inches.* This range, therefore, we may take as our fixed unit in place of the standard deviation of stature, which may differ within the different sub-groups. Since, then, the range of medium stature, in terms of the standard deviation of stature = ·9356, it follows that the standard deviation of stature, in terms of the middle range as unit, $= \frac{1}{\cdot 9356} = 1{\cdot}0688$. And again, since the distance of the mean from the boundary between tall and medium = ·4022 standard deviation units, and from the boundary between short and medium = ·5334 standard deviation units, it also follows that the values of these means—in terms, not of the standard deviation, but of the range of medium stature, taken as unity—equals ·4022 x 1·0688 and ·5334 x 1·0688, or ·4299 and ·5701, respectively. Assuming, then, the normal distribution of the data within each of the sub-groups in the above table, and in each case expressing the mean (x) and standard deviation (σ) in terms of the range of medium stature taken as unity, and measuring the former from the boundary between short and medium, we get, by using Sheppard's Tables, the following values:—

—	Damage.	Stealing.	Sexual.	Violence.	Fraud.
Numbers	64	433	112	234	154
Means	·5701	·3517	·4284	·4656	·7909
Standard deviations	1·0687	·8373	·9233	·9269	·8473

* Any differences in the values of $a+b$ between the sub-groups is due to differences between their standard deviations. As the standard deviation becomes smaller, a fixed distance will be measured by an increasing number of standard deviation units.

follow. The data, constants, and general results of the analysis, are given in the series of tables, Nos. 21 to 35—the contents of each table being arranged upon the same plan as the one adopted heretofore for the Group II. series of measurements. The raw statistics of each of these thirteen characters will be found in the schedule records 1 to 1,000; which records, being collected by one observer, are subject to the influence of only one personal equation.

Concurrency of Eyebrows.—We wish to discover, from statistics of eyebrows described within alternative categories as either concurrent, or non-concurrent, whether different kinds of criminals are distinguished by the degree to which they possess this character. The method we employ for investigating the statistics is the one we have just sketched in outline, and which is fully described by Pearson in Biometrika, Vol. VII. Although eyebrows are colloquially described as either concurrent or non-concurrent, we start from the assumption that, anatomically, concurrency of eyebrows is a continuous variate; and that, in any large series of individuals, a wide separation between eyebrows will be found to merge insensibly into their complete union: the distribution of the whole series following the normal or Gaussian type. Also, in the absence of information as to the relative values of the standard deviations of the arrays, we are compelled to premise that differences between the criminal sub-groups in this respect are negligible. That is to say, if $\sigma =$ the standard deviation of total criminals, we assume the mean value $\sqrt{1-\eta^2}\,\sigma$ to be the standard deviation for each array.* (*See* pp. 35 and 84.)

Assuming, then, the normal distribution of the data, we proceed to measure, for each array in standard deviation units, the distance of the means from the fixed point on the scale which divides the 'concurrent' category from the 'non-concurrent.' For the first array or 'damage' sub-group, for instance, we see from Table 21 that, out of the 64 cases observed, 24, or 37·5 per cent. are recorded as concurrent. It follows that the mean value of concurrency for this group will be somewhere amongst the grades we have classed as 'non-concurrent'; and, by consulting Sheppard's Tables, we find that the exact position of the mean is ·319 standard deviation units from the line dividing the two categories from each other. In like manner, we find that the means of the 'stealing,' 'sexual,' 'violence' and 'fraudulence' arrays, in order, are ·585, ·170, ·618, and ·880 standard deviation units from the same fixed point of measurement. Finally, taking the average of these means, properly weighted, of course, by the respective number of individuals in each array, we obtain ·575 as the mean distance of concurrency for total criminals, and find by subtraction that the deviations from this value of each of the sub-group means are, respectively, − ·256, + ·011, − ·404, + ·043 and + ·305. Accordingly:—

$$\eta^2=\frac{1}{996}\left\{64\,(\cdot256)^2+437\,(\cdot011)^2+111\,(\cdot404)^2+231\,(\cdot043)^2+153\,(\cdot305)^2\right\}\times(1-\eta^2)$$

$$=\frac{\cdot0372}{1\cdot0372}=\cdot0359$$

and

$$\eta=\cdot189$$

TABLE 21.—CORRELATION OF EYEBROWS, CONCURRENT, NON-CONCURRENT, WITH NATURE OF CRIME.

Frequencies, distinguishing Crime, Age, and Intelligence.

—	Totals.	Crimes. D	S	R	V	F	Ages in years. 15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	Intelligence. Weak-minded.	Not weak-minded
Concurrent	711	24	122	48	62	29	10	74	63	44	42	14	12	3	4	9	6	2	1	1	82	203
Non-concurrent.	285	40	315	63	169	124	14	115	111	98	95	79	38	35	30	53	22	12	6	3	186	525
	996	64	437	111	231	153	24	189	174	142	137	93	50	38	34	62	28	14	7	4	268	728

Mean distance of eyebrows from limits of concurrency, in terms of standard deviation of distance as unit ... ... $\cdot564 \pm \cdot021$

Correlation ratio with crime ... ... $\cdot189 \pm \cdot021$

Coefficient of correlation with age ... ... $\cdot226 \pm \cdot020$

Coefficient of correlation with intelligence ... ... $\cdot047 \pm \cdot021$

Predicted mean distance of eyebrows in a group of n individuals, in terms of s. d. as unit, correcting for age only: $\cdot564 + \cdot016$ (mean age $-37\cdot29$ years) $\pm \cdot637/\sqrt{n}$.

* This is the only character in the group for which this assumption has to be made. All the other characters being grouped in three classes, the actual value of the standard deviation of each array can be directly calculated from the data.

Measures in Criminal Groups.

—	Predicted mean eyebrow distance.			Actual mean eyebrow distance.	Excess over predicted.	Twice p.e. of prediction.
	Mean of all.	+Correction for age.	=Predicted.			
Damage to property	·564	− ·018	·546	·313	− ·233	± ·164
Stealing and burglary ...	·564	− ·004	·560	·575	·015	± ·063
Sexual offences	·564	− ·038	·526	·167	− ·359	± ·125
Violence to the person ...	·564	− ·057	·507	·606	·099	± ·087
Forgery and fraud	·564	+ ·133	·697	·863	·166	± ·107

Correlation ratio of distance between Eyebrows with Nature of Crime, at constant age ... ... $\cdot164 \pm \cdot021$.

This value, ·189, is the crude correlation ratio of concurrency with crime. It will be seen, however, in Table 21, that this quality is also correlated with age (coefficient ·226), and, as shown in Appendix Table 185, between the criminal sub-groups, there are marked differences in age distribution. We must accordingly correct the value, ·189, for the effect upon our observations due to these age differences. This we do, as before, through the medium of the regression formula, which gives the corrected mean distance of eyebrows for random samples as equal to $\cdot564 + \cdot016$ (mean age $- 37\cdot29$) $\pm \cdot637\sqrt{n}$: from which equation the corrected values recorded in Table 21 are determined ;* and, through these values, the correlation ratio of distance between eyebrows with nature of crime, at constant age, is found to be 164. On the face value of the statistics, there is a slight degree of relationship between the crime a criminal commits and the set of his eyebrows —sexual and damage offenders being marked by a greater degree of concurrency, and fraudulent offenders by a greater average in the opposite direction, than would be expected on the theory that our criminal sub-groups were random samples of total criminals. These differences, if existent, are of course very trifling ; and the correlation ratio of ·16 has no practical significance, even if it might be taken as representing an actually existing degree of organic relationship.

The rather large correlation coefficient, ·226, found between distance of eyebrow and age, requires explaining, because the relation this coefficient measures is the extent to which eyebrows tend to become more separated with increasing years, whereas the verdict of common experience is certainly that eyebrows tend to become thicker, bushier, and more concurrent with the growth of years. A likely explanation may be that, possibly, inaccuracies have crept into the data, due to the fact that slight degrees of concurrency would be more easily overlooked with light-coloured eyebrows, or with those turning grey, than they would be with those of a darker shade ; and that, consequently, owing to error of judgment, the non-concurrent would tend to be recorded in a greater relative proportion with the increasing greyness of age. We have no data of the colour of eyebrows, but there cannot fail to be a high correlation between this and colour of hair, for which we have statistics. Accordingly, we have analysed the frequencies of lightness of hair with eyebrow distance and with age, the tabulated data and their results being as follows :—

TABLE 22.

—	Totals.	Eyebrows.		Age in years.													
		Concurrent.	Non-concurrent.	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
Hair light ...	509	120	389	10	64	74	59	60	46	34	28	29	60	22	14	6	3
Hair dark ...	481	169	312	12	124	106	82	75	47	16	10	3	2	2	—	1	—
Totals ...	—	—	—	22	188	180	141	135	93	50	38	32	62	24	14	7	3

Coefficient of correlation of distance of eyebrows with lightness of hair ... $\cdot209 \pm \cdot021$

" " lightness of hair with age ... ... $\cdot475 \pm \cdot017$

Partial coefficient of correlation of eyebrow-distance with age, apart from effects of lightness of hair ... ... $\cdot147 \pm \cdot021$

* It must be observed that the series of actual eyebrow distances recorded in Table 21 are equal to the values given above in the text, multiplied in each case by ·982 which equals $\sqrt{1-\eta^2}$, as the amount of restriction, for the standard deviation of the arrays, of the standard deviation of total criminals.

It will be seen that the eyebrows of lighter-coloured and grey-haired people do show, according to our records, a less tendency towards concurrency than do those of the darker-haired, and that the correlation coefficient measuring the degree of the tendency is ·209. The value of this coefficient confirms the suspicion, described above, of personal error in our eyebrow records. At any rate, it confirms a simple explanation of an anomalous conclusion, difficult to account for otherwise, and which is again strengthened by the partial correlation coefficient of eyebrow-distance with age, apart from effects due to lightness of hair, namely ·147, which is a considerable reduction from the value, ·226, previously obtained.

The question arises whether the correlation of eyebrow-distance with crime is also likely to be reduced to a figure lower than ·160, if lightness of hair be regarded. As shown on p. 97, the correlation of lightness of hair with crime is ·23, or, practically, the same value as the correlation of this character with age. Correcting for age reduced the correlation ratio (η), of eyebrow-distance with crime, from ·189 to ·164. We may assume that, if the error associated with the observation of light-coloured eyebrows were also allowed for, this value would again be reduced to probably ·14 or ·15.

Eyesight.—The statistics of this character, with the results of their analysis, are presented in Table 23. It will be seen that over 50 per cent. of the individuals tested had, what is technically described as "*normal*" eyesight—that is to say, all of them were able to read, at a distance of 6 metres, block type of size 10 mm. × 10 m.m., and of thickness 2 mm. All of these 50 per cent. of normals, therefore, are included in the one category, $\frac{6}{6}$; although the remaining 50 per cent. of defectives were distributed in gradually diminishing frequency within the seven categories, $\frac{6}{9}$ to $\frac{6}{60}$, or nil. But "normal" vision is not the ungraduated entity it would appear to be from this classification; there being, in fact, a physiological variability of normal vision of much the same extent as that of defective vision. It may, therefore, be safely assumed that if the vision of the 50 per cent. of individuals grouped within the $\frac{6}{6}$ categoryhad been more rigorously tested, they would have been differentiated upon a scale of increasing acuteness of vision (say $\frac{6}{5}$ to $\frac{6}{1}$), in a series of diminishing frequencies corresponding more or less closely to the series differentiated upon the defective scale, $\frac{6}{9}$ to $\frac{6}{60}$. Upon these grounds, therefore, we classify our statistics of eyesight within the three grades good, fair, and indifferent—assuming, for the statistical analysis of the material, that the physiological scale of eyesight is one which gives a normal distribution of the frequencies within these three grades.

Table 23.—Correlation of Eyesight with Nature of Crime.

G = good eyesight, measured by ability to read, at distance of 6 metres, block type of size 10 mm. × 10 mm. and thickness 2 mm. ($\frac{6}{6}$).

F = fair eyesight, measured by inability to read above, but ability to read at same distance, block type of size 20 mm. × 20 mm. and thickness 4 mm. ($\frac{6}{9}$ or $\frac{6}{12}$).

I = indifferent eyesight, defined as inability to read all above ($\frac{6}{18}$, $\frac{6}{24}$, $\frac{6}{36}$, $\frac{6}{60}$, or nil).

Frequencies with Crime, Age, and Intelligence.

Eyesight.	Totals.	Crimes.					Ages in Years.														Intelligence.		
		D.	S.	R.	V.	F.	15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–	Weak-minded.	Unintelligent.	Intelligent.
Good ...	589	36	247	70	154	82	18	145	118	101	83	52	25	12	10	17	4	4	—	—	150	198	241
Fair .	193	12	91	22	39	29	2	29	28	19	31	21	14	12	9	14	9	3	1	1	58	60	75
Indifferent ...	214	16	99	19	38	42	4	15	28	22	23	20	11	14	15	31	15	7	6	3	60	71	83
Totals ...	996	64	437	111	231	153	24	189	174	142	137	93	50	38	34	62	28	14	7	4	268	329	399

Mean eyesight is "good" and, in a scale in which "fair" may range from 0 to 1, is... ... ... 1·41 ± ·038

Standard deviation of eyesight in same measure ... ... 1·80 ± ·027

Standard deviations of eyesight in criminal groups in order... 1·93, 1·71, 1·63, 1·83, 1·96

Correlation ratio with crime ... ... ·127 ± ·021

Coefficient of correlation of "good" sight with age ... ... − ·464 ± ·017

Coefficient of correlation of "good" sight with "intelligence" ... ... ·034 ± ·021

Predicted mean eyesight (upon the same scale) in a group of n individuals, correcting for age only: $1{\cdot}41 - {\cdot}0589$ (mean age $- 37{\cdot}29$ years) $\pm 1{\cdot}075/\sqrt{n}$.

determining correlation between a measured character A, and a character B, of which only a percentage of cases wherein B exceeds a given intensity is recorded for each grade of A.

TABLE 24.—CORRELATION OF HEARING WITH NATURE OF CRIME.

"G" = good, "F" = fair, "I" = indifferent or nil.

Frequencies with Crime, Age, and Intelligence.

—	Totals.	Crimes. D.	S.	R.	V.	F.	Ages in years 15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–	Intelligence. Weak-minded.	Unintelligent.	Intelligent.
G	838	51	379	92	195	121	24	176	161	127	123	78	41	25	24	34	16	6	3	—	223	270	345
F	102	7	34	12	27	22	—	9.	9	10	8	11	8	7	4	20	5	5	3	3	25	36	41
I	56	6	25	7	9	9	—	4	4	5	6	4	1	6	6	8	7	3	1	1	.20	23	13
Totals ...	996	64	438	111	231	152	24	189	174	142	137	93	50	38	34	62	28	14	7	4	268	329	399

Grouping F and I and measuring Good Hearing upon a normal scale in which the s. d. is unity and G ranges from zero upwards.

Mean hearing ... ... 1·000 ± ·021
Coefficient of correlation with age ... ... −·547 ± ·015
Coefficient of correlation with intelligence (grouping W with U) ... ·101 ± ·021

Measures in Criminal Groups and Deviations from crude Mean.

—	Mean hearing.	Excess over mean of all criminals.	Twice p.e.
Damage to property	·83	−·17	±·17
Stealing and burglary ...	1·10	+·*10*	±·06
Sexual offences	·94	−·06	±·13
Violence to the person ...	1·01	+·01	±·09
Forgery and fraud	·82	−·*18*	±·11

Correlation ratio of hearing with nature of crime .. ... ·107 ± ·021·

Values of expected Means, corrected for Age by regression formula 1·000 − ·0385 × (*age* − 37·29), *and the deviations therefrom.*

Expected mean hearing.	Excess of actual over expected.	Twice p e.
1·04	−·*22*	±·15
1·01	+·*09*	±·06
1·09	−·*15*	±·11
1·14	−·*13*	±·08
·68	+·*14*	±·10

Correlation ratio at constant age ... ·155 ± ·021.

In the present instance we wish to measure the correlation of the character age, graduated in quinquennial periods, with hearing : of which character only the proportional frequencies within the three categories of good, fair, and indifferent are recorded for each period of age. Assuming its linearity, we want to determine the slope of the regression line, whose equation, (see page 37), is :—

$$y = \bar{y} + r \frac{\sigma_y}{\sigma_x}(x - \bar{x})$$

$$i.e., \quad \frac{y - \bar{y}}{\sigma_y} = \frac{x - \bar{x}}{\sigma_x} r_{xy},$$

where $\frac{y-\bar{y}}{\sigma_y}$ and $\frac{x-\bar{x}}{\sigma_x}$ are the co-ordinates of any point on the line, and represent the deviation from the means of the correlated variables, hearing (x), and age (y) ; and where r_{xy} is the coefficient of correlation of these two characters. It follows that

$$r_{xy} = \frac{y - \bar{y}}{\sigma_y} \div \frac{x - \bar{x}}{\sigma_x} \text{ *}$$

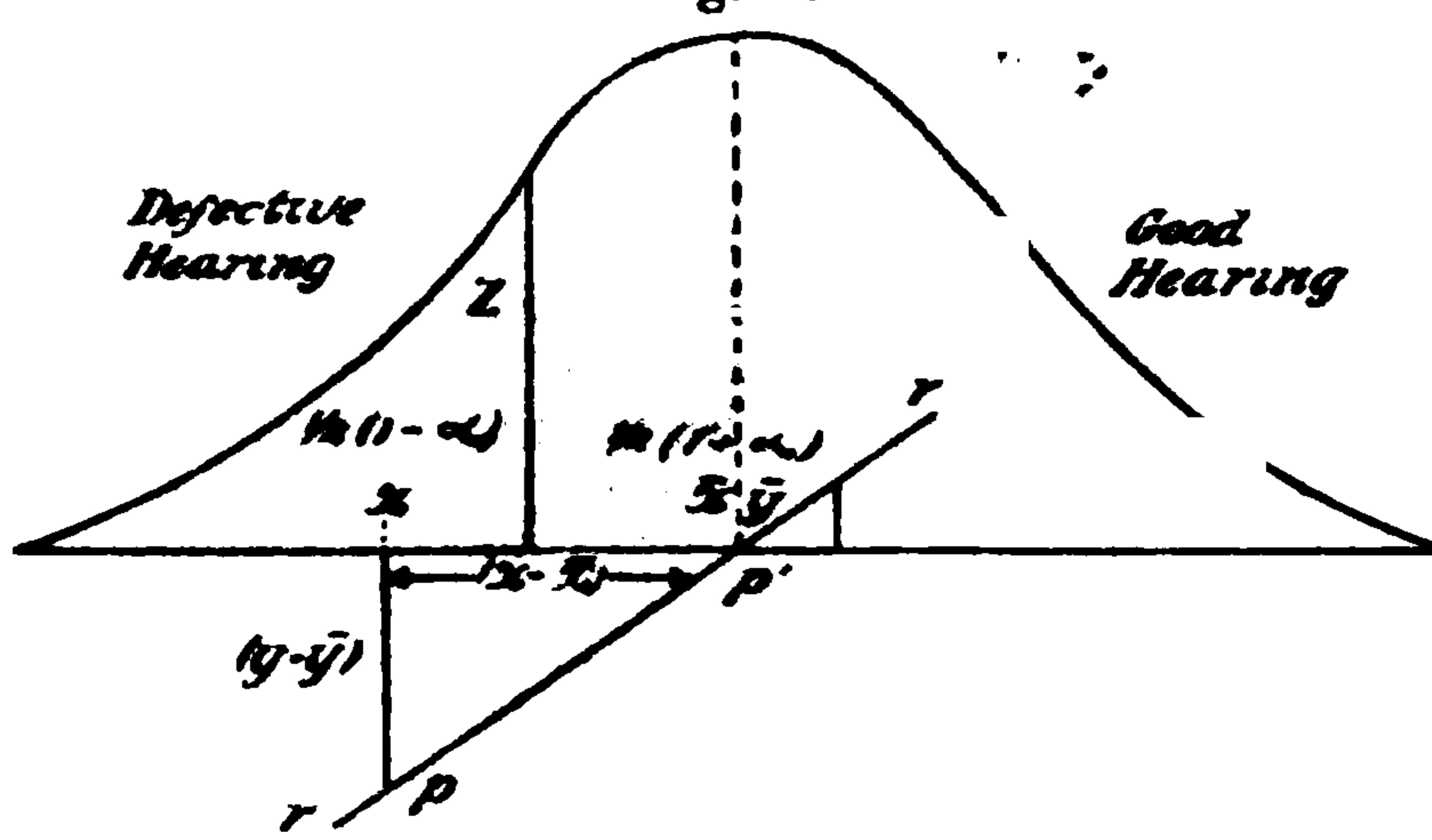
* *i.e.*, the correlation coefficient of hearing with age (r_{xy}) = the ratio of the co-ordinates, measured from the mean of hearing, of a point on the regression line where it is intersected by a vertical through the centroid of that volume of the frequency-surface corresponding to either good or defective hearing.

The mean age of total criminals, independently of their hearing grade, is $\bar{y}$; y is the mean age of that percentage of the total whose hearing capacity has been recorded fair or indifferent (*i.e.*, defective) ; and σ_y is the standard deviation of age for total criminals. The values of these two means, and of this standard deviation, are obtained, in the usual arithmetical way, directly from the data in Table 24. The question for consideration is how to obtain the value $\frac{x-\bar{x}}{\sigma_x}$, *i.e.*, the mean and standard deviation of the x, or hearing variate, which is not distributed quantitatively, but only within the three categories good, fair, indifferent. To determine these, we have to assume that the distribution of hearing is sufficiently Gaussian to justify the use of probability tables, such as Sheppard's, for determining (1) the proportional frequency (z), in terms of its standard deviation, of the grade of hearing which is at the boundary between good and defective ; and (2) the proportional area $(\frac{1-\alpha}{2})$ of defective hearing to the whole distribution surface. These two determinations, given by Z and $\frac{1}{2}(1-\alpha)$ in Sheppard's Tables, depend upon the percentage of defective hearing, and $\frac{z}{\frac{1}{2}(1-\alpha)}$ corresponds to the value of $\frac{x-\bar{x}}{\sigma_x}$ required.*

---

* The method may be illustrated by the following normal curve, which represents the distribution of hearing in any random population :—

Fig. vi.



z is the ordinate dividing criminals with good hearing from those with defective hearing.

$\bar{x}$ is the mean hearing of total criminals.

x is the mean hearing of criminals whose hearing is defective.

$\frac{1}{2}(1-\alpha)$ is the percentage of criminals with defective hearing, or it is the ratio of the area cut off by z to the total area, which equals 1.

σ_x is the standard deviation of hearing, and $= 1$.

$r - r$ is the regression line of hearing with age.

y and $\bar{x}$, the mean age and hearing of total criminals, fall at the same point p' on the regression line.

$y - \bar{y}$ divided by σ_y is the deviation of age, measured from the mean of all, of criminals with defective hearing.

$x - \bar{x}$ divided by σ_x is the deviation of hearing, measured from the mean of all, of criminals with defective hearing.

p is the point on the regression line whose co-ordinates, $\frac{y-\bar{y}}{\sigma_y}$ and $\frac{x-\bar{x}}{\sigma_x}$, measured from the mean, give the slope of this line, or the correlation coefficient (r).

$\frac{y-\bar{y}}{\sigma_y}$ can be determined directly from the data.

$\frac{x-\bar{x}}{\sigma_x}$ can be determined from the general properties of the normal distribution curve.

Now, one of the properties of the Gaussian, or normal, curve of error, is that any ordinate of the curve $\times\ \sigma_x \times \sigma$—that is to say, any ordinate (z) multiplied by the square of the standard deviation of the curve—is equal to the first moment, about the mean of the whole area, of the volume of the frequency, $\frac{1}{2}(1-\alpha)$, cut off from the total surface by this ordinate z. But $\frac{1}{2}(1-\alpha) \times (x-\bar{x})$ is also equal to the first moment, about the mean of this volume $\frac{1}{2}(1-\alpha)$.

$$\therefore\ \tfrac{1}{2}(1-\alpha) \times (x-\bar{x}) = z\,\sigma^2$$

$$\text{and } \tfrac{1}{2}(1-\alpha) \times \frac{x-\bar{x}}{\sigma} = z\,\sigma$$

$$\textit{i.e.}\ \frac{x-\bar{x}}{\sigma} = \frac{z\,\sigma}{\frac{1}{2}(1-\alpha)}$$

$$\text{or, since } \sigma = 1, \frac{x-\bar{x}}{\sigma} = \frac{z}{\frac{1}{2}(1-\alpha)}$$

The values of z and $\frac{1}{2}(1-a)$ can be obtained, from Sheppard's Tables, for all percentages of defective hearing; and thus the denominator $\frac{x-\bar{x}}{\sigma_x}$, as well as the numerator $\frac{y-\bar{y}}{\sigma_y}$, can be obtained, from our statistics, for the value of the correlation coefficient of hearing with age.

Thus, from the statistics in Tables 24 and 184, we find :—

Mean age of all criminals ... ... 37·2890 years.
Mean age of the combined groups with fair and indifferent hearing... ... ... 49·1455 „
Standand deviation for all criminals ... ... 14·2000 „
Further, from Sheppard's Tables, we find that $\frac{1}{2}(1-a)$ or $\frac{158}{996} = \cdot 1586$.
And thus $\frac{1}{2}(1+a) = \cdot 8414$, which gives for the ordinate z ·2420·

$$\text{Hence } r = \frac{y-\bar{y}}{\sigma_y} \Big/ \frac{x-\bar{x}}{\sigma_x}$$

$$= \frac{y-\bar{y}}{\sigma_y} \Big/ \frac{z}{\frac{1}{2}(1-a)}$$

$$= \frac{49\cdot 1455 - 37\cdot 2890}{14\cdot 2} \div \frac{\cdot 2420}{\cdot 1586}$$

$$= \cdot 5472.$$

This coefficient, ·547, is a measure of the extent to which defective hearing increases with age.

It is true that the tendency of hearing to become defective with age is not a new discovery. But the aim of the correlation process is directed, not so much to the discovery of unexpected phenomena, as it is to the finer appreciation of those that are familiar—to a bringing of existing knowledge into definite focus. The merit of the above correlation coefficient lies in the fact that, besides telling us that defective hearing increases with age, it also provides an exact numerical measure of the extent of this very familiar relationship; and thus enables it to be compared with other relations of a similar kind. For instance, we have now measured the relation of age with many anatomical characters —with head and face measurements, with acuteness of vision, with defective hearing, and (*see* p. 99) with the tendency of hair to become thin and grey. And since all these similar relations have been measured upon the same correlation scale between 0 and 1, our knowledge of anatomical changes, attendant upon age, becomes, in the light of the correlation coefficients obtained, more precisely defined and focussed. Anatomists, from general experience, and without taking or evaluating measurements, may have suspected that the human head grows larger with age; the association, with senility, of failing vision, of defective hearing, of baldness and of greyness, is matter of common experience. But to fully appreciate the significance of these changes—how microscopic, if any exist at all, is the change of head shape (correlation coefficient ·01) compared with its increase in length (correlation coefficient ·15); how small the latter is compared with the decrease in visual acuity (correlation coefficient ·46), which is less in extent than is the increase of defective hearing (correlation coefficient ·55); how individuals tend to become grey (correlation coefficient ·90), at a very much greater rate than they tend to become deaf, but become bald (correlation coefficient ·57) at a very much lesser rate than their hair tends to turn grey—to appreciate fully the relative effects of age upon these conditions, we must measure them on the correlation scale, and express their relative values as fractions between 0 and 1. And conversely, some idea of the standard value, against which to test the practical significance of correlation fractions, may be obtained from the series of coefficients just enumerated. It is clear, for instance, that the coefficient of ·1 represents a degree of association too microscopic to be revealed by unaided observations; that coefficients of ·3, and over, represent a strength of association whose existence, more or less roughly apprehended, would be patent to everyday observation; that amounts of association measured by coefficients of ·5 and ·6, respectively, would hardly be differentiated by ordinary observational experience, and that no degree of association equivalent to a coefficient of less than ·6 is of much practical service for individual prediction—it is clear that these coefficients would be of no greater service, in fact, than would be the knowledge of an individual's baldness in the predicting of his age. The fatuity of Lombroso's pretensions, and predictings of criminality from the presence or absence of physical stigmata—the associations of physical characters with crime, if existent at all, being hardly any of them greater than ·1—is manifest from these considerations.

Predicted mean, allowing for age, ·924 − ·0092 (mean age − 37·294) ± ·392/√ (number in group).

Measures in Criminal Groups, and excess over Mean of all. — *Excess over predicted Mean allowing for Age.*

—	Mean.	Excess.	Twice p.e.	Predicted mean.	Excess.	Twice p.e.
Damage to property	·956	+ ·031	·100	·934	+ ·022	± ·098
Stealing and burglary ...	·932	+ ·009	·038	·926	+ ·006	± ·037
Sexual offences	1·022	+ *·098*	·076	·945	+ *·077*	± ·074
Violence to the person ...	·923	− ·001	·053	·955	− ·032	± ·052
Forgery and fraud	·815	− *·108*	·065	·849	− ·034	± ·063

Correlation ratio of inclination of nose with nature of crime ... ... ·092±021·

Correlation ratio with nature of crime at constant age ... ·059±·021.

TABLE 26.—CORRELATION OF THICKNESS OF LIPS WITH NATURE OF CRIME.

"T" = thin, "M" = medium, "Th" = thick.

Frequencies with Crime, Age, and Intelligence.

—	Totals.	Crimes. D.	S.	R.	V.	F.	Ages in Years 15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–	Intelligence. Weak-minded.	Unintel-ligent.	Intel-ligent.
T.	218	12	101	23	43	39	2	20	22	28	30	17	14	12	20	28	13	7	3	3	43	81	94
M.	481	34	209	53	110	75	7	83	91	72	71	45	28	20	11	28	13	7	4	1	137	144	200
Th.	297	18	127	35	78	39	15	86	61	42	35	31	8	6	3	7	2	—	—	—	88	104	105
Totals ...	996	64	437	111	231	153	24	189	174	142	136	93	50	38	34	63	28	14	7	4	268	329	399

Measuring "Thickness of Lips" on a scale in which "medium" may range from − ·5 to + ·5,

Mean	·094
Standard deviation	·767
Standard deviations in criminal groups in order	·68, ·78, ·77, ·76, ·76
Coefficient of correlation with age (grouping T and M)	− ·354±·019
Coefficient of correlation with intelligence (grouping T and M, and, in intelligence, W and U)	− ·105±·021

Predicted mean thickness of lips ·094 − ·0191 (mean age − 37·294) ± ·484/√ (number in group).

Measures in Criminal Groups, and excess over Mean of all. — *Excess over predicted Mean, allowing for Age.*

—	Mean.	Excess.	Twice p.e.	Predicted.	Excess.	Twice p.e.
Damage to property	·105	+ ·011	± ·129	·116	− ·011	± ·121
Stealing and burglary ...	·071	− ·023	± ·049	·099	− ·028	± ·046
Sexual offences	·129	+ ·035	± ·098	·140	− ·011	± ·092
Violence to the person ...	·180	+ ·086	± ·068	·162	+ ·018	± ·064
Forgery and fraud	·000	− ·094	± ·084	·066	+ ·066	± ·078

Correlation ratio of thickness of lips with nature of crime ... ·077±·021.

Correlation ratio with nature of crime at constant age ... ·047±·021.

Right and Left-handedness.—The analysed statistics are presented in Table 27. It will be seen that, on the average of 996 total criminals, only four per cent. are left-handed and only three per cent. are ambidextrous. Accordingly, the expected numbers of left-handed, and ambidextrous, individuals, within the criminal sub-groups, are subject to so large an error that no reliable conclusions can be drawn from the small recorded differences in the actual numbers. From the analysis of so few data no positive argument as to the existence or non-existence of association between right and left-handedness and crime, can be legitimately based. The correlation ratio ·21 may, or may not, be significant of such association, is all that can be asserted.

TABLE 27.—CORRELATION OF RIGHT AND LEFT HANDEDNESS WITH NATURE OF CRIME.

"R" = right-handed, "A" = ambidextrous, "L" = left-handed.

Frequencies with Crime, Age, and Intelligence.

—	Totals.	Crimes.					Ages in years.														Intelligence.		
		D.	S.	S.	V.	F.	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	Weak-minded.	Unintelligent.	Intelligent.
R	931	62	407	105	308	149	21	170	161	134	129	90	47	35	32	60	28	14	6	4	249	205	377
A	27	1	10	2	11	3	1	6	5	2	5	2	—	2	1	2	—	—	1	—	6	9	12
L	38	1	20	4	12	1	2	13	8	6	2	1	3	1	1	1	—	—	—	—	13	15	10
Totals ...	996	64	437	111	331	153	24	189	174	142	136	93	50	38	34	63	28	14	7	4	268	329	399

Grouping A and L and measuring Right Handedness upon a normal scale in which the standard deviation is unity, and R ranges from zero upwards.

Mean	1·51 ± ·02
Coefficient of correlation with age	·143 ± ·021
Coefficient of correlation with intelligence (grouping W and U)	·084 ± ·021

Measures in Criminal Groups.

—	Mean.	Excess.	Twice p.e.
Damage to property	1·82	+·31	±·17
Stealing and burglary	1·45	−·06	±·06
Sexual offences	1·57	+·06	±·13
Violence to the person	1·25	−·26	±·09
Forgery and fraud	1·90	+·38	±·11

Correlation ratio of right-handedness with nature of crime ... ·214 ± ·020.

Shade of Eyes.—The statistics of this character, and of the six others which immediately follow, relate to observations made by one investigator upon 500 convicts only (Records 2,500 to 3,000). The data and analysed statistical information on the "shade of eyes" character are given in Table 28. The means are measured from the centre of the medium group, whose range is taken as the unit of measurement. The correlations of eye-shade with age and intelligence (·07 and ·03, respectively), are obviously too small for differences of age and intelligence between the criminal sub-groups to have any important influence upon their mean eye-shade. As shown in the final table, the differences between these means of eye-shade are none of them greater than twice the probable error of the mean; and from the value of the correlation ratio, ·075, we can only conclude that there is no significant relationship between the shade of a criminal's eyes and the nature of the crime he commits.

TABLE 28.—CORRELATION OF SHADE OF EYES WITH NATURE OF CRIME.

"L" = light, "M" = medium, "D" = dark.

Frequencies with Crime, Age, and Intelligence.

—	Totals.	Crime.					Age.														Intelligence.			
		D.	A.	S.	V.	F.	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	Weak-minded.	Unintelligent.	Fairly intelligent.	Intelligent.
L. ...	175	10	68	12	28	36	2	27	29	27	22	6	13	9	9	9	12	6	2	1	32	31	54	58
M. ..	105	8	30	17	23	19	1	19	24	14	12	11	9	4	5	—	3	1	1	—	25	29	31	20
D. ...	219	19	95	21	49	35	2	27	51	38	31	25	18	9	3	6	6	3	—	—	41	45	54	69
Totals	499	37	217	50	100	89	5	73	104	79	65	42	40	22	17	15	21	10	3	1	98	115	139	147

Measuring "Shade of Eyes" on a scale of *darkness* in which "medium" may range from −·5 to +·5.

Mean	·21
Standard deviation	1·95
Standard deviation in criminal groups in order	1·73, 2·20, 1·10, 1·87 1·85
Coefficient of correlation with age (grouping L and M)	−·068±·030
Coefficient of correlation with intelligence (grouping L and M, and, in intelligence, W and U, F and I)	−·030±·030

Measures in Criminal Groups.

—	Mean.	Excess.	2 p.e.
Damage to property	·56	+·35	±·43
Stealing and burglary	·16	−·05	±·18
Sexual offences	·28	+·07	±·37
Violence to the person	·32	+·12	±·26
Forgery and fraud	·00	−·21	±·28

Correlation ratio of "Shade of Eyes" with nature of crime ·075±·030.

Shade of Hair. Complexion of Skin.—Tables 29 and 30 contain the data and results of these two characters which, on account of the high correlation between them may, with interest, be considered together as one character : this notion explaining the basis of the popular differentiation between fair and dark individuals. Our data of light, medium, and dark hair, and of fair, medium, and dark skin, are combined in the following table :—

Skin

Hair	F	M	D	
D	22	42	224	288
M	23	29	31	83
L	100	20	9	129
	145	91	264	500

from which, by grouping together in turn the data of (1) the fair with the medium skin, (2) the dark with the medium skin, (3) the light with the medium hair, (4) the dark with the medium hair, four fourfold tables are obtained, yielding the four following equations,* and values of "r" :—

(1) Skin L M − D : Hair F M − D

$$\cdot1444 = \cdot15598r + \cdot00104r^2 + \cdot02495r^3 + \cdot00077r^4 + \cdot01076r^5 + \cdot00063r^6 + \cdot00614r^7 + \cdot00054r^8$$

$$r = \cdot8034 \pm \cdot0107$$

(2) Skin L − M D : Hair F M − D

$$\cdot12275 = \cdot13411r + \cdot00702r^2 + \cdot01497r^3 + \cdot00467r^4 + \cdot00391r^5 + \cdot00343r^6 + \cdot00092r^7 + \cdot00264r^8$$

$$r = \cdot7930 \pm \cdot0112$$

(3) Skin L M − D : Hair F − M D

$$\cdot11822 = \cdot12859r + \cdot00294r^2 + \cdot01234r^3 + \cdot00189r^4 + \cdot00206r^5 + \cdot00134r^6 - \cdot00053r^7 + \cdot00098r^8$$

$$r = \cdot8302 \pm \cdot0094$$

(4) Skin L − M D : Hair F − M D

$$\cdot12518 = \cdot11056r + \cdot01987r^2 + \cdot00740r^3 + \cdot01130r^4 + \cdot00075r^5 + \cdot00728r^6 - \cdot00007r^7 + \cdot00474r^8$$

$$r = \cdot8621 \pm \cdot0077$$

TABLE 29.—CORRELATION OF SHADE OF HAIR WITH NATURE OF CRIME.

"L" = light, "M" = medium, "D" = dark.

Frequencies with Crime, Age, and Intelligence.

—	Totals.	Crime. D.	S.	R.	V.	F.
L ...	129	13	65	8	29	24
M ..	82	11	34	8	22	7
D ...	288	13	129	33	55	58
Totals	499	37	218	49	106	89

—	Age. 15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-
L ...	2	23	25	19	17	5	13	7	6	4	4	3	1	—
M ..	—	9	24	15	10	5	5	4	4	3	3	—	—	—
D ...	3	41	55	45	39	32	23	11	7	8	14	7	2	1
Totals	5	73	104	79	66	42	41	22	17	15	21	10	3	1

—	Intelligence. Weak-minded.	Unintelligent.	Fairly intelligent.	Intelligent.
L ...	24	24	37	44
M ..	15	22	31	14
D ...	59	69	71	89
Totals	98	115	139	147

* The work of reduction of all fourfold tables throughout this volume was curtailed by the help of P. F. Everitt's Tables published in Biometrika, Vol. 7, November 1910.

associated to any marked degree with either shade of hair or skin ; but that, on the other hand, to a small degree, crime is so associated—to a greater degree, than it is with characters hitherto examined. It should further be noticed that the degree of this relationship is greater with hair (·23) than it is with complexion (·16)—the enhanced value of the former ratio being mainly due to the fact that dark hair distinguishes the fraudulent group from the other offenders, whereas, in skin colour, they are undifferentiated, or slightly lighter. But the variability of hair colour in the fraudulent is an outstanding feature, and it would seem, in fact, that both dark and light, as opposed to a medium, shade of hair, are characteristic of fraudulent offenders, who are also differentiated from other criminals by a greater frequency of the combination of fair skin with dark hair. As will be seen later (p. 138), this difference we have discovered is probably a distinction of class: a source of differentiation which, at any rate, must be eliminated before drawing hasty comparisons that may lead to fallacious conclusions.

Hair Texture and Quantity.—The statistics, and the analysed results, are tabulated in Tables 31 and 32. Both characters are measured from the middle of the median range, which is taken as unit. With regard to the first character, the correlation coefficients with age and intelligence, and the correlation ratio with crime, are all of them insignificant in value ; and we conclude that, upon the evidence of these data, the texture of the criminal's hair is not related to the crime he commits. With regard to hair quantity, however, the correlation coefficient with age, ·57, is a very high one ; and consequently, just as we had to do when estimating the relationship between hearing and crime, allowance must be made for differences in the age distribution of the sub-groups, before the relation between crime and baldness can be measured. It will be seen from the contrasted means in the table that the reason why fraudulent offenders have thinner hair, and a greater amount of baldness, than other criminals, is largely because they are, on the average, eight years older. Compared upon a standardized age basis, their hair is still thinner than that of offenders in the other sub-groups, although, having regard to the probable errors, none of the differences in this respect are very definitely significant ; and this is shown by the value of the correlation ratio, (η), of thickness of hair with crime, ·151·

TABLE 31.—CORRELATION OF HAIR TEXTURE WITH NATURE OF CRIME.

"F" = fine, "M" = medium, "C" = coarse.

Frequencies with Crime, Age, and Intelligence.

—	Totals.	Crime.					Age.														Intelligence.			
		D.	S.	R.	V.	F.	15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–	Weak-minded.	Unintelligent.	Fairly intelligent.	Intelligent.
F ...	154	11	65	10	35	33	1	17	20	23	29	16	16	7	5	5	7	6	2	—	30	30	42	52
M ...	181	11	74	25	44	27	1	21	45	32	25	14	13	8	7	3	8	3	1	—	36	49	48	48
C ...	164	15	78	15	27	29	3	35	39	24	12	12	12	7	5	7	6	1	—	1	32	36	49	47
Totals	499	37	217	50	106	89	5	73	104	79	66	42	41	22	17	15	21	10	3	1	98	115	139	147

Measuring "Texture of Hair" on a scale of coarseness in which "medium" may range from $-\cdot 5$ to $+\cdot 5$·

Mean	·03
Standard deviation	1·10
Standard deviation in criminal groups in order	1·30, 1·13, ·73, ·91, 1·28
Coefficient of correlation with age (grouping F and M $-\cdot 135$, grouping M and C $-\cdot 176$, mean)	$-\cdot 155 \pm \cdot 030$
Coefficient of correlation with intelligence (grouping F and M, and, in intelligence, W and U, and F and I)	$\cdot 028 \pm \cdot 030$

Measures in Criminal Groups.

—	Mean.	Excess.	2 p.e.
Damage to property	·19	+·16	±·24
Stealing and burglary...	·09	+·06	±·10
Sexual offences	·12	+·08	±·21
Violence to the person	−·10	−·13	±·14
Forgery and fraud	−·08	−·11	±·16

Correlation ratio of hair texture with nature of crime ... ·091 ± ·039.

TABLE 32.—CORRELATION OF HAIR QUANTITY WITH NATURE OF CRIME.

"Th" = thick, "M" = medium, "T" = thin, "TB" = thin bald, "B" = bald.

Frequencies with Crime, Age, and Intelligence.

—	Totals.	Crime. D.	S.	S.	V.	F.	Age. 15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	Intelligence. Weak-minded.	Unintelligent.	Fairly intelligent.	Intelligent.
Th ...	180	13	84	18	38	27	4	45	48	27	16	15	7	4	4	4	5	1	—	—	38	43	51	48
M ...	115	11	47	14	31	12	1	21	35	25	17	4	8	1	1	1	1	—	—	—	23	30	36	26
T ...	97	7	36	11	23	20	—	7	17	11	17	14	12	8	2	8	3	2	—	1	21	19	26	31
TB ...	64	5	24	4	11	20	—	—	2	12	13	7	8	8	7	5	7	1	—	—	12	12	15	25
B ...	43	1	26	2	4	10	—	—	2	4	4	2	6	6	3	2	5	6	3	—	5	11	11	16
Totals	499	37	217	49	107	89	5	73	104	79	66	42	41	22	17	15	21	10	3	1	99	115	139	146

Grouping T, TB, and B, and measuring "Hair Quantity" on a scale of *thinness*, in which "medium" may range from $-\cdot5$ to $+\cdot5$.

Mean ...	·172
Standard deviation ...	1·91
Standard deviation in criminal groups in order ...	1·31, 1·82, 1·37, 1·35, 1·49
Correlation ratio with crime ...	·186 ± ·029
Coefficient of correlation with age (grouping Th and M) ...	·574 ± ·020
Coefficient of correlation with intelligence (grouping Th and M, and, in intelligence, W and U, and F and I) ...	·097 ± ·030

Predicted mean, allowing for mean age of group, $\cdot172 + \cdot080$ (mean age $- 37\cdot87$) $\pm \cdot86/\sqrt{}$ (number in group).

Measures in Criminal Groups, and deviations from predicted Means, allowing for Age.

—	Predicted mean. Mean of all.	+ Correction for age.	= Predicted.	Actual mean.	Excess.	2 p.e.
Damage to property ...	·172	+ ·052	·224	·000	− ·224	± ·284
Stealing and burglary ...	·172	+ ·013	·185	·022	− ·163	± ·117
Sexual offences ...	·172	− ·229	− ·057	− ·038	+ ·019	± ·247
Violence to the person ...	·172	− ·360	− ·188	·000	+ ·188	± ·167
Forgery and fraud ...	·172	+ ·489	·661	·933	+ ·272	± ·183

Correlation ratio with nature of crime at constant age ... ·151 ± ·030.

Greyness of Hair.—Statistics of the incidence of grey hair, and the results of their analysis, yielding a measure of the extent to which criminals are distinguished by the relative presence or absence of this characteristic, are given in Table 33. There are, of course, wide differences of individual proclivity to become grey-haired; yet the appearance of grey hairs is always ultimately a question of age. Consequently, before drawing conclusions from the existence of different degrees of this character in contrasted populations, the question to be answered is this: are individuals within this group more grey than those within that group, because, on the average, they are older; or is the greater extent of greyness amongst the former individuals the real expression of a tendency for their hair to turn grey at an earlier age? The partial correlation ratio furnishes the most satisfactory answer to questions of this kind.

TABLE 33.—CORRELATION OF GREYNESS OF HAIR WITH NATURE OF CRIME.

Frequencies with Crime, Age, and Intelligence.

—	Totals.	Crime. D.	S.	S.	V.	F.	Age. 15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	Intelligence. W.	U.	F.	I.
Grey ...	117	8	51	6	17	35	—	—	3	7	8	14	17	12	13	9	20	9	3	1	17	14	33	52
Not grey ...	382	21	166	42	89	56	5	73	101	72	58	28	24	10	4	6	1	1	—	—	81	101	106	95
Totals ...	499	29	217	46	106	90	5	73	104	79	66	42	41	22	17	15	21	10	3	1	98	115	139	147

Mean greyness (standard deviation unity) ...	− ·724 ± ·030
Correlation ratio of greyness with crime ...	·251 ± ·028
Coefficient of correlation with age ...	·897 ± ·006
Coefficient of correlation with intelligence (grouping U with W, and F with I) ...	·315 ± ·027

Predicted means greyness $= -\cdot724 + \cdot0654$ (mean age $- 37\cdot870$) $\pm \cdot297/\sqrt{n}$

Measures in Criminal Groups and deviations from predicted Means.

—	Predicted Mean.	Actual Mean.	Excess.	2 p.e.
Damage to property ...	$-\cdot 68$	$-\cdot 80$	$-\cdot 12$	$\pm\cdot 10$
Stealing and burglary ...	$-\cdot 71$	$-\cdot 70$	$\cdot 01$	$\pm\cdot 04$
Sexual offences	$-\cdot 91$	$-1\cdot 11$	$-\cdot 20$	$\pm\cdot 08$
Violence to the person ...	$-1\cdot 02$	$-\cdot 96$	$\cdot 06$	$\pm\cdot 06$
Forgery and fraud	$-\cdot 32$	$-\cdot 27$	$\cdot 05$	$\pm\cdot 06$

Correlation ratio of greyness with crime at constant age ... $\cdot 184 \pm \cdot 029$

Upon consulting the final table, it will be seen that, on the face-value of the statistics, fraudulent offenders are markedly more grey, whereas sexual offenders—to a pronounced degree, and those committing crimes of violence—to a minor degree, are less grey than thieves and incendiaries, whose degree of greyness approximates closely to the average of criminals generally : the crude correlation ratio of greyness with crime being ·25. It will further be seen that the hair of intelligent criminals is greyer than that of the unintelligent : the correlation coefficient of grey hair with intelligence being ·31· But fraudulent criminals, on the average, are six years older, sexual and violence offenders are respectively three and five years younger, than the mean age of criminals generally (*see* Appendix Tables 186 and 187 for particulars of this group) ; and intelligent criminals are considerably older than the unintelligent and weak-minded. In fact, the serial position ot the various crime categories, arranged in the order of relative greyness, is the same as their serial position when these categories are arranged in the order of relative age. And the correlation coefficient of greyness with age is ·9—a considerably higher degree of association than we have hitherto found for any other character. It is clear, therefore, that before we can assert, from the results of comparison, that certain groups of criminals, such as the intelligent and fraudulent groups, &c., are distinguished by the greater proclivity of their hair to turn grey, proper allowance must be made for the effects upon greyness due to existing differences of age in the populations compared. That is to say, to arrive at a legitimate conclusion, we must find the partial correlation coefficient of intelligence with greyness, and the partial correlation ratio of crime with greyness, both for a constant age.

The partial correlation coefficient of intelligence with greyness, for constant age, ${}_a\rho_{ig}$, is given by the formula

$$ {}_a\rho_{ig} = \frac{r_{ig} - r_{ia}\, r_{ag}}{\sqrt{1 - r_{ia}^2}\,\sqrt{1 - r_{ag}^2}} $$

where (r_{ig}) is the correlation coefficient of intelligence with greyness $= -\cdot 3147$, (r_{ia}) the coefficient of intelligence with age $= \cdot 2916$, and (r_{ag}) the coefficient of age with greyness $= \cdot 8975$.

$$ \therefore {}_a\rho_{ig} = \frac{\cdot 3147 - (\cdot 2916 \times \cdot 8975)}{\sqrt{1 - (\cdot 2916)^2}\,\sqrt{1 - (\cdot 8975)^2}} = \cdot 125 \pm \cdot 029 $$

We see from the value of this coefficient, in relation to its probable error, that there is no pronounced degree of relationship between the intelligence of criminals and the tendency of their hair to turn grey ;* and that, consequently, the extent of relationship, ·25, apparently shown on the face value of our statistics, was a spurious one, dependent to great extent on the fact that intelligent criminals happen, on the average, to be three years older than the unintelligent and weak-minded.

We next have to measure the association of crime with greyness for constant age, ${}_a\eta_{cg}$, and proceed to this end, as before, by allowing for the effect upon greyness, due to differences in the mean age, of the criminal sub-groups, by aid of the regression formula :—

$$ \lambda = -\cdot 724 + \cdot 0654\ (\text{age} - 37\cdot 87) \pm \cdot 297/\sqrt{n} $$

—which provides the series of predicted means, duly corrected for age, which is presented in the table above, side by side with the series of actual means given by the data. From these contrasted series of means in relation to the probable errors, it will be seen that, when compared on a standardized age-basis, sexual offenders alone deviate at all widely

* The degree of relation recorded (cor. coef. ·13) depends probably upon the inferior social class from which mentally defective prisoners are drawn.

It was originally asserted by Lombroso, and the statement has been confirmed by observers, that the criminal displays an inordinate tendency to tattoo his body—the tendency being regarded as an atavistic revival of the love of ornate display which characterises the savage. The criminal, of course, does frequently tattoo his body; and the presence of such marks, carefully recorded by the police authorities for purposes of criminal identification, have been entered into our schedule under five categories of no marks, a few trifling marks, some definite symbol or image, more than one definite picture, and elaborate or profuse distribution of marks. Records of a similar kind relating to the general population are obviously not available; although it is known that the practice of tattooing the body is not a very uncommon one amongst certain classes of the law-abiding public. The object of analysing the present statistics is to trace, by comparing the varying prevalency of tattoo marks amongst different orders of criminal, some explanation of the connection between tattooing and crime more simple than the elaborate theory which refers it to the category of atavistic anomalies.

From an examination of Table 35, which record the tabulated statistics, and various results of their analysis, it will be seen in the first place that, in 43 per cent. of the 487 convicts examined, tattoo marks of some kind were found, that well-defined marks were shown by 25 per cent., and really elaborate tattooing by only 10 per cent. Now, since our sample comprises the most pronounced kinds of criminal, and the tattooing, described by authors, has mainly referred to elaborate operations of the kind, it is clear that the practice of tattooing cannot be such a peculiarly criminal characteristic as has been alleged. It will further be seen that the extent of the proclivity we are discussing varies considerably amongst different orders of criminals, precisely as it is known to vary amongst different classes and types of the law-abiding public Thus, as illustrated by the figures in the third column of the final table, which records the mean degree of tattooing for each of the criminal sub-groups, thieves and burglars, *i.e.*, habitual criminals generally, are the most tattooed; the next in order are those convicted of personal violence; sexual offenders and incendiaries are tattooed to a much less degree; the least tattooed of all being the forgers and fraudulent class. The correlation ratio (η) expressing the extent of these differences on the correletion scale, is ·327.

TABLE 35.—CORRELATION OF TATTOOING WITH NATURE OF CRIME.

"N" = no marks. "T" = trifling. "D" = well defined. "E" = extensive.

Frequencies with Crime, Age, and Intelligence, and time in Services (Army or Navy), if any.

–	Totals.	Crimes.					Age.													
		D.	S.	R.	V.	F	15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–
N ...	277	26	96	33	54	68	4	32	48	39	31	26	33	12	12	13	17	7	2	1
T ...	88	5	48	7	17	11	—	16	23	13	14	8	2	4	1	1	4	1	1	—
D ...	74	4	41	4	18	7	1	15	20	13	12	4	4	4	—	—	—	1	—	—
E ...	48	1	27	4	14	2	—	9	10	13	6	2	2	2	3	—	—	1	—	—
Totals	487	36	212	48	103	88	5	72	101	78	63	40	41	22	16	14	21	10	3	1

–	Totals.	Intelligence.				Time in Service.																	Total Services.	Total not Services.
		W.	U.	F.	I.	0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	11–	12–	13–	14–	15–	16–		
N ...	277	62	58	65	92	10	15	24	11	8	3	7	1	3	—	6	—	1	1	—	2	2	94	185
T ...	88	19	15	26	28	5	6	2	3	2	4	5	4	—	—	2	—	—	—	—	1	1	35	48
D ...	74	18	13	29	14	4	8	6	9	2	3	3	1	2	2	3	1	1	3	1	—	—	49	23
E ...	48	17	7	16	8	—	3	5	5	4	2	2	8	3	—	4	—	1	1	—	—	5	43	6
Totals	487	116	93	136	142	19	32	37	28	16	12	17	14	8	2	15	1	3	5	1	3	8	221	262

Treating tattooing as an alternative character (grouping all tattooed), mean = $-·18 \pm ·03$ in terms of standard deviation as unit.

Correlation ratio of tattooing with nature of crime ... . $·327 \pm ·027$

Coefficient of correlation with age ... ... $-·283 \pm ·028$

Coefficient of correlation with intelligence (grouping U with W, and F with I) ... ... $-·223 \pm ·029$

Coefficient of correlation with Service treating this as an alternative character $·433 \pm ·025$

Predicted mean measure of tattooing $-·183 - ·014$ (mean age $-37·870$) $-·088$ (mean intelligence $-·276$) $+·390$ (mean service $+·111$) $\pm·584/\sqrt{n}$.

Measures in Criminal Groups and deviations from predicted Means, allowing for Age, intelligence and Service (Army or Navy) :—

—	Mean.	Corrections for			Predicted mean tattooing.	Actual mean tattooing.	Excess of actual over predicted.	Twice p.e.
		Age.	Intelligence.	Service.				
Damage to property	−·183	−·009	+·050	+·132	−·010	−·557	−·547	±·195
Stealing and burglary	−·183	−·002	+·029	+·100	−·056	+·103	+·159	±·080
Sexual offences	−·183	+·039	+·077	−·036	−·103	−·462	−·359	±·169
Violence to the person	−·183	+·061	−·007	−·041	−·170	−·058	+·113	±·115
Forgery and fraud	−·183	−·068	−·124	−·220	−·609	−·711	−·102	±·125

Correlation ratio of tattooing with crime for constant age, intelligence, and services ... ... ·321 ± ·029

Three conditions in particular, having a selective value in regard to the type of crime a criminal may commit, suggest themselves as likely to be also associated with the tattooing habit, and thus possibly to be at the source of differences amongst criminals, in this respect. These conditions are age, intelligence, and service occupation as a soldier or sailor. Pursuing our inquiry in these directions we have, accordingly, obtained from the correlation Table 35 the coefficients of tattooing (1) with age, − ·283, *i.e.*, the older the subject, the less tattooed ; (2) with intelligence, − ·223, *i.e.*, the more tattooed the less intelligent ; (3) with previous occupation in the services, ·433, *i.e.*, service employment is highly associated with the habit of tattooing. We see that the extent to which a criminal is tattooed depends to an appreciable extent upon his intelligence, to a rather greater degree upon his age, and to a relatively large degree upon his previous occupation as a soldier or sailor. We must examine then, how, and to what extent, the degree of relationship between tattooing and crime is modified by allowing for differences between the criminal sub-groups, with regard to these variable conditions associated with the practice of tattooing.

The coefficients of the regression equation which will furnish corrections for these conditions are found from the following determinant, which consists of the correlation coefficients given above, and those obtained from Appendix Tables 186 and 188.

—	Age.	Intelligence.	Services.	Tattooing.
Age...	1	·292	− ·156	− ·283
Intelligence	·292	1	− ·109	− ·223
Services	− ·156	− ·109	1	·433
Tattooing	− ·283	− ·223	·433	1

We find that the corrected measures of mean tattooing for each group equals

$$-\cdot183-\cdot014\,(\text{age}-37\cdot87)-\cdot088\,(\text{intelligence}-\cdot276)+\cdot390\,(\text{services}+\cdot111)$$
$$\pm\frac{\cdot584}{\sqrt{n}}$$

And applying these corrections to the individual sub-groups, we obtain a series of predicted means giving the different average amounts of tattooing to be expected for these groups—on the supposition that they represent random, in place of criminal, selections—when due allowance has been made for differences between them in mean age, mean intelligence, and relation to the services. These corrected means, contrasted with the values actually given by the data, are presented in columns 5 and 6 of the above table ; from which the correlation ratio of tattooing with crime for constant age, intelligence, and services, is found to be ·321—a very small reduction in the uncorrected, or crude, value, previously obtained, ·327.

But different degrees of tattooing, although reduced in extent from their previous values, still persist between different orders of criminals ; habitual criminals still remain, on the average, more marked, incendiaries and sexual offenders less marked, than criminals generally. Now, habitual criminals are drawn disproportionately from the towns, and incendiaries—most of whom are convicted of stack-firing—from rural districts ; and townsmen might be expected, for many obvious reasons, to be more frequently and more elaborately tattooed than country folk. Consequently, their residence in town or country prior to conviction, may provide additional explanation of the different extent to which thieves, incendiaries, and sexual offenders are respectively tattooed.

The frequencies of urban and rural residence with crime and tattooing are given in Table 36, where sailors, and individuals residing in seaports, are classed with the urban, and nomadic individuals with the rural, population. The relative values of the means show that crimes of wilful damage to property, and sexual offences, are committed in fairly equal proportions by town and country residents; crimes of theft, burglary, and fraud, mainly by town residents; and crimes of violence by individuals whose residence is more frequently rural than that of thieves, and less frequently so than that of the "damage" and "sexual" offenders. And the correlation coefficient of tattooing with residence in the country, as opposed to residence in the towns, is $-\cdot265$: which gives the extent to which the prevalence of tattooing decreases as a district becomes more rural. Accordingly, the corrected mean measures of tattooing (y), in groups of individuals, residing in varying proportions in town and country, will be given by the regression equation

$$y = -\cdot183 + \cdot2655\,(x - \cdot5968)$$

Applying this correction to the "damage," "stealing," and "sexual" sub-groups, we find the residual deviations in tattooing, from the values predicted by this equation, in relation to twice their probable errors, are for the "damage" group $-\cdot207 \pm \cdot216$; for the "stealing" group, $\cdot239 \pm \cdot090$; and for the group of "sexual offenders" $-\cdot176 \pm 188$. These differences are hardly significant: which strengthens the hypothesis that the actual differences of tattooing between these three orders of criminals depends mainly upon the different extent to which they have been resident, previously to their conviction, in town or country. We do not pretend to have analyzed the matter exhaustively; but the statistical evidence before us is sufficient for an interim conclusion that although criminals, like the law-abiding public, differ considerably in the extent to which they are tattooed, these differences have no special relation to criminal proclivity; and that they tend to disappear when differences are allowed for in other conditions associated with tattooing, of which age, intelligence, service in the army or navy, and urban or rural residence, are the principal ones.

TABLE 36.

Frequencies of Residence in Town or Country with nature of Crime and Tattooing.

—	Totals.	Crime.					Tattooing.	
		D.	S.	R.	V.	F.	T.	N
Urban	351	18	167	28	69	69	168	183
Rural	137	19	47	20	32	19	42	95
	488	37	214	48	101	88	110	278
Measures and deviations...	·6	−·6	+·2	−·4	−·1	+·2		

Correlation ratio of urban residence with crime ... ... ·252
Coefficient of correlation of urban residence with tattooing... −·265

Group IV.

Hitherto, we have been measuring the connection between crime and certain physical characters, through the medium of the correlation ratio (η); and in order to employ the particular methods adopted, we have proceeded upon the assumption that these physical characters were not only quantitatively measureable, but that the categories within which each character had been grouped, if not always identical, would, at any rate, in every case, correspond to a quantitative scale inherent in the nature of the attribute. With regard to the characters of Groups I and II, the truth of this presumption is, of course, incontestable. Our statistics here consisted of series of measurements which were themselves the actual thing under investigation—the tangible millimetre scale upon which the characters were measured is necessarily identical to a real anatomical scale in the attributes themselves. With the Group III series, the classification of each character into multiple categories was certainly not always identical to any real anatomical scale; but, for reasons stated, we felt justified in assuming that the classification adopted in each case would correspond to such a scale—that the order in which our subjects, roughly grouped into classes, were arranged, would be the same as their order on a real scale of anatomical measurements. We have now, however, to deal with some remaining characters for which this assumption is no longer tenable. Eye and hair colour, shape of nose, conformation

Table 39.

499 Criminals.

Crimes.	H			N			Λ			M			HN			Totals.
	f.	exc.	2 p.e.	f.	exc.	2 p.e.	f.	exc.	2 p.e.	f.	exc.	2 p.e.	f.	exc.	2 p.e.	
Damage to property	10	2·2	3·7	2	−2·7	2·9	8	2·9	3·0	8	−4·6	4·7	9	2·2	3·5	37
Stealing and burglary	44	−1·7	8·7	32	4·6	6·9	30	− ·0	7·2	73	− ·9	10·7	38	−2·0	8·2	217
Sexual offences ...	14	3·3	4·4	8	1·6	3·4	6	1·0	3·6	15	−2·4	5·5	8	−1·4	4·1	51
Violence to the person	22	− ·3	6·2	9	−4·4	4·9	13	−1·7	5·1	38	1·9	7·9	24	4·5	5·8	106
Forgery and fraud ...	15	−3·5	5·7	12	·9	4·4	12	− ·2	4·6	36	6·0	7·2	13	3·2	5·3	88
Intelligence																
Weak-minded ...	27	6·2	5·9	11	−1·5	4·6	21	7·3	4·8	19	−14·7	7·5	21	2·7	5·6	99
Unintelligent ..	21	−3·4	6·4	15	·3	4·9	16	− ·0	5·2	44	4·5	8·2	20	−1·4	6·0	116
Fairly intelligent ...	29	·2	6·9	18	·7	5·3	16	−2·9	5·6	45	−1·7	8·9	29	3·7	6·5	137
Intelligent	28	−2·9	7·2	19	·4	5·6	16	−4·3	5·9	62	11·9	9·2	22	−5·1	6·8	147
Totals ..	105	—	—	63	—	—	69	—	—	170	—	—	92	—	—	499

Coefficient of contingency of palate with nature of crime ... ... ·000
Coefficient of contingency of palate with intelligence ... ... ·125

Conformation of Palate.—The essentials of the method of statistical analysis, called the method of contingency, consists in measuring the extent to which the combined frequencies of any character given by the data—*e.g.*, the respective number of thieves, forgers, &c. with eyes that are blue, brown, &c.—deviate from the frequencies that would be expected according to the law of independent probability, assuming there be no affinity between crime and the different classes of the character under investigation. By referring to Table 37, which records the data, &c. of palates, (Records 1 to 1,000), the frequencies of occurrence of different kinds of palates amongst five different orders of criminals will be found in Columns(f). Thus it will be seen that, out of the 64 individuals in the "damage" group, the palates of 10 are described as high, of 8 as narrow, of 8 as Λ-shaped, of 20 as medium, and of 18 as high and narrow; and the respective frequencies of different kinds of palates are similarly stated for the other criminal groups. Now, if, in place of this classification into five categories determined by shape of palate, our 996 convicts are sorted at random into five divisions, (H. N. Λ. M. and HN), each containing respectively 110, 136, 66, 460 and 224 individuals, the chances of any one stated individual being included in any one of these divisions would be, for the H. division, $\frac{110}{996}$, for the N. division, $\frac{136}{996}$, and so forth. Next, if in place of the five crime categories, the 996 convicts are divided again, entirely by chance into five groups, (D. S R. V. F.), each containing 64, 437, 111, 231, and 153 individuals respectively, the respective probabilities of any individual being included in any one of these divisions equals $\frac{64}{996}$, $\frac{437}{996}$, &c., &c. And for these two random sortings combined, the chances of any one individual falling into any one set of the twenty-five possible combinations of two divisions would be, for the HD. combination, $\frac{110 \times 64}{(996)^2}$, for the N.S. combination, $\frac{136 \times 437}{(996)^2}$, and so forth. Now, in many two-fold sortings precisely similar to that just described, it is clear that, on the average, the number of individuals falling into any specified compartment will be equal to the chance of any one individual being included within that compartment at any one sorting, multiplied by the number of individuals, 996. That is to say, on the average, the number of individuals we would expect to find within each compartment of Table 37, assuming there be no affinity or contingency between shape of palate and nature of crime, would be, in the HD. compartment, $\frac{110 \times 64}{996} = 7{\cdot}07$, and so forth, as in the following Table:—

INDEPENDENT PROBABILITY FREQUENCIES—RANDOM SORTINGS.

——	H	N	A	M	HN	Totals.
D	7·07	8·74	4·24	29·56	14·39	64
S	48·26	59·67	28·96	201·82	98·28	437
R	12·26	15·16	7·36	51·26	24·96	111
V	25·51	31·54	15·31	106·69	51·96	231
F	16·90	20·89	10·14	70·66	34·41	153
Totals ...	110	136	66	460	224	996

The figures in this table are the independent probability frequencies to be expected on the average when 996 individuals are grouped at random into a system of twenty-five compartments, as described above: the values of these frequencies being found by multiplying the chances of an individual falling into each of the five groups of the one set by the totals for each group of the other set. In Table 37, we have the actual frequencies (f) given by the data of 996 convicts grouped, by the shape of their palates and the nature of the crimes they have committed, into a precisely similar system of twenty-five compartments. Consequently, the differences between the observed frequencies (f) in Table 37, and the independent probability frequencies in the Table above, give the amount of deviation from independent probability in our palate-crime statistics. Thus, the observed number of "damage" offenders with high palates is 10, the expected number is 7·07, the deviation from independent probability being 2·93; or, again, the observed number of the "stealing" group with high and narrow palates is 98, the expected number is 98·28, the deviation from independent probability being $-$·28. The various values of these sub-contingencies, or positive and negative deviations from independent probability, are given for each compartment in the columns headed "Excess" of Table 37. And the measure of contingency, or the average deviation of the whole system from independent probability, is equal to the sum of the squares of all these sub-contingencies. It is represented by the notation—

$$\chi^2 = S\left\{\frac{(\text{expected}-\text{actual frequency})^2}{\text{expected frequency}}\right\};$$

and the mean square contingency, ϕ^2, being equal to $\frac{\chi^2}{N}$, the coefficient of contingency, expressing on a scale between 0 and 1 the amount of association between crime and palate formation—the coefficient of contingency $C_2 = \sqrt{\frac{\phi^2}{1+\phi^2}}$. Thus, from the figures in Table 37,

$$\chi^2 = \frac{(2{\cdot}93)^2}{7{\cdot}07} + \frac{(12{\cdot}26)^2}{48{\cdot}26} + \text{\&c., \&c.} = 28{\cdot}03$$

$$\phi^2 = \frac{28{\cdot}03}{996} = {\cdot}02814$$

which, after subtracting the appropriate correction,* viz. ·01606, equals ·01208.

$$C_2 = \sqrt{\frac{{\cdot}01208}{1{\cdot}01208}} = {\cdot}1092$$

* The correction applied to the value of $\phi^2 = {\cdot}02814$ above, requires a note of explanation. The "mean square contingency," being the sum of squares divided by positive frequencies, can only be zero when each constituent is zero; that is to say, when there is no deviation from independent probability in any compartment of the table. But deviations of some degree are inseparable from limited samples, and only become non-existent in the mass material. The mean value of ϕ^2 in such case may be shown to be (number of grades of first character minus 1) × (number of grades of second character minus 1) / N, and in our instance is 4 × 4 ÷ 996 or ·01606. The excess of ϕ^2, over and above this value which is incident to sampling, is all that can be attributed to correlation; and this excess in the above instance is ·02814 – ·01606 or ·01208.

The proof is as follows:—If n_c is the number in the total N committing crime (c), and n_p the number in the total N possessing form of palate (p), the expected number in the total N combining (c) with (p) will be $n_c n_p/N$. If n_{cp} is the actual observed number, $n_{cp} - n_c \times n_p/N$ is the contingent excess, and the square contingency for all crimes and palates is

$$\chi^2 = S\,(n_{cp} - n_c n_p / N)^2 / n_c n_p / N.$$

Now, the standard deviation of $n_{cp} - n_c n_p/N$ may be shown to be $\sqrt{\{n_c n_p / N \,.\, (1-n_c/N)(1-n_p/N)\}}$; and it follows that χ^2 has a mean value, apart from any actual contingency, but due only to the errors of sampling, equal to

$$S\,(1-n_c/N)\;(1-n_p/N)$$

This summed for every compartment in the table is (number of rows – 1) × (number of columns – 1) which is the correction for χ^2. The correction for ϕ^2 is $1/N$th of this.

Of course the actual value of ϕ^2 may be less than the mean or expected value found above; but such negative values must be interpreted as strengthening the evidence that there is no contingency.

As we have stated, the figures in the independent probability table above are the *average* values of the frequencies to be expected from an indefinitely large number of random sortings. It is only on the *average* that the expected frequencies would correspond exactly to these figures: any *individual* frequency would be expected to deviate from the mean value within a certain range determined by the standard deviation of the probability frequencies. Thus, the frequency in the D.H. compartment of the independent probability table is 7·07: which is to say that, based on the result of a large number of random sortings, the expected frequencies of individuals in the "H" group who are included amongst those in the "D" group will have a mean value of 7·07. But for *individual* sortings, the expected frequencies will deviate from this mean value to the extent of the expression $\sqrt{npq}$ — where (p) is the probability of any individual falling into a particular compartment; (q) is the counter probability of his appearing in any other than this compartment; and (n) is the numerical strength of the total population being sorted. In the present instance, the value of (p), or the chances of any individual being included in the D.H. division, $= \frac{7 \cdot 07}{996}$, and the chances (q) of his being excluded from this division $= \frac{996 - 7 \cdot 07}{996}$ $\therefore \sqrt{npq} = \sqrt{\frac{7 \cdot 07 \times 988 \cdot 93}{996}} = 2 \cdot 65$. This value, 2·65, is the standard deviation (σ), or variability from the mean value, 7·07, of the expected frequency within the D.H. compartment. And, accordingly, the probable error of the expected mean frequency for individual sortings $= \cdot 6745 \times 2 \cdot 65 = 1 \cdot 78$, and twice the probable error $= \pm 3 \cdot 57$. From the value of this mean expected frequency, 7·07, in relation to its probable error, $\pm$ 3·57, we know that, in four random sortings out of five, the frequency within the D.H. compartment of the independent probability table will be something between 3·50 and 10·64. The actual frequency for this compartment, *i.e.*, the number of the damage group with high palates, is 10—a number within the expected range.

The values of twice the probable errors of the expected frequencies calculated, as described above, for each of its compartments, are given in the columns of Table 37, headed "2 p.e." In this table there are twenty-five compartments; and, assuming there be no contingency between palate-shape and crime, the sub-contingencies, represented by the figures in the "excess" columns, should not be greater than the attached value of twice the probable errors, in more than five instances. In fact, these deviations are greater than the probable error values in six instances; which shows that, so far as the present statistics are concerned, there is some significant relationship between the shape of a criminal's palate and the type of crime he commits, although the extent of this relationship, measured by the coefficient of contingency, C_2, is very small, ·110.

The contingency with intelligence, ·228, is double the contingency with crime—the frequencies of nine out of fifteen of the palate-intelligence compartments deviating from the mean expected frequencies by more than twice the probable error of the difference. From the evidence of these contrasted contingencies, we would conclude that the small apparent association between palate-shape and crime is a spurious one, due solely to the fact that the criminal sub-groups have different degrees of average intelligence. The weak-minded, amongst whom narrow and Λ-shaped palates are disproportionately distributed, are in much larger proportion in the "damage" and "sexual" criminal sub-groups, which also exceed the other crime groups in their proportion of Λ-shaped palates. This conclusion is confirmed by Table 39, where palate statistics of another group of 500 convicts (Records 2,500 to 3,000) are presented, and their contingencies with crime and intelligence analysed. The values of C_2 here are, respectively, zero and ·125, or—according to these statistics, which record the same shape of palate for the feeble-minded as for the intelligent—the correlation between the shape of a criminal's palate and the crime he commits is practically nil.

Shape of Nose.—The statistics (Records 1 to 1,000), and contingencies of nose-shape with crime and with intelligence, are given in Tables 40 and 41. It will be seen that with regard to the crime categories, in two instances only—the concave noses of the "fraudulent" group, and the convex noses of the "stealing" group—do the actual, deviate from the expected, frequencies, by more than twice the probable error of the differences; and that, within the "intelligence" categories, such a degree of deviation occurs in only three instances—the concave noses of the "weak-minded" and the "intelligent" groups, and the undulating noses of the weak-minded. The individual contingencies, therefore, of nose-shape with both crime and intelligence, are none of them greater than would be expected for frequency distributions determined solely by the laws of independent probability: and the correlation of this character with crime, ·082, and with intelligence, ·112, may both be regarded as practically insignificant of any organic relationship.

Colour of Eyes and Nature of Crime.

Excess of actual, over expected, frequencies and twice the probable error of sampling

Nature of Crime.	B, BG.		X.		G, XG, GGn.		H, Gn.	
	Exc.	2 p.e.	Exc.	2 p.e.	Exc.	2 p.e.	Exc.	2 p.e.
Damage to property	−2·48	±4·32	+ ·78	± 4·47	− ·84	±3·97	+2·54	±3·41
Stealing and burglary.	+4·56	±9·90	+3·20	±10·20	−2·85	±9·19	−3·91	±7·98
Sexual offences ...	+2·13	±4·95	− ·86	± 5·12	−3·71	±4·56	+2·44	±3·91
Violence to the person.	− ·01	±7·16	−6·14	± 7·40	+4·67	±6·61	+1·48	±5·70
Forgery and fraud	−4·20	±6·60	+3·01	± 6·82	+3·72	±6·09	−2·55	±5·24

Colour of Eyes and Intelligence.

Excess of actual, over expected, frequencies and twice the probable error of sampling.

Intelligence.	B, BG.		X.		G, XG, GGn.		H, Gn.	
	Exc.	2 p.e.	Exc.	2 p.e.	Exc.	2 p.e.	Exc.	2 p.e.
Weak-minded ...	−1·98	±6·93	+ ·04	±7·16	−1·81	±6·42	+3·74	±5·51
Unintelligent ...	+2·22	±7·47	−3·10	±7·71	− ·90	±6·92	+1·78	±5·94
Fairly intelligent	−4·72	±8·06	+ ·54	±8·32	*+9·05*	*±7·48*	−4·88	±6·43
Intelligent ...	+4·46	±8·32	+2·52	±8·59	−6·35	±7·73	− ·62	±6·65

Coefficient of contingency of colour of eyes with nature of crime ... ·000
Correlation ratio of colour of eyes with age ... ... ·108 ± ·030
Coefficient of contingency of colour of eyes with intelligence ... ·000

Table 43.—Contingency of Colour of Hair with Nature of Crime.

892 Criminals.

Nature of Crime.	Black.			Dark brown.			Light brown.			Blonde or red.			Totals.
	F.	Exc.	2 p.e.	F.	Exc.	2 p.e.	F.	Exc.	2 p.e.	F.	Exc.	2 p.e.	
Damage to property ...	16	2·1	5·0	22	−4·1	6·8	20	2·6	5·6	3	− ·6	2·6	61
Stealing and burglary	81	−6·4	12·0	172	7·5	15·7	110	·7	13·2	21	−1·8	6·4	384
Sexual offences ...	21	−2·2	6·4	49	5·3	8·7	24	−5·0	7·1	8	1·9	3·3	102
Violence to the person	54	4·2	9·3	84	−9·8	12·4	66	3·6	10·3	15	2·0	4·8	219
Forgery and fraud ...	31	2·3	7·1	55	1·0	9·6	34	−1·9	7·9	6	−1·5	3·7	126
Totals	203			382			254			53			892

Coefficient of contingency of colour of hair with nature of crime ... ·000

Table 44.—Contingency of Colour of Hair with Nature of Crime and Intelligence

499 Criminals.

Nature of Crime.	Black, dark brown, light brown.			Red.			Blonde.			Totals.
	F.	Exc.	2 p.e.	F.	Exc.	2 p.e.	F.	Exc.	2 p.e.	
Damage to property	32	−1·4	7·8	1	−1·1	1·9	4	2·4	1·7	37
Stealing and burglary ...	198	2·3	14·7	13	·8	4·6	6	−3·1	4·0	217
Sexual offences	46	·9	8·6	2	− ·8	2·3	2	− ·1	2·0	50
Violence to the person ...	95	− ·6	11·9	5	− ·9	3·3	6	1·5	2·8	106
Forgery and fraud	79	−1·3	11·1	7	2·0	3·0	3	− ·7	2·6	89
Intelligence :—										
Intelligent	129	−3·6	13·7	12	3·7	4·7	6	− ·2	4·0	147
Fairly intelligent... ...	128	2·6	13·7	3	−4·8	2·6	8	2·1	2·5	139
Unintelligent	104	·3	12·7	7	·5	3·0	4	− ·8	1·7	115
Weak-minded	89	·6	11·8	6	·5	4·0	3	−1·1	2·6	98
Totals	450			28			21			499

Coefficient of contingency of colour of hair with nature of crime ... ·006
" " " " intelligence ... ... ·018

With regard to hair-colour, two contingency tables are provided—one in which the hair-colours of 892 convicts (Records 1 to 1,000) are classified within the four categories, black, dark-brown, light-brown, and blonde or red; and the other in which the hair-colours of 499 convicts (Records 2,501 to 3,000) are grouped within the three classes, black or brown, red, and blonde. The 108 records omitted from the former table—only 892 out of 1,000 observations being included therein—are those of hair described in the schedule as grey, the original colour of the hair, before turning grey, being unrecorded. It will be seen that in no instance are the sub-contingencies, *i.e.*, the differences between the actual, and expected, frequencies, within any compartment of the two tables, greater than twice the value of the expected differences. Upon the evidence of these statistics, we accordingly conclude that there is no relation between the colour of a criminal's hair and either the type of crime he commits, or—according to the frequencies in Table 44—his degree of intelligence.

Asymmetry of Face.—An asymmetrical conformation of head and face has been emphasised by criminologists as a characteristic peculiarly criminal. The asymmetry of her skull was one of the principal stigmata or anomalies upon which Lombroso based the diagnosis of Charlotte Corday's instinctive criminality. Statistics of cephalic asymmetry will be considered later. In Tables 45, 46, 48, we present now the analysed statistics of facial asymmetry, measured from three different points of view—(1) statistics of general asymmetry of face: Table 45, recording the observer's impressions—resulting from direct inspection of 997 convicts (Records 1 to 1,000)—of faces that appeared to be symmetrically formed on the right and left of the median line, and of those that gave the impression of being asymmetrical; (2) statistics of nose deflection: Tables 46, 47 recording, for 996 convicts (Records 1 to 1,000), the relative frequencies of noses deflected to the right, and to the left, and of those without perceptible deflection; (3) statistics of differences in length between the right and left ears: Tables 48, 49, 50, recording to the nearest millimetre, and irrespective of sign, differences of 0 mm., 1 mm., 2 and 3 mm., 4 mm. and over, between the measurements of the right and left ear given in the schedule (Records 1 to 1,000).

TABLE 45.—CONTINGENCY OF ASYMMETRY OF FACE WITH NATURE OF CRIME, AND CONTINGENCY FOR CONSTANT INTELLIGENCE.

"R"—asymmetry to right. "="—symmetrical. "L"—asymmetry to left.

"f"—observed frequency. "exc."—excess above the expected frequency in the intelligence group. "2 p.e."—twice the probable error of the difference.*

Nature of Crime.	Total (all degrees of intelligence).							Intelligent.						
	R		=		L		Totals.	R		=		L		Totals.
	f	exc. 2 p.e.	f	exc. 2 p.e.	f	exc. 2 p.e.		f	exc. 2 p.e.	f	exc. 2 p.e.	f	exc. 2 p.e.	
Damage to property ...	32	8·2 5·1	21	−12·8 5·3	12	4·6 3·3	65	2	1·0 1·2	2	− ·6 1·3		− ·4 ·8	4
Stealing and burglary ...	152	−6·9 10·2	230	4·5 8·4	52	2·4 6·7	434	29	−7·2 5·6	100	3·8 6·2	18	3·4 3·9	147
Sexual offences	52	11·4 6·5	50	−7·7 6·7	9	−3·7 4·3	111	11	3·6 3·1	17	−2·6 3·4	2	−1·0 2·1	30
Violence to the person ...	91	3·0 8·7	116	−6·1 9·0	28	1·1 5·9	235	35	8·4 5·2	61	−9·6 5·7	12	1·2 3·6	108
Forgery and fraud ...	38	−17·6 7·4	101	22·0 7·6	13	−1·4 4·9	152	22	−5·8 5·2	83	9·1 5·8	8	−3·2 3·6	113
Totals	365		518		114		997	99		263		40		402

* In this investigation, in place of calculating the probable error of n_{sr} as explained on p. 108, the probable error of $n_{sr} - n_s n_r / n$ has been computed (see note * next page).

Nature of Crime.	Unintelligent.							Weak-minded.						
	R		=		L		Totals.	R		=		L		Totals.
	f	exc. 2 p.e.	f	exc. 2 p.e.	f	exc. 2 p.e.		f	exc. 2 p.e.	f	exc. 2 p.e.	f	exc. 2 p.e.	
Damage to property ...	7	1·3 2·5	8	·4 2·6		−1·6 1·6	15	23	−1·2 4·2	11	−4·3 3·9	12	5·5 2·9	46
Stealing and burglary ...	58	−4·7 5·9	85	1·7 6·1	21	2·9 3·8	164	65	·3 5·5	45	4·2 5·2	13	−4·4 3·8	123
Sexual offences	23	3·9 4·3	23	−2·4 4·4	4	−1·5 2·7	50	18	1·7 3·5	10	− ·3 3·3	3	−1·4 2·6	31
Violence to the person ...	27	·2 4·9	36	·5 5·0	7	− ·7 3·1	70	29	−1·0 4·5	19	·1 4·3	9	·9 3·1	57
Forgery and fraud ...	10	− ·7 3·3	14	− ·2 3·4	4	·9 2·1	28	6	·2 ·5	4	·3 2·1	1	− ·6 1·5	11
Totals	125		166		36		327	141		89		38		268

All degrees of intelligence :—

$$\phi^2 = (29\cdot723 - 2 \times 4)/997 = \cdot0218.$$

Coefficient of contingency of nature of crime with asymmetry of face :—

$$\sqrt{\cdot0218/1\cdot0218} = \cdot146.$$

Within the intelligence grades :—

$$\phi^2 = (12\cdot844 + 4\cdot644 + 8\cdot413 - 2 \times 4 \times 3)/997 = \cdot0039.*$$

Coefficient of contingency equivalent to this mean square contingency (*i.e.*, leading to the same measure of improbability of a chance distribution) :—

$$\sqrt{\cdot0039/1\cdot0039} = \cdot062.$$

TABLE 46.—CONTINGENCY OF NOSE DEFLECTION WITH NATURE OF CRIME.

"R"—deflection to right. "="—no perceptible deflection. "L"—deflection to left.
Actual frequencies, "f"; excess over expected, "exc."; twice probable error of sampling, "2 p.e."

Nature of Crime.	R			=			L			Totals.
	f	exc.	2 p.e.	f	exc.	2 p.e.	f	exc.	2 p.e.	
Damage to property ...	41	5·72	7·87	14	*−8·68*	*6·35*	9	2·96	3·31	64
Stealing and burglary...	241	·13	18·23	156	1·12	15·43	40	−1·24	8·49	437
Sexual offences... ...	63	1·82	10·22	42	2·66	8·29	6	*−4·47*	*4·34*	111
Violence to the person	126	−1·32	14·22	80	−1·87	11·69	25	3·20	6·23	231
Forgery and fraud ...	78	−6·33	11·85	61	6·78	9·66	14	−·44	5·09	153
Totals	549			353			94			996

Coefficient of contingency of nose deflection with nature of crime ... ·021

* The proof of this correction is similar to that in * note of p. 107 for simple contingency. If the number n_a, in the total n of any intelligence grade, have type of asymmetry (a), and if n_c in the same intelligence grade commit crime (c), the number in the grade expected to combine (a) and (c) is $n_a n_c/n$. If n_{ac} is the actual observed number, $n_{ac} - n_a n_c/n$ is the contingent excess, and $\phi^2 = \frac{1}{N} S\,(n_{ac} - n_a n_c/n)^2/n_a n_c/n$, summed for all associations of (a) and (c) in an intelligence grade, and for all intelligence grades into which the total N are classed.

Now, as before, $(n_{ac} - n_a n_c/n)^2$ has a mean value—assuming that no contingency exists between (a) and (c) apart from that due to error of sampling only—equal to $n_a n_c/n \cdot (1 - n_a/n)(1 - n_c/n)$; and consequently, ϕ^2 has a mean value $\frac{1}{N} S\,(1 - n_a/n)(1 - n_c/n)$, which summed for each (a) (c) compartment of the table, and for each intelligence grade is $\frac{1}{N}$ (grades of $(a) - 1$) $\times$ (grades of $(c) - 1$) $\times$ grades of intelligence, or in our case, $2 \times 4 \times 3$.

TABLE 50.

Intelligence.	0			1 mm.			2 or 3 mm.			4 mm. and over.			Totals
	f	exc.	2 p.e.	f	exc.	2 p.e.	f	exc.	2 p.e.	f	exc.	2 p.e.	
Weak-minded	142	− 3·15	15·02	34	−7·93	8·55	62	6·36	9·78	30	4·73	6·69	268
Unintelligent	188	10·89	16·28	51	− ·17	9·40	57	*−10·89*	*10·73*	31	·17	7·37	327
Intelligent ...	210	− 7·73	17·59	71	8·10	10·36	88	4·54	11·80	33	−4·90	8·15	402
Totals ...	540			156			207			94			997

Coefficient of contingency of difference of ear lengths with intelligence ... ... ·042

It will be seen from the method by which we have elected to analyse these statistics—the method of contingency—that asymmetry has been regarded by us as an anatomical character, to be differentiated by its degree only, and independently of its sign, *i.e.*, whether positive, or negative, to the right or left. Criminologists who have asserted the existence of association between criminality and asymmetry have looked upon this character in the way described—as a quantitative deviation from perfect symmetry. Now, an existing association between asymmetry, thus defined, and criminality, would not transpire by any method which measured the means of asymmetry upon the assumption that, anatomically, deviations to the right or left have a positive or negative value, relatively to deviations in an opposite direction. We therefore decided that the alleged association been asymmetry and crime would be best tested by analysing our statistics of asymmetry according to the method of contingency, which gives the measure of the extent to which different kinds of criminals differ (1) in the perfect symmetry of their features (=), (2) in their asymmetry to the right (R), and (3) in their asymmetry to the left (L).

With regard to facial asymmetry, Table 45, four contingency tables are given—the first yielding a crude contingency coefficient of asymmetry with nature of crime, independently of the varying intelligence of the criminals examined; and the other three tables yielding three coefficients, which, combined, give the best estimate available of the correlation between asymmetry and crime, for a uniform degree of intelligence. It will be seen by inspecting the frequencies within the compartments of the first table, where no regard is given to intelligence, that 8 in 15, or one-half of the observed frequencies, deviate from the expected, or independent probability, frequencies, by more than twice the probable amount. According to these statistics, the crude correlation of facial asymmetry with nature of crime, given by the coefficient of contingency, C_2, = ·146. Turning now to the other three tables, where the contingencies have been determined from the same total group of criminals, but, this time, not until after their preliminary differentiation into the three groups, intelligent, unintelligent, and weak-minded—it will be seen, by examining the frequencies within the compartments of these tables, that not more than 10 in 45 of the observed, deviate here from the expected, frequencies, by more than twice the probable amount of deviation. As already explained, a purely random sorting of groups, numerically similar to those in the above table, would yield frequencies of which as many as 9 in 45 would be expected to deviate from the theoretic frequencies, to this extent. We conclude, therefore, that the crude contingency coefficient of crime with asymmetry—found from the first table—must be attributed mainly to a contingency of intelligence with both asymmetry and nature of crime ; and that the *real* coefficient of contingency of asymmetry of face with nature of crime, *i.e.*, the coefficient, when the degree of intelligence of individuals within the various crime categories is approximately uniform, equals ·062. In other words, upon the evidence of our statistics, there is no significant relation between the degree of asymmetry of a criminal's face and the crime he commits.

This conclusion is confirmed by the statistics of nose and ear asymmetry given in the contingency Tables 46, 49. The coefficients, ·021 and ·000, measuring the contingencies of these characters with crime, are insignificant; and show that there is no appreciable degree of relationship between asymmetry and crime.

So far, we have been occupied in transmuting crude data into statistical evidence. In accordance with the plan set forth on p. 38, we have been reducing our data to a form in which they can be utilized for elucidating the problem before us—whether there be any characteristic physical differences between different orders of criminals? This preliminary examination has provided series of statistical facts—of mean values and of coefficients—which, although inadequate for drawing definite conclusions, when regarded separately, when considered together, should lead to a general solution of the question. And first, we must seek further evidence in two directions. The statistical facts at present in hand consist of *mean* values only of 37 physical characters, and of the relation of these mean values between criminals distinguished by the perpetration of different types of crime. For the satisfactory interpretation of these facts, we also require to know (1) the variability, and general character of distribution, of these 37 physical attributes, and the relation between their variability within the several criminal sub-groups; and (2) the relation between the means and variability of the physical characters under investigation, for criminals, not only when differentiated by the nature of the delinquent's crime, but when distributed on a continuous scale of increasing criminality.

B. *The standard deviations or variability of the 37 physical characters under investigation.*

The absence of significant difference in the mean value of any character in contrasted populations is not in itself sufficient evidence for concluding that there is no difference of any kind in the whole distribution of the character. For instance, thieves, relatively to sexual offenders, might be characterised by the possession of very large, as well as of very small, heads, yet, if the former just nicely balanced the latter, measurements of cephalic circumference might yield identical mean values of circumference for both sexual offenders and thieves. Such a happy blending of neutralising opposites is not a very likely contingency: but the argument that it may occur is familiar; and the illustration of it we have given might have been taken direct from the works of Lombroso, where statements that criminals are characterised by a conjoint possession of opposite extreme degrees of attributes—by large and small heads, by tall and diminutive stature, by projecting, as well as by receding, jaws, &c.—are frequently met with. A less controversial argument is the one contained in Lombroso's theory of anomaly, that criminals are stigmatized by extreme degrees of character in one direction only—by low foreheads, receding chins, outstanding ears, &c. The exact degree of truth in this proposition might often be veiled by a mere comparison of mean values; although it is difficult to see how a preponderance of extreme degrees of any character could fail, on the balance, to disturb the value of its mean. Nevertheless, it is clear that to establish scientific authority either for, or against, the statements we have quoted, to challenge successfully the somewhat naïve, but dogmatic, theory of anomaly, the question at issue becomes one, not of contrasted mean values, but of the relation between standard deviations.

The standard deviation is a measure of the variability, or average difference, between the individual values of a series of measurements—the mean of the series being taken as a standard of comparison. Each measurement of a series is compared with the mean of the series, and the difference between it and the mean is squared. Then the square-root of the average value of the sum of these squares is the standard deviation. It is obvious that any differences in the frequencies of extreme degrees of contrasted series of measurements will appear in differences between their standard deviations. An illustration of this will be found in the statistics of shade of hair, Table 29. These statistics show that, relatively to other criminals, both dark and light, as opposed to medium shades, of hair, preponderate amongst fraudulent criminals. This fact, however, is not brought out by comparing the means of hair-shade for different orders of criminals; it does not emerge until their respective standard deviations of hair-shade are compared. The mean hair-shade of fraudulent criminals is different, but not markedly so, from the mean of criminals generally; but the standard deviation of hair-shade for this particular criminal group stands out in marked contrast to the much smaller value for the other groups. Accordingly we have calculated for each criminal sub-group as well as for total criminals, the standard deviation of all the physical characters under investigation; and the values of these standard deviations, (Cols. 1), together with the differences between the values for total criminals, and those for each of the sub-groups (Cols. 2), contrasted, in each case, with twice the probable error of the standard deviation in limited samples, (Cols. 3), are presented in Table 51.*

Referring to the figures in the second column (headed "Excess") of this table, it will be seen how (*i.e.*, whether in a positive or in a negative direction), and to what extent, the standard deviation of the criminal sub-groups differ from those of the total group of criminals, *i.e.*, from the standard deviation of a total sample of which each sub-group is a selected sub-sample. It will be seen that the values of the sub-group differ, sometimes positively, sometimes negatively, but in every case to a greater or lesser extent, from the values of the total group. But absolutely unselected samples, drawn entirely at random from an indefinitely large population, will never yield identical values of standard deviation: differences of some degree will always appear between the variabilities of sub-samples and the variability of the general sample from which they have been drawn. The question here is, whether the differences recorded in Table 51 are, on the whole, greater than those which, as we have just described, result inevitably from random sampling? Now the test of real, or only apparent, differentiation, the proof of the significance or non-significance of crude differences between samples, is given, firstly, by balancing the number of positive differences against the negative—these should tend to balance each other if the differences are normally distributed; and, secondly, by comparing the several differences with their probable errors—in the absence of a real differentiation, in only one case out of five, should the value of the difference be greater than that of twice its probable error. Now, in the above table considered as a whole, the recorded differences (Cols. II) for all the characters† are 57 of them positive and 71 negative; whereas, exactly balanced, there would be 64 of each. The differences recorded are accordingly, in this respect, precisely of the kind to be expected from random sampling. And in amount they also approximate to similar expectation. Excluding those relating to hair-shade and quantity, there are in all, 128 samples; and, of these, the difference between the standard deviation of sub-group and total group is greater than the value of twice the probable error of the difference, in 32 instances, and is greater than three times the probable error, in 10 instances. If the 128 sub-groups were pure random, instead of selected, samples, the number of instances when the standard deviation would be expected, according to the laws of probability, to deviate to these respective extents, would be $23 \pm 3{\cdot}0$ and $6 \pm 1{\cdot}5$, *i.e.*,‡ the number expected to be greater than twice the probable error might be anything between 20 and 26, and, greater than three times the probable error, might be anything between four and eight. Moreover, the differences greater than twice the probable error of the difference are all of them fairly equally distributed between the sub-groups—four of them attaching to the "damage" group, five to the "stealing," seven to the "sexual" and "fraudulent," and nine to the "violence" group. Accordingly, considering Table 51 as a whole, we can only conclude, from the evidence of the differences recorded therein, that very little, if any, real differentiation of variability exists in the physical characters of different orders of criminals. And with the statement of this conclusion, Lombroso's theory of anomaly collapses. This theory asserts that different kinds of criminals are so patently differentiated from each other that individual thieves, forgers, incendiaries, etc., are distinguishable by the mere inspection of the size and form of physical attributes such as we have been investigating. Of course, upon the evidence of this investigation, we cannot assert that criminals, taken "*en masse*," are not differentiated to any extent by the possession of extreme degrees of certain physical features. The samples we have been examining are admittedly small ones; and had they been ten times larger, some significant differences, at present concealed by the magnitude of the probable errors involved, might have emerged. All we can assert positively is that evidence of significant differences in variability have not been revealed by the analysis of our restricted data—which, however, do reveal this fact that such differences, if existent, must at any rate be microscopic in amount.

* The figures in the fourth column of this table are the values of the ratio—known as the coefficient of variation—of the standard deviation to the mean, expressed as a percentage, $\left(\frac{\text{st. dev.} \times 100}{\text{mean}}\right)$. They express relative variability: and through them the variabilities of the several characters are legitimately inter-comparable. For instance, the standard deviation, or apparent variability, of head circumference, (15·73), is twice as great as that of head-height, (8·01): but as shown by their coefficients of variation, the actual amount of variability of the latter, 6·06, is more than twice as great as that of the former character, 2·81.

† We leave unconsidered, for the time being, the hair-shade and quantity characters, whose relation with crime is undoubtedly significant, and the explanation of which will be criticised later.

‡ The values of the probable errors here equal $\cdot6745 \sqrt{npq}$. In the first instance the value is $\cdot67 \times \sqrt{128 \times \frac{23}{128} \times \frac{105}{128}} = 2{\cdot}9$, and in the second instance it is $\cdot67 \times \sqrt{128 \times \frac{6}{128} \times \frac{122}{128}} = 1{\cdot}5$.

TABLE 51.—STANDARD DEVIATION, EXCESS OF S.D. OF GROUP OVER S.D. OF TOTAL, COEFFICIENT OF VARIABILITY

Nature of Crime.	Head Length.				Head Breadth.				Head	
	SD.	Exc.	2 PE±.	Cft. of Variation.	SD.	Exc.	2 PE±.	Cft. of Variation.	SD.	Exc.
All Crimes	6·39		·06	3·34	5·48		·05	3·63	3·00	
Malicious damage to property	6·88	+·49	·67	3·60	5·48	+·00	·53	3·64	3·05	+·05
Stealing and burglary ...	6·18	−·21	·16	3·22	5·34	−·14	·14	3·54	2·96	−·04
Sexual offences	5·84	−·55	·39	3·03	5·43	−·05	·36	3·61	2·72	−·28
Violence to the person ...	6·85	+·46	·35	3·56	4·79	−·69	·24	3·18	3·15	+·15
Coining	6·25	−·14	·78	3·25	5·12	−·36	·64	3·39	3·27	+·27
Forgery and Fraud	6·65	+·26	·38	3·42	5·83	+·35	·35	3·83	3·03	+·03

	Facial Breadth.				Facial Index.				Auricular Alve	
	SD.	Exc.	2 PE±.	Cft. of Variation.	SD.	Exc.	2 PE±.	Cft. of Variation.	SD.	Exc.
All crimes	5·63		·05	4·10	7·26		·07	6·52	5·65	
Malicious damage to property	5·04	−·59	·49	3·68	6·70	−·56	·65	5·93	6·01	+·36
Stealing and burglary ...	5·58	−·05	·15	4·06	7·01	−·25	·18	6·31	5·74	+·09
Sexual offences	5·66	+·03	·38	4·13	6·98	−·28	·47	6·28	5·13	−·52
Violence to the person ...	5·49	−·14	·28	3·99	7·84	+·58	·40	6·97	5·62	−·03
Coining	5·78	+·15	·72	4·18	6·91	−·35	·87	6·18	} 5·66	+·01
Forgery and Fraud	6·13	+·50	·35	4·43	7·90	+·64	·45	7·11		

	Chin Projection.				Ears Length (Right).				
	SD.	Exc.	2 PE±.	Cft. of Variation.	SD.	Exc.	2 PE±.	Cft. of Variation.	SD.
All crimes	8·47		·26	10·79	4·88		·15	7·58	5·00
Malicious damage to property	8·08	−·39	·96	10·84	5·12	+·24	·51	8·14	4·97
Stealing and burglary ...	8·27	−·20	·38	10·75	4·86	−·02	·22	7·54	5·05
Sexual offences	8·52	+·05	·77	10·75	4·61	−·27	·42	7·26	4·65
Violence to the person ...	8·56	+·09	·53	10·77	4·47	−·41	·28	7·07	4·64
Forgery, Coining and Fraud...	8·59	+·12	·66	10·13	4·90	+·02	·38	7·42	4·82

	Inclination of Nose.			Form of Lips.			Shade of Eyes.			Sh
	SD.	Exc.	2 PE±.	SD.	Exc.	2 PE±.	SD.	Exc.	2 PE±.	SD.
All crimes	·59		·02	·78		·02	1·95		·08	2·72
Malicious damage to property	·57	−·02	·07	·68	−·10	·08	1·73	−·22	·28	1·31
Stealing and burglary ...	·63	+·04	·04	·78	·00	·04	2·20	+·25	·14	2·30
Sexual offences	·64	+·05	·06	·77	−·01	·07	1·10	−·85	·15	1·88
Violence to the person ...	·52	−·05	·05	·76	−·02	·05	1·87	−·08	·17	1·80
Forgery, Coining and Fraud...	·54	−·05	·04	·76	−·02	·06	1·85	−·10	·18	4·50

AND TWICE THE PROBABLE ERROR, OF 26 QUANTITATIVE PHYSICAL CHARACTERS, AND OF 16 CHARACTERS.

Index.		Head Circumference.				Head Height.				Facial Length.			
2PE±.	Cft. of Variation.	SD.	Exc.	2PE±.	Cft. of Variation.	SD.	Exc.	2PE±.	Cft. of Variation.	SD.	Exc.	2PE±.	Cft. of Variation.
·03	3·82	15·73		·15	2·81	8·01		·08	6·06	7·70		·08	6·22
·29	3·87	16·68	+·95	1·62	2·99	8·95	+·94	·87	6·83	7·69	−·01	·74	6·32
·08	3·76	15·21	−·52	·39	2·72	8·02	+·01	·21	6·03	7·50	−·20	·20	6·05
·18	3·48	14·85	−·88	·99	2·66	7·43	−·58	·50	5·70	7·50	−·20	·50	6·06
·16	4·02	16·94	+1·21	·85	3·02	8·03	+·02	·40	6·16	8·06	+·36	·41	6·55
·41	4·17	12·95	−2·78	1·62	2·32	7·45	−·56	·93	5·59	7·43	−·27	·93	6·01
·17	3·87	15·57	−·16	·89	2·76	7·35	−·66	·43	5·53	8·11	+·41	·46	6·50

olar Diameter.		Auricular Nasal Diameter.				Gnathic Index.				Occipital Projection.			
2PE±.	Cft. of Variation.	SD.	Exc.	2PE±.	Cft. of Variation.	SD.	Exc.	2PE±.	Cft. of Variation.	SD.	Exc.	2PE±.	Cft. of Variation.
	4·84	5·58		·05	4·79	3·60		·03	3·59	7·55		·26	8·72
·58	5·21	5·56	−·02	·53	4·84	3·41	−·19	·33	3·38	8·25	+·70	·98	9·87
·15	4·92	5·56	−·02	·15	4·77	3·51	−·09	·09	3·49	6·76	−·79	·31	8·54
·34	4·42	5·13	−·45	·34	4·43	3·53	−·07	·24	3·51	70·2	−·53	·63	7·88
·25	4·83	5·65	+·07	·25	4·86	3·63	+·03	·16	3·62	8·18	+·63	·51	8·59
·30	4·84	5·61	+·03	·29	4·77	3·89	+·29	·20	3·91	8·58	+1·03	·68	9·10

Ears Length (Left).			Distance between Eyes.				Eye-sight.			Hearing.		
Exc.	2PE±.	Cft. of Variation.	SD.	Exc.	2PE±.	Cft. of Variation.	SD.	Exc.	2PE±.	SD.	Exc.	2PE±.
	·15	7·80	4·92		·21	4·40	1·80		·05	·39		·01
−·03	·59	7·97	4·72	−·20	·74	4·13	1·93	+·13	·23	·46	+·07	·05
+·05	·23	7·85	5·08	+·16	·33	4·43	1·72	−·08	·08	·37	−·02	·02
−·35	·42	7·34	3·94	−·98	·53	3·44	1·63	−·17	·17	·40	+·01	·04
−·36	·29	7·39	4·72	−·20	·44	4·09	1·83	+·03	·11	·36	−·03	·03
−·18	·37	7·33	5·18	+·26	·52	4·51	1·96	+·16	·17	·42	+·03	·03

ade of Hair.		Complexion.			Hair Texture.			Hair Quantity.			Facial Pallor.		
Exc.	2PE±.	SD.	Exc.	2PE±.	SD.	Exc.	2PE±.	SD.	Exc.	2PE±.	SD.	Exc.	2PE±.
	·11	2·23		·10	1·10		·05	1·91		·08	1·22		·05
−1·41	·20	2·41	+·18	·38	1·30	+·20	·20	1·31	−·60	·20	·82	−·40	·12
−·42	·15	2·09	−·14	·14	1·13	+·03	·08	1·82	−·09	·12	1·25	+·03	·08
−·84	·25	2·25	+·02	·20	·73	−·37	·10	1·37	−·54	·18	1·17	−·05	·16
−·92	·17	1·50	−·73	·14	·91	−·19	·08	1·35	−·56	·12	1·29	+·07	·12
+1·78	·46	2·92	+·69	·30	1·28	+·18	·13	1·49	−·42	·08	1·16	−·06	·12

C.—*The general form of frequency distribution of the* 37 *characters under investigation.*

Turning now to the question of how, apart from differences in the mean and standard deviation, criminals, distinguished by various types of crime, are also differentiated by changes in the general form of the frequency distribution of their attributes, the crude distribution polygons in Figs. vii, viii, ix, contain all the information we have attempted to obtain in this direction. An examination of these diagrams, however, will show, with sufficiently clear effect, those salient features of the case which are all we desire to portray. The details of these distribution polygons—fine shades of difference that may be between the curves they represent—are of theoretic interest only, and have no practical bearing upon, and would only tend to obscure, the present issue: which is the illustration, not of how much these various frequency distributions differ in non-essential details—this could only be revealed by a complete analytical treatment, which would entail an unjustifiable expenditure of time and labour—but of how closely they correspond in features of importance.

FIG. vii.

DISTRIBUTION OF FREQUENCY OF HEAD LENGTHS IN FIVE CRIME GROUPS COMPARED WITH THAT IN THREE AGE GROUPS, AND IN THREE STATURE GROUPS.

(2,348 criminals.)

Crimes.	*Ages.*	*Statures.*
Damage to property. Stealing and burglary.	15 to 25 years.	Under 5 ft. 4 ins.
Sexual offences.	25 to 40 years.	5 ft. 4 ins. to 5 ft. 7 ins.
Violence to the person. Forgery and Fraud.	40 years and over.	5 ft. 7 ins. and over.

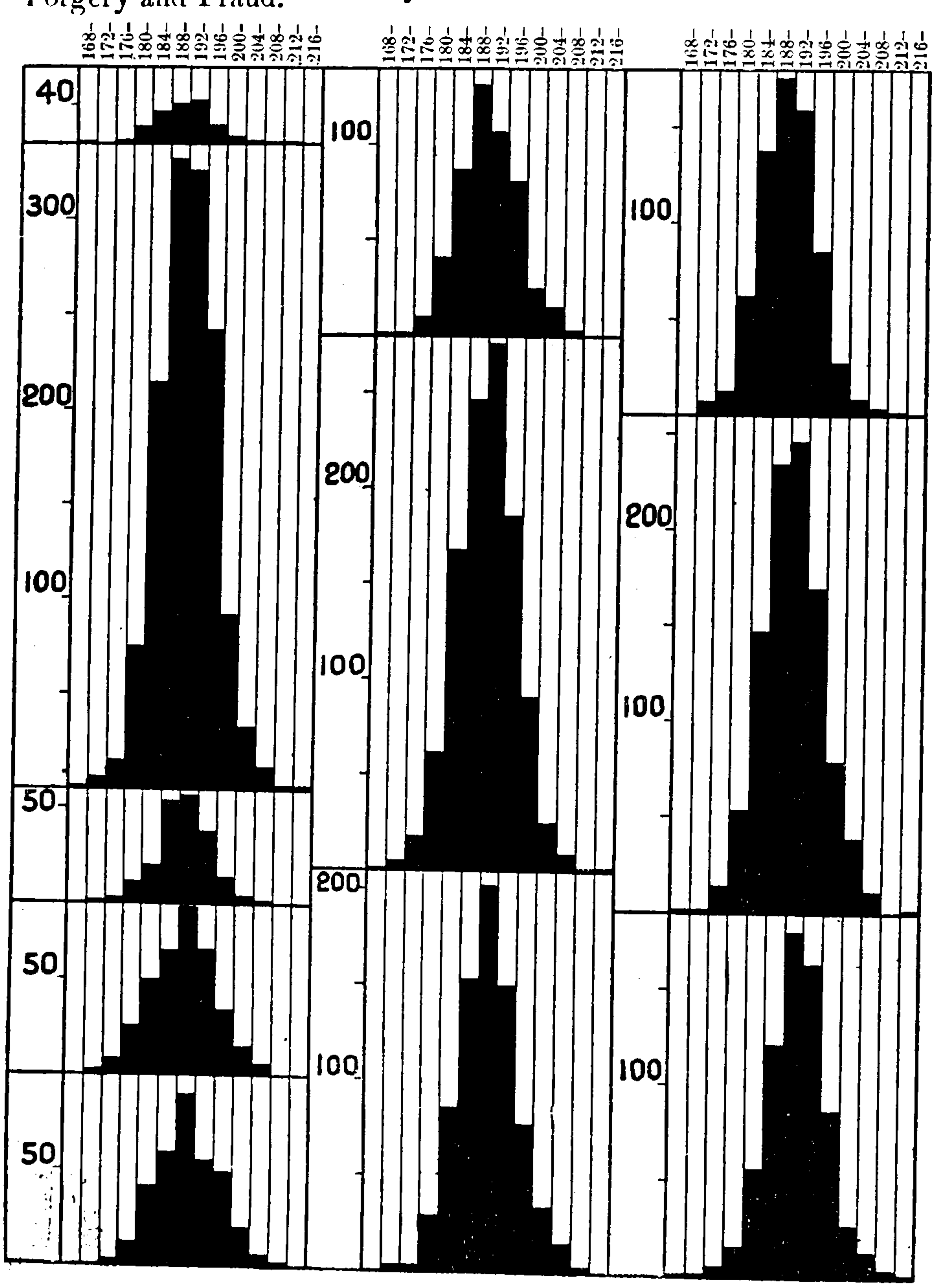
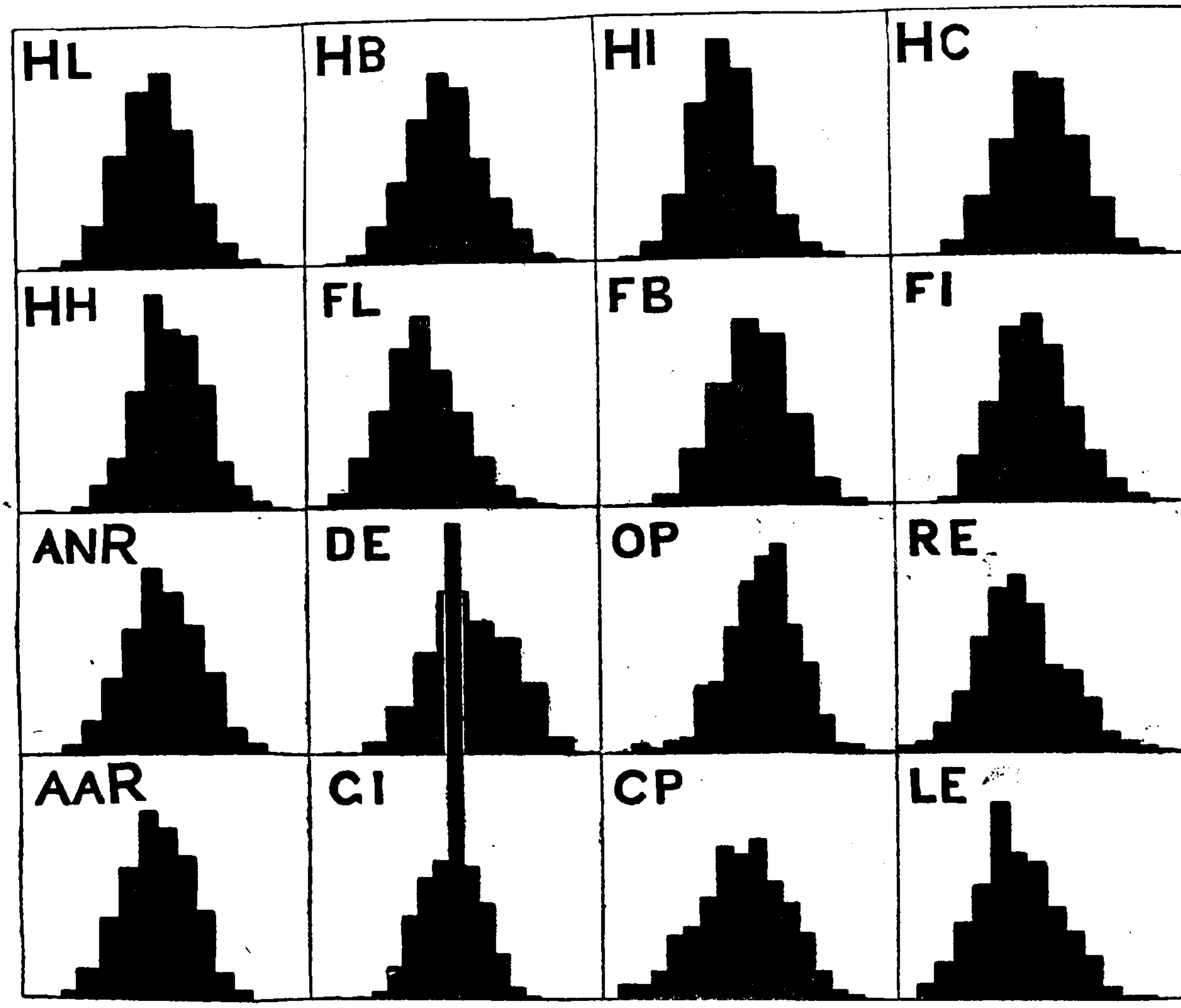


FIG. IX.

FREQUENCY DISTRIBUTIONS OF SIXTEEN HEAD MEASUREMENTS.

(2,348 criminals.)

HL. Head Length.
HH. Head Height.
ANR. Auricular Nasal Radius.
AAR. Auricular Alveolar Radius.
HB. Head Breadth.
FL. Facial Length.
DE. Distance between Eyes.
GI. Gnathic Index.
HI. Head Index.
FB. Facial Breadth.
OP. Occipital Projection.
CP. Chin Projection.
HC. Head Circumference.
FI. Facial Index.
RE. Right Ear Length.
LE. Left Ear Length.



Reduced to uniform observed range of character (width of square), and to uniform total frequency (quarter area of square).

Upon three points in particular, an examination of the frequency distributions illustrated ought to help to a decision. In the first place, in pursuance of the idea expounded on p. 31 and 82, these diagrams indicate the grounds for the view that the distribution of human characters approximates to the Gaussian type. In the case of every character,* whether the distribution be of the total measurements, or of these measurements divided into groups according to the age, the stature or crime of the subjects measured—in every case it will be seen that the form of the frequency distribution, having regard to error of numbers, answers fairly well to the distinguishing test of the normal type: that is to say, each series of measurements tends to be distributed symmetrically about the mean which corresponds fairly closely to the summit of the whole distribution; and the frequencies tend to diminish more or less rapidly on both sides of the mean, until, almost level with the axis, they tend, in both directions, to prolong the distribution into a tail. It was the uniformity of these distributions, and their close resemblance to the types usually obtained for measurable human characters, that justified our assumption of a normal distribution for those of our physical characters which were not precisely measured. A second fact revealed by these diagrams is the general tendency towards continuity in the distributions from axis to summit, and the absence of any pronounced humps at either extreme, which would inevitably be present if, according to

* A palpable exception is apparent in "Gnathic Index," where personal error, in failing to distinguish difference in two consecutive measurements which are nearly equal, unduly inflates the frequency "100."

the theory of anomaly, different kinds of criminals were stigmatised by the preponderance of extreme degrees of physical attributes. A comparison of many of the distributions at different age periods is particularly illustrative of the way in which the statement of this theory might be liable to misrepresent the real facts of the case. For instance, it would be perfectly true to fact to say that small heads preponderate amonst young people; but it would be very misleading to express this fact by the statement that a small head is an *anomaly* characteristic of youth. Small heads preponderate because large heads are less frequent; and the general average of head girth is lower in youth than in age. As the diagrams reveal, it is not only the extreme, but all degrees of measurement that change, it is the whole distribution of the character, which, as it were, moves bodily along the scale, with increasing years. On the other hand, the description of a small head as an anomaly peculiar to youth would only be intelligible on the assumption that some part of the distribution, such as the frequency of small heads, tended to decrease with age, while other parts remained unchanged. The third point of importance, illustrated by the diagrams, is that changes in the distribution of physical characters, associated with the delinquent's crime, are not visible on the surface: and consequently, they, if existent, are microscopic relatively to changes associated with his increasing age and stature, which are in many cases distinctly visible. Apart from the reasons already stated, our data are in most cases not sufficiently numerous to justify an analytical treatment of these distributions complete enough to reveal the nature of any such finer existing differences.

D.—*Changes in physical characters associated with the differentiation of criminals on an increasing scale of criminality.*

Before returning to the main thread of our argument, it will be convenient to introduce here the results obtained by correlating certain physical characters of habitual criminals with a function of their increasing criminality. The two functions we have adopted are (1) the average frequency of conviction per year of freedom, and (2) the average fraction of every year spent in prison—both functions being estimated from the date of first conviction. The details of the method by which each criminal, from information contained in his official penal record, was relegated to a position on these scales of criminality are described in part 2, chap. v., p. 268. Assuming that conviction and reconviction for crime are not purely circumstantial occurrences, and that constitutional factors play some part in this eventuality, it is a reasonable presumption that, whatever may be the ultimate nature of the criminal diathesis, increasing frequency of conviction to, and increasing periods of detention in, prison, should vary directly with increasing intensities of this diathesis. And, consequently, if this inward potentiality for committing, and being apprehended and convicted of, crime, which we call the criminal diathesis, were reflected outwardly by physical signs, it is reasonable to suppose that progressive changes in physical attributes would be associated with progressive changes in frequency of conviction to, and length of confinement in, prison. If criminals, as opposed to the law-abiding public, are stigmatised by small heads, or by eyes set closely together, criminals who have been reconvicted several times every year, or who spend a third of their lives under detention, should, presumably, be thus branded more emphatically than those who have been more rarely reconvicted, and who have suffered shorter periods of incarceration.

Unfortunately, the schedule records 2,501 to 3,000, with the 300 supplementary records, are the only ones containing sufficient information for the sorting of our subjects upon the scales of criminality adopted; and within these records the data of very few physical characters are included, although the head index, head circumference, distance between eyes, stature and weight, whose correlations we have measured, may be taken as fairly representative of physical characters generally. The distribution of the data will be found in the Appendix Correlation Tables 189, 190, 191, 192, 193; the correlation coefficients of the characters enumerated with increasing criminality being as follows:—

——	Convictions per year.	Fraction of year imprisoned.
Stature	$-\cdot 02 \pm \cdot 03$	$-\cdot 09 \pm \cdot 03$
Weight	$-\cdot 07 \pm \cdot 03$	$-\cdot 09 \pm \cdot 03$
Distance between eyes	$-\cdot 01 \pm \cdot 03$	$-\cdot 002 \pm \cdot 03$
Head circumference	$-\cdot 06 \pm \cdot 03$	$\cdot 02 \pm \cdot 03$
Head index	$-\cdot 07 \pm \cdot 03$	$-\cdot 01 \pm \cdot 03$

Upon the evidence of these coefficients, and in so far as the characters just enumerated may be considered representative, there is no relationship between the physical attributes of an offender and his degree of criminality, measured either by the length or gravity of his penal record.

To resume: we have not found any evidence that criminals, differentiated by the type of crime they have committed, are distinguishable by any macroscopic differences in the variability, or in the general form of distribution, of their physical attributes; nor that, upon the evidence of the few characters examined, there is any differentiation in the physical attributes of habitual criminals, associated with the relative gravity of their penal records. The problem before us, then, resolves itself into an examination and comparison of the *mean values* of physical attributes; the test implied by that examination and comparison forming the only remaining argument in support of contentions for the existence or non-existence of a physical criminal type.

IV.—Examination and Comparison of the Mean Values of the 37 Physical Attributes under Investigation.

We return now to the general examination of the statistical facts—the mean values, correlation ratios and coefficients of contingency—which had resulted from our inquiry when, in pursuance of an aim explained on p. 115, we deviated temporarily from our main direction of enquiry. We will firstly consider how the correlation ratios, and coefficients of contingency, we have obtained, should be interpreted, and what precise meaning attaches to their individual values; secondly, what general conclusions can be drawn from the trend of their values taken together; and lastly, we will attempt a detailed interpretation of this general conclusion, and will try to estimate and explain, from the evidence of the contrasted means, what amount of real differentiation there may be in physical characters (1) between criminals indicted for different orders of crime, and (2) between criminals as a class, and the non-criminal public.

A.—*Interpretation of the correlation ratios and coefficients of contingency.*

The association, or correlation, of two variables, is a measure of the extent to which one phenomenon determines, or is determined by, another—which is to say that it measures the degree to which the conjoint occurrence of two variables deviates from strict independence. Measures of this relationship are given by the correlation coefficient, the correlation ratio, and the coefficient of contingency. These expressions are, all three of them, measures of association or correlation because they express the extent to which actual association between attributes deviates from independent probability. But the precise meaning of any measured strength of association—of the numerical values of a correlation coefficient, a correlation ratio, or a coefficient of contingency—depends not only upon the *degree* of association measured, but upon the *way* the attributes under measurement are associated: depends not only upon the *extent* to which any correlated system of variables departs from independent probability, but upon the *way* the deviations from independence are distributed throughout the system. In technical language, the way—apart from the extent—associated attributes deviate from independent probability is called their "regression"; and the import of any expression measuring *amount* of deviation depends upon whether the regression is "linear," "non-linear," or whether there is no regression at all. In other words, the full import of the value of any correlation coefficient (r), correlation ratio (η), or coefficient of contingency (C_2), depends upon the law, as well as upon the amount, of relation between the two attributes whose correlation they measure.

In order to interpret properly the full import of the correlation ratios and coefficients of contingency we have obtained for the 37 physical characters examined, we must decide whether the associations they measure do or do not obey the law of regression. Can we, by any arrangement of the criminal sub-groups, show that the means of each character within the several crime categories of arson, stealing, rape, violence and fraud, are progressively continuous in value, so that, if plotted, these values would tend, within a range of error due to random sampling, to fall upon a straight or curved line? Or must we conclude, from the chaotic distribution of the differences between theses mean values, that these differences and the correlations they express, have been determined by some fundamentally different law of relation to that of regression? In other words, in order to interpret properly the full import of our correlation ratios and coefficients of contingency, we must ascertain whether their values have resulted from some common cause operating equally upon all the criminal sub-groups, or whether from some special influences, which, acting now upon this, and now upon that, individual sub-group, and never progressively affecting all the sub-groups, have produced differences of mean values within isolated categories not logically and consecutively followed up by similar differences within them all. It is of the utmost importance to be clear upon this point: for the strength of any relationship, a feature to be considered when interpreting its reputed strength, is not only the amount, but also the nature, of the bond. The import of our correlation ratios and

significant or insignificant of a real association.* All that can be positively stated with regard to any of the individual values of our correlation ratios, and coefficients of contingency, are the probabilities that such values may or may not represent a significant degree of association between some physical attribute and crime.

If any of our series of measurements or observations were divided entirely at random into five divisions of the same numerical proportions as our five criminal sub-groups are divided, and if the process of division were repeated an indefinite number of times, and a value of η were calculated for the distribution of the character corresponding to each random division, then the series of correlation ratios thus obtained would represent the order of values to be expected for any similar series of purely chance relationships. This distribution of correlation ratios would have a certain mean value, from which the individual ratios would deviate to a certain average extent—called the "standard deviation" of the distribution. Now, the values of this mean and standard deviation for random samples, numerically comparable to our selected criminal samples, can be theoretically calculated; and in relation to them the following positive statement can be made with regard to any of our correlation ratios and coefficients of contingency :—Any one of these values, regarded separately, may or may not be significant; but if any one of them exceed ·6745 times the value of the standard deviation for random samples, the chances are even, if any one exceed twice this amount, the chances are five to one, in favour of the particular ratio or coefficient being significant of a real relationship between the physical character under investigation, and crime. This is the most that can be positively stated of any individual value. In view, however, of the nature of this statement, it follows that a broader judgment of the relation between physical characters and crime will be obtained from an examination, not of each individual value, but of all the values of the thirty-seven correlation ratios and coefficients of contingency, taken together.

C.—*General conclusion to be drawn from the combined values of our correlation ratios and coefficients of contingency.*

On page 52, the statement appears :—"We may say generally that it would be waste of time to investigate elaborately the precise meaning of any correlation ratio less than ·1 in value." And again, on page 53, appears the following :—"These values, all less than ·1, justify the conclusion that there is no appreciable association, &c." These conclusions were based upon the statement, given above, that the interpretation of any individual value of correlation ratios can be expressed only in terms of probability. With regard to any values, obtained from our data, as small as ·1, the probabilities are in favour of such values being insignificant of any real relationship. Yet, frequently throughout this work, values of the same order measuring associations of physical characters with age, stature and intelligence, have not been regarded as negligible quantities. The reason for this different appreciation of the same values of correlation estimates should now be apparent from many of the remarks in the immediate preceding section. Firstly, the correlation coefficient (r)—such as that of age with head-length—represents not only a measured amount of deviation from independent probability, but denotes also how the deviation has been determined, viz., by a close and progressive association between the attributes, governed by the law of linear regression. For an indefinite series of random correlated systems, the average value of "r" is zero ;† and the standard deviation, or average extent to which individual values deviate from zero, is, for random samples of the numerical strength of our criminal ones, very small. Consequently, the probable error, which equals ·6745 of the standard deviation, is also small ; and a value of "r" = ·1, in the present investigation, has always been many times greater than its probable error : which is to say that the chances, in every case, have always been in favour of this order of value being significant of a real association. But, unlike those of the correlation coefficient "r," the individual values of η & C_2 are always positive and never negative ; consequently, the average value of η & C_2 for an indefinite series of correlated systems distributed at random, or, in other words, the standard chance relationship, by reference to which any value of a correlation ratio or coefficient of contingency must be estimated, is not zero, but possesses always some small positive value. It follows, therefore, from these considerations, that any of our correlation ratios or coefficients of contingency less than ·1 in value, when measured, not

* When cards are properly shuffled, the strength of any particular hand is determined solely by chance. But any one particular hand may possess any degree of strength : all we can predict is that, with an indefinite number of deals, the average strength of any particular player's hand, relatively to that of other players, will be zero. An individual whist player may be dealt a hand containing all cards of one suit. Such an event, assuming the cards are properly shuffled and dealt at random, would be a possible chance occurrence. All that can be positively stated is that the probabilities against the occurrence of such a chance relationship are many millions to one.

† The average value is zero because individual values of "r" may be negative as well as positive; and the sum of the positive and negative values in any large series of random samples equals zero.

from zero on the correlation scale, but from some small value such as ·05 or ·08, would never be greater than its probable error : and, consequently, the chances here are all in favour of a correlation ratio or coefficient of contingency of ·1 being insignificant of any degree of real association. Secondly, in view of the chaotic fluctuations of the means of physical characters within the several crime categories—sometimes one category, sometimes another, yielding means which deviate from the general average—in view of this absence of any consistent or orderly regression, small values of η and of C_3 that we have obtained, even though they be significant of a real departure from independent probability, have nevertheless not the same interpretative significance as have small significant degrees of association between quantitative variables, such as head-length and age. The correlation coefficient of head-length with age, ·13, small though it be, is yet justifiably interpreted as indicating a growth—small and variable in amount admittedly, nevertheless an uninterrupted progressive growth—of head, related to an ever-continuous lapse of time. But, from a small significant value of any one of our correlation ratios and coefficients of contingency, we would not be justified in forming a similar conception of physical attributes changing progressively with increasing criminality. On the other hand, realising, as we do, that a mean value within any crime category may have been disturbed by a thousand trifling and unimportant influences which, if existent, are obviously unanalysable, we assert, in regard to any small individual value of η or C_3, that its origin is not worth investigating.

From considerations of the individual values of our correlation ratios and coefficients of contingency, one conclusion can be positively stated : that the average association between physical characters and crime, if existent, is microscopic in extent ; but the whether-or-no of trifling existing association at all cannot be definitely decided from these considerations of individual values. The precision and certainty, however, of a conclusion resulting from any statistical test, increase with a repetition of the experiment. We may be doubtful whether a correlation ratio value of ·15 is, or is not, significant of a real, as opposed to a chance, relationship. But if, resulting from repeated examination of similar data, we obtain a series of results averaging out at ·15, our doubt is transformed into approximate certitude : with each additional experiment the chances are enormously increased that the relationship is a real one. Accordingly, to obtain a more precise and certain conclusion as to the existence or non-existence of a real relationship between physical characters and crime, we must turn from considering their values separately, and must examine the general trend of our ratios and coefficients, considered as a whole. We must compare the distribution of the whole series with that to be expected for correlation systems numerically similar to our criminal ones, but selected, not as ours were by the delinquents' crimes, but entirely at random. The mean value of our series of ratios, compared with the mean of the series obtained from such theoretic random correlation systems, should enable us to form a certain estimate whether our statistics show any real relationship between physical attributes and crime, and if so, the precise amount of such relationship.

The values of the correlation ratios and coefficients of contingency for the characters examined are tabulated in the last column of Table 52, and they may be recapitulated as follows :—

Values of Ratios and Coefficients	—·02	—·05	—·08	—·11	—·14	—·17	—·20	—·23	over ·23	
Frequencies	3	6	8	10	2	4	1	2	1	37

It will be seen that the distribution is slightly skew, but that it approximates to the Gaussian type. Six only of the values are greater than ·15, viz., (1) concurrency (correlation ratio ·164), whose observations were subject to a particular source of error ; (2) left-handedness, a relatively rare character, whose correlation ratio with crime (·214) is subject, consequently, to a wide range of probable error ; (3) tattooing, where the value quoted (.322) represents the relation of this character with crime at an incomplete stage of analysis ; and (4) hair-shade, (5) greyness of hair, and (6) complexion of skin, three characters for which the values of the correlation ratios with crime (·228, ·184, and ·164 respectively) would inevitably be reduced, were the influence of class differences between the sub-groups properly allowed for.* Omitting from the series these characters with correlation values greater than ·15, the distribution of the values of the remainder is symmetrical about a mean of ·078. For the whole series as it stands, the commonest or modal value is about ·09, and that of the mean is ·107. What would be the value of a purely chance relationship, with which the value ·107 must be compared ? In other words, what would be the distribution and mean value of an indefinitely large series of

* See p. 137.

correlation ratios measuring the relationship between any of the characters under investigation and groups of individuals, identical numerically with our criminal groups, but otherwise unselected, and sorted entirely at random? Such a series, like our own, would approximate to the Gaussian type in the form of its distribution; and the mean of the whole series, representing, as it would, the value of a purely chance correlation, would, according to the theory of probability, be equal to $\sqrt{\frac{G}{N}}$ where (N) is the total number of individuals examined, and (G) is the number of groups into which they are divided.* With our data, those of head and facial characters were distributed within six groups, and, for the remaining characters, the criminal sub-groups (G) were five in number. The total number (N) of individuals examined was, for the head, face and jaw measurements, 2,500; and for other characters it was generally 1,000; and for a certain few of them only 500. Accordingly, the mean correlation ratio for random correlation systems with these respective frequencies of the arrays (G), and of total individuals (N), would be

$$(1)\sqrt{\frac{6}{2500}} = \cdot 05\,;\ (2)\sqrt{\frac{5}{2500}} = \cdot 045\,;\ (3)\sqrt{\frac{5}{1000}} = \cdot 07\,;\ (4)\sqrt{\frac{5}{500}} = \cdot 10$$

i.e., the average of the four, taken together, would lie somewhere between ·045 and ·1· The mean value, then, representing no correlation—or the standard value corresponding to zero on the correlation scale, with which our mean ratio of ·107 must be compared, and from which, instead of from zero, its real value must be estimated—we may consider to be approximately ·075· We have, then, the mean value for a purely chance relationship —·075; the actual mean value, excluding six characters—·078, including the whole series as it stands—·107. Thus, the contrast between fact and ideal probability, between the average amount of association, contained in our statistics, and the expected amount, given by the laws of probability for random samples, reveals a difference of ·03 for the measure of real association between physical characters and crime.

The analysis of the problem, referred to in the foot-note * below, having recently been completed and published by Pearson in Biometrika, Vol. VIII., p. 254. we can now estimate the significance of the correlation values we are discussing from a more satisfactory mathematical standpoint. As we have already stated, values of correlation ratios and coefficients of contingency involve the summation of terms which are all necessarily positive, and whose error of defect, in one sub-group, will not be balanced—as it is to a large extent in the determination of "r"—by error of excess in another: that is to say, such compensation will not occur unless the terms are far removed from zero. If there be no correlation or contingency in the gross, any differences arising in the finite sample will contribute positively to η^2 or ϕ^2; and, consequently, the mean value of η^2 will be (number of arrays $-$ 1) $/N$; and of ϕ^2 it will be (number of rows $-$ 1) (number of columns $-$ 1) $/N$. The proof of this second proposition was given in a foot-note, p. 107, and, before calculating the coefficients of contingency $C_2 = \sqrt{\phi^2/(1+\phi^2)}$, their mean or expected values were, in each case, deducted from the observed values of ϕ^2. In foot-note † below will be found the proof of the corresponding proposition relating to values of η^2; and since, on the strength of this proof, we have now been able to calculate the corrections appropriate to values of η^2, it remains to make similar deductions from the values of η given in the first thirty characters, in order to bring these in line with the remaining seven characters for which values of C_2 were obtained. These corrected values of η will be found in the last column of the comprehensive table No. 52;

* The exact analysis of the problem is still under investigation, and the above is only an approximate formula. We have seen that $\eta = \sqrt{\frac{\frac{\delta^2}{\sigma^2}+\frac{\delta^2}{\sigma^2}\ \ldots\ \&c.}{N}}$ Now, on the average of an indefinitely large series of samples $\frac{\delta^2}{\sigma^2}=1$. Hence $\eta = \sqrt{\frac{1+1+1\ \ldots}{N}} = \sqrt{\frac{G}{N}}$.

† We have $\eta^2 = S.\, n\, d^2/N\,\Sigma^2$, where N is the total number of individuals, Σ their standard deviation in the measured character, n the number of individuals in a category of the unmeasured character, d their deviation in mean value of the measured character from the mean of total individuals, and where S is the sum for all categories.

Now, the standard deviation of the difference between the mean of a sub-sample of number n and the mean of the sample of number N, where the sub-sample is selected at random, was found in foot-note p. 46 to be $\Sigma\sqrt{\frac{1}{n}-\frac{1}{N}}$ It follows that d^2 has in many samplings a mean value $\Sigma\left(\frac{1}{n}-\frac{1}{N}\right)$, and hence η^2 a mean value $S.\, n\left(\frac{1}{n}-\frac{1}{N}\right) / N$, summed for all arrays. This value is $S.\left(1-\frac{n}{N}\right) / N$ or (number of arrays $-$ 1) $/N$.

A full discussion of the correction for η^2, when there is correlation, is given by K. Pearson in Biometrika, Vol. VIII., p. 254, but our values are in no case large enough to need the fuller determination.

these physical characters have no significant association with the nature of the crime committed. In other words, we conclude that if there be any real association between physical characters and crime, this is so microscopic in amount as not to be revealed by the values of our correlation ratios and coefficients of contingency—these values being of almost the same order of magnitude as would have been obtained if, instead of separating them into crime groups, our subjects had, prior to observation, been divided at random into five or six categories of the same numerical proportions as our five or six criminal sub-groups.

D. *Detailed interpretation of general conclusion.*

The above is a broad conclusion derived from the wide range of statistical facts generalized in our correlation ratios and coefficients of contingency. As already explained, however, the criminal sub-groups of arson, stealing, sexual offences, violence and fraud, constitute the classes not of a continuous, but of the typical categoric, variate, crime. Any conclusion, therefore, derived merely from consideration of these ratios and coefficients, may overlook details which will only be revealed from a direct examination and contrast of the relative values of the means themselves. For instance, in the general estimate of differentiation summarized by our correlation ratios and coefficients of contingency, the deviation of a mean value of any particular category carries weight proportionately to the number of individuals in the category. Thus, a category of low numerical strength, such as the group of coiners, relatively to a heavily weighted category, such as that of thieves, contributes in small measure only to the general estimate of relationship between any physical character and crime, resumed in the particular value of any correlation ratio or coefficient of contingency; and consequently, this general estimate might conceal the existence of a pronounced differentiation of mean in a numerically small category, such as that of coiners.

We have been dealing with thirty-seven physical characters: and for thirty of these, being graduated variables, we have obtained the mean value; and for the remaining seven (the seven categoric variables, for which the means were not obtainable), we have found the numerical frequencies of each of their categories, within the five criminal sub-groups of damage, stealing, sexual offences, violence and fraud. The thirty characters for which the mean values were obtained were examined by the correlation ratio method; the seven for which the means could not be obtained were, from the exigencies of the case, examined by the method of contingency. In pursuing the former methods, the means of a criminal sub-group were, for every one of the thirty characters, compared with the means of the total group of criminals; and the differences, resulting from this contrast, in relation to their probable errors, determined the values of the thirty correlation ratios ultimately obtained. For the characters examined by the method of contingency, it was the deviation from ideal probability, not of their mean values, but of the actual frequencies of their categories, which, in relation to their probable errors, determined the values of the seven coefficients of contingency ultimately obtained. In Table 52, these results—the whole series of mean and of frequency deviations, of probable errors, of ratios and coefficients previously obtained—are recapitulated in a summarized form convenient for reference and for comparison. Down this table, longitudinally, the characters are set forth in the order of their original examination; and, transversely, the table is divided into sections—each of which, corresponding to a sub-group of damage, stealing, sexual, violence and fraudulent offenders, respectively, is sub-divided into two columns. The figures in the left of these two columns, headed "Excess," gives (1) for the first thirty characters, the actual differences between the means of each sub-group and the means of the total group; and gives (2) for the last seven characters, the actual deviations from expected frequency of the several categories of each character. Conveniently contrasted with the figures in this column, those in the adjacent right-hand column give the respective values of twice the probable errors of these means or frequencies. Finally, in the column at the extreme right-hand of the whole table, the values are recorded of the series of thirty correlation ratios, and seven coefficients of contingency, obtained during the investigation.

When examining the figures in this Table, it is important to realise precisely how these have been obtained, what they represent, and what kind of meaning can be extracted from their respective values. Our object is to determine, and to explain, the extent to which different kinds of criminals are distinguishable by differences in their physical attributes. This object can only be attained by studying the differences between statistics of physical characters recorded for different kinds of criminals. But the mere discovery of *some* amount of difference between samples is not in itself sufficient to establish the existence of a real or essential differentiation. Between pure random samples of any one homogeneous thing, differences of some amount are inevitable. The question to be answered by the statistician is whether differences, revealed by the comparison of statistics, are or are not greater than this inevitable difference, which, although its amount will vary according to the conditions of the comparison, is bound to appear in some amount whenever statistics are compared. This standardized amount of expected error in the means, or other statistical values, of samples, is called the probable error of that value; and no legitimate conclusion can be drawn from observed differences between series of statistics until the range of this probable or expected error has, in every case, been determined. The conclusion, therefore, to be drawn from the several deviation values recorded in the left-hand columns of the above table depends entirely upon the relation of these values to the probable errors, *i.e.*, to those standardized amounts of expected differences, which, for each case, are recorded in the adjoining right-hand columns of the table.

We have before us a series of differences between the means of 30 characters, and the frequency deviations of the four or five categories of seven characters, recorded within each of five criminal sub-groups. Altogether, then, we are dealing here with 280 samples of the same total population of criminals—the differentia of each sample being the nature of the delinquent's crime. The problem to be solved is, in what way, and to what extent, do the recorded mean and frequency differences before us, for these 280 samples, selected in each case according to the nature of crime, differ from the corresponding differences which, according to the laws of probability, would inevitably occur for 280 random samples, selected in each case entirely by chance?

Before proceeding to deal with the problem, it would be well to resume briefly the procedure by which the several values, recorded in the above table, were obtained. For the first 30 characters, the plan consistently pursued was as follows. We first found from our statistics the mean value of the character for total criminals, and for each of the sub-divisions of the total. These crude values, however, were not, at this stage, legitimately comparable with each other, for two reasons: firstly, because the respective distributions of age, stature, intelligence, &c.—conditions which, in most cases, were themselves correlated with, and consequently might themselves be disturbing influences upon, the character under investigation—were different for each criminal sub-group, and for total criminals; and secondly, because at this stage of our investigating of each character, we did not know the value of that amount of expected differences, which, as already explained, would inevitably be present, even if there were no correlation at all between the characters under investigation and crime. Before, then, we could proceed to make a legitimate and effective comparison of our results, definite information had to be obtained in response to the two questions which faced us. Assuming with regard to both of these questions that our criminal sub-groups were random samples of total criminals—that is to say, hypotheticating for the time being, that there might be no correlation between the characters under investigation and crime—the first question to be answered was this one:—What amount of difference should be expected between the means of sub-groups and of total criminals as a result of the fact that the average age, stature, intelligence, &c. of each of these sub-groups, differed markedly from the average of total criminals? The second question facing us was:—What is the probable error of, or range of difference that may inevitably occur between, the mean values of purely random samples of any one homogeneous thing? The answer to the first question was found, as already explained, through the agency of the multiple regression formula. And, in every case, before comparing our mean values—for instance, the mean head-length, &c. of fraudulent criminals, &c. with the means of total criminals—we subtracted from, or added to, the mean of total criminals such an amount as was appropriate according to the verdict of the formula: that is to say, an amount which, whether there were or were not any relation between the characters under investigation and crime, would, independently of this relation, be due solely to disparities between the age, stature and intelligence of the samples under comparison. The differences recorded in the left-hand column of the above table are in every case the results of comparisons thus legitimatised. And the probable errors, or, rather, the values of twice the probable errors recorded in the adjacent columns, are the answers obtained to the second question: they are the *expected* amounts of error which would inevitably arise in *random* samples of the same numerical strength as our criminal sub-groups. The way to examine the figures in the above table is now apparent. In the left-hand column, within each crime category, we have (1) for the first 30 characters, the *actual* differences, given by the data, between the means of the criminal sub-groups and those of the total group of criminals, after correcting for disparities of age, stature and other disturbing influences; and we have (2) for the several categories of the last seven characters, the *actual* differences given by the data between the frequencies of the sub-groups and those of independent probability. And, side by side with each recorded difference, we have, in the adjacent columns, the probable errors of the means or frequencies: that is to say, the *expected* error, the *expected* deviation of frequency, on the assumption that our criminal sub-groups, in place of being selected by the nature of the delinquent's offence, are samples of similar ages and statures to the criminals; but otherwise selected purely at random, or upon a principle entirely dissociated from the character under investigation. It is clear that the relation between the recorded differences to the probable errors—between the figures in the left-hand, to those in the right-hand, column, of the above table—will show whether our criminal sub-groups do, or do not, with regard to the 37 characters investigated, correspond to random samples of total criminals; or, in other words, whether there is, or is not, any association between physical characters and crime.

What, then, is the theoretic relation which, according to the theory of probability, exists between the means and frequencies of random samples and their probable errors? The relation is the one we have already turned to, more than once, when testing the significance of our statistical results. It is that differences between the means, frequencies or other statistical values, of random samples, will be, in 50 per cent. of cases, less in value than the probable errors of the differences; in 82 per cent. will be less in extent than twice, and in 96 per cent. will be less than three times, these values; and that a difference greater than four times its probable error will occur only seven times in a thousand samples; and that a difference between random samples greater than five times the probable error of the difference will arise not more than seven times in 10,000 instances.

The relation to their probable errors of the differences recorded in the above table for our 280 selected samples of criminals, contrasted with this theoretic relation for random samples, is as follows:—

TABLE 53.—NUMBER OF TIMES AMOUNT OF DEVIATION IN MEAN MEASURE (OR IN FREQUENCY) IS ACTUALLY OBSERVED IN EACH CRIMINAL GROUP.

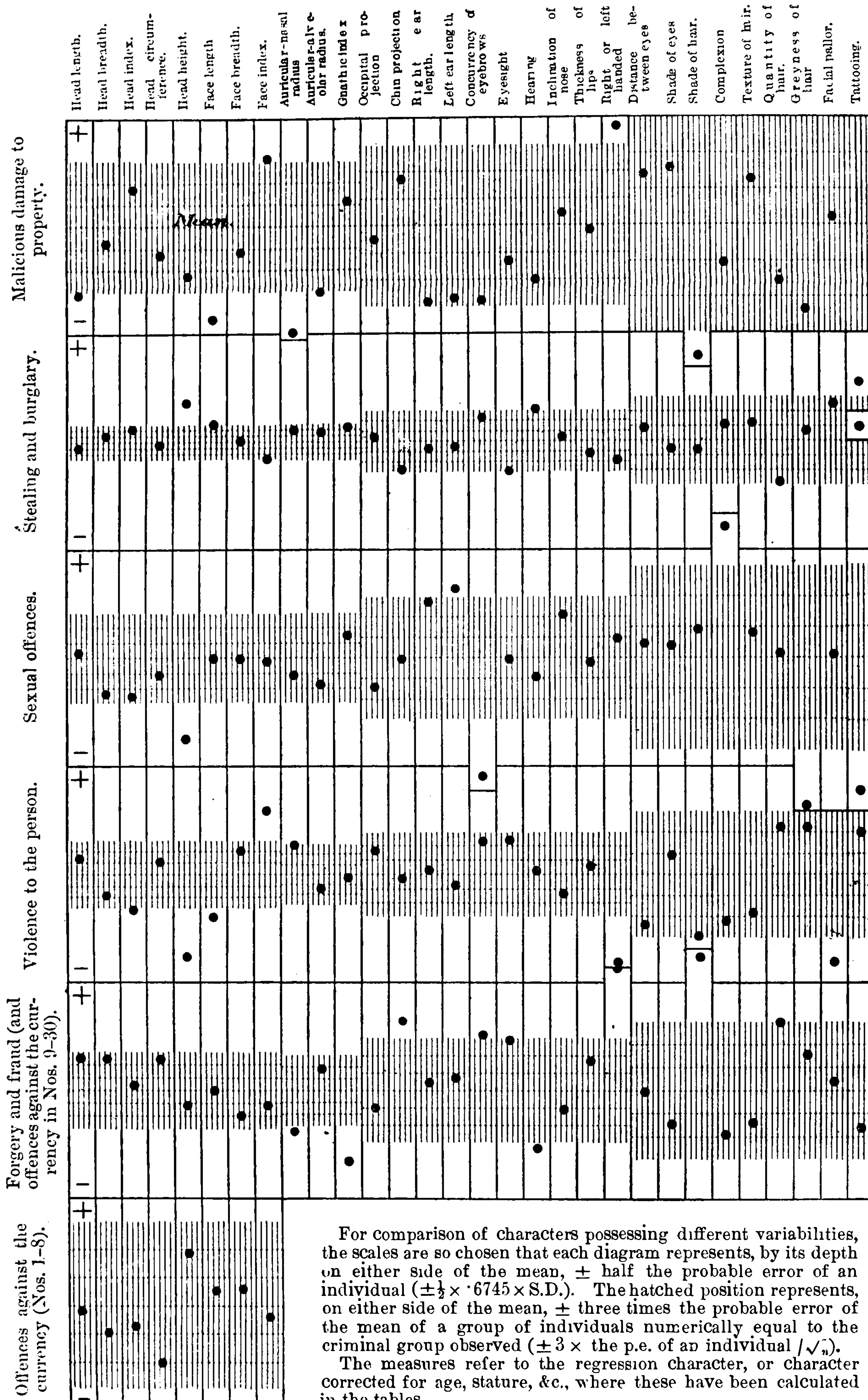
Crime groups.	Less than p.e.	1 × p.e. to 2 × p.e.	2 × p.e. to 3 × p.e.	3 × p.e. to 4 × p.e.	4 × p.e. to 5 × p.e.	5 × p.e. to 6 × p.e.	Greater than 6 × p.e.	Totals.
Damage to property ..	15	23	8	8	1	1	0	56
Stealing and burglary ...	29	16	8	1	1	1	0	56
Sexual offences	29	13	9	2	2	1	0	56
Violence to the person ...	22	21	9	2	1	1	0	56
Forgery and fraud ...	20	20	6	5	2	3	0	56
Totals	115	93	40	18	7	7	0	280

NUMBER OF TIMES AMOUNT MAY BE EXPECTED TO OCCUR IF THE CRIMINAL SELECTIONS ARE REPLACED BY RANDOM SAMPLES.

Sub-group	28·0	16·8	8·8	2·0	0·4	·0	·0	56
Totals	140·0	84·2	44·0	9·8	2·0	·0	·0	280

Examining the figures along the five crime rows of the upper table in contrast with the sub-group row of the lower table, and contrasting the two rows of totals, it will be seen how the differences between 56 samples of criminals, selected by the crimes of damage, stealing, rape, violence or fraud, compare in detail with similar differences between 56 samples of individuals selected entirely at random from a homogeneous population. Excluding consideration, for the time being, of the two characters of tattooing, and left-handedness—whose position in the table is queried—it will be seen how close is the resemblance here between the respective magnitudes of these actual, and theoretic, distributions of differences. Thus, the frequency of differences which is less in value than their probable errors would be, for random samples, 28; in actual fact we find the frequencies to be, 15, for samples selected by crimes of damage; 29, selected by crimes of stealing; and for samples selected by crimes of rape, violence and fraud, 29, 22 and 20, respectively. The damage frequency certainly, possibly also that of the fraudulent group, does not come up to expectation. But taking all crime groups together, and comparing total frequencies, the 115 differences less in value than their probable errors, for our 280 selected criminal samples, form a reasonably close approximation to the 140 corresponding differences for the same number (280) of ideal random samples. Similarly, the number of samples showing differences greater than once, but less than twice, the values of their probable errors—which would be for 56 random samples, 16·80—actually is, for each of our five groups of 56 selected

FIG. x.—DEVIATIONS FROM THE GENERAL MEAN OF THE MEANS IN VARIOUS CRIMINAL GROUPS FOR THIRTY MEASURED CHARACTERS.



For comparison of characters possessing different variabilities, the scales are so chosen that each diagram represents, by its depth on either side of the mean, $\pm$ half the probable error of an individual ($\pm\frac{1}{2}\times \cdot 6745 \times$ S.D.). The hatched position represents, on either side of the mean, $\pm$ three times the probable error of the mean of a group of individuals numerically equal to the criminal group observed ($\pm 3 \times$ the p.e. of an individual $/\sqrt{n}$).

The measures refer to the regression character, or character corrected for age, stature, &c., where these have been calculated in the tables.

of $\sqrt{n}$, or the number of individuals in each sample examined. For instance, the width of the band representing three times the probable error of mean head-length in the damage and arson diagram is greater than that in the stealing diagram, because the number of individuals in the sample of incendiaries was less than that in the sample of thieves. And similarly, within all the diagrams, the band related to the last nine characters is considerably wider than the band belonging to the first eight, because the number of individuals examined with regard to the latter characters was 2,500, and with regard to the former was only 500.

It should be borne in mind that the probable error of any individual random measurement, which is the unit of the scale upon which these diagrams have been constructed, is a standardized amount of variation, by reference to which some idea can be obtained of the amounts of difference recorded by the several dots and bands. It is equal to ·6745, or, roughly, two-thirds of σ; and it represents the amount of deviation, plus or minus, from the mean value of any character for a total population, which would be equal or exceeded by 50 per cent. of the individuals comprising it. Thus, in the case of stature—which we select for illustration as the most familiar of human physical characters—the standard deviation in males is $2\frac{1}{2}$ inches*; and two-thirds of this ($\pm$ 1·7 inches) is the probable error of stature for one individual. If stature, then, were included in our series of physical characters, the scale would be so chosen that the width of the diagram allocated to a crime group would measure 1·7 units. Now, between the mean stature of men (66·9 inches) and that of women (62·2 inches),* there is a difference of 5 inches, let us say: which is to say that men differ in stature from women to an amount which, in the mean, is equal to *twice* the standard deviation of stature, or *three times* the probable deviation for one individual, *i.e.*; the dot representing stature of women would be right off our diagram of stature of men, and, in fact, would be about the centre of the third diagram below. If it be borne in mind, then, that a difference of mean stature, corresponding to the familiar amount of difference between men and women, would be represented in our diagram by a dot so far exceeding any departures we have found, some idea will be formed of how extremely minute are the differences between the mean values actually recorded by the dots and bands within these diagrams.

The total width of the hatched band, as we have said, represents + or − three times the probable error of mean differences between random samples. The dotted line running through these bands divides them into sections, representing respectively $\pm$ once and $\pm$ twice these probable errors. We have, then, series of dots, representing actual mean departure given by our selected samples of criminals, plotted against bands, representing the varying amounts of mean departure, which, with definite probability, will inevitably occur in finite random samples. The frequency of different amounts of departure was given in Table 53; and we need only repeat that the chances of the mean value of a sub-sample, deviating from the mean of the total sample, to the extent of three times the probable error of the difference, are 96 to 1 against the occurrence of that contingency. In other words, the mean of a random sub-sample would not be expected to deviate to this extent from the mean of the total sample more than four times in a hundred, and almost certainly not more than twice in thirty instances. Consequently, assuming that our sub-groups of criminals selected by the crimes of arson &c., theft, rape, violence and fraud, are, so far as physical characters are concerned, equivalent to random samples of total criminals—an assumption that implies the absence of any relationship between physical characters and crime—assuming this, we would expect to find not more than two of the dots in each of the diagrams falling outside the limits of the shaded bands. In fact, as shown by their enumeration, the number of dots falling outside these limits—if we exclude those relating to the two characters, left-handedness and tattooing, which are queried—is, for the stealing group, one, for the violence group and group of sexual offenders, three, for the damage group, seven, and for the fraudulent group, six. Hence, a rapid inspection of these diagrams, which illustrate certain characters only, confirms the conclusion arrived at from a minute analysis of Table 52, which referred to all the characters dealt with in this investigation—the conclusion that, upon the present evidence of our statistics, only fraudulent and damage offenders are physically differentiated to any appreciable extent from criminals generally; and these only in regard to some five or six out of the fifty-three characters we have examined.

In turning to a closer examination of these particular five or six characters by which criminals are apparently differentiated, it must not be overlooked that the diagrams in Fig. X. have been purposely constructed upon an ample scale, in order, by their magnification, to make minute differences immediately visible. As already explained, the scale

---

* See Powys *Biometrika*, Vol. I., p. 43.

unit employed, which is ·6745 times the standard deviation of each character examined, has been made equal to the width of space between the limiting lines of each diagram, *i.e.*, the unit is forty millimetres in length. Now, ± ·6745 times the standard deviation of head-length, for instance, measured upon a millimetre scale, is 8·21 mm. Consequently, for head-length, a difference of 8·21 mm., upon a millimetre scale, has been drawn out to a length of forty millimetres—that is to say, the scale to which differences of mean head-length are represented in the diagram is the tangible millimetre scale nearly five times magnified. Similarly, for other characters therein represented, the diagram scale is in most cases four or five times larger than the scale upon which these characters would actually be measured. Remembering this fact, then, that actual differences are one-fifth of their illustrated magnitude, it will be appreciated how much smaller in reality, although pictured large, are the significant differences that have so far appeared, upon the evidence of our statistics, between criminals. None of these are greater than six times their probable error; the greatest recorded deviation is less than the probable deviation of the individual value. A difference of this order between means of head-length would be equal to about 5 mm.; between means of stature it would be equal to about $1\frac{1}{2}$ inches, or three times less than the familiar visible difference between the mean stature of men and women, rather greater than the difference of mean stature between boys of sixteen and those of seventeen,* about equal to the difference of mean stature between Englishmen and Irishmen, and rather less than the difference between Scotsmen and English.† From these considerations it is clear that the physical differentiation, demonstrated by our statistics for four or five characters, between different kinds of criminals, even if it be existent, is only of theoretic interest; and can have no practical bearing upon the diagnosis of a physical criminal type. In fact, assuming the existence of this actual amount of physical differentiation between criminals, we could not, from a knowledge of it, make a better prediction of an individual's criminal tendencies than we could, from a knowledge of a boy's stature, estimate whether he were sixteen or seventeen years old, or from the knowledge of a man's stature, decide whether he were born in London, Edinburgh or Dublin.

Nevertheless, from the evidence of Table 53 and of the diagrams in Fig. X there *is* a small degree of physical differentiation between criminals, academically interesting. The 265 samples of criminals, selected by the delinquents' crimes, might, so far as the physical characters we have examined are concerned, be pure unselected random samples save in some eleven or twelve instances; five or six of which are samples selected by the crime of arson, four or five by the crime of fraud, and perhaps one or two by sexual offences. Can any simple explanation be found to account for this amount of physical differentiation, small though it be, of fraudulent offenders and incendiaries? Or, in the absence of such explanation, shall we have to assume a causal relation between certain physical characters and the criminality of arson and fraud? Now, the characters differentiating "arson and damage" criminals are five or six of the seven characters, head-length, facial-length, facial-index, auricular nasal radius, gnathic index, hearing and hair-shade. And those differentiating fraudulent criminals are the auricular nasal radius, the gnathic index, hearing, hair-shade and concurrency of eye-brows. Thus, four characters—the auricular nasal radius, gnathic index, hearing and hair-shade—are common to the two sets; and by reference to Fig. X, it will be seen, with regard to them, that fraudulent and arson offenders are differentiated in an opposite direction to each other; and also that, with regard to head-length, facial-length and facial-index, the fraudulents, although they do not diverge in the mean to so great an extent, do tend to counterbalance the divergency of the incendiaries. Thus, directly comparing with each other, the recorded deviations within the "arson" and "fraud" diagrams, it will be seen that, relatively to the mean of criminals generally, whereas (1) the mean head-length of the former is significantly shorter, that of the latter tends to be larger; whereas (2) the mean facial index of the former is significantly greater, that of the latter is rather less; whereas (3) the mean gnathic index of the former is greater, of the latter it is significantly less; and that, whereas (4) the hair-shade of incendiaries is significantly darker, and their hearing is worse, the hair-shade and hearing of the fraudulents are significantly lighter and better than the shade of hair and the hearing of criminals generally. We ask, then, whether there be any condition apart from age, stature, and intelligence, already allowed for, which, having a selective value both in regard to the type of crime a criminal may commit, and to his physical attributes, may be at the source of the opposite physical differentiation between fraudulent offenders and incendiaries?

---

* See Powys, Biometrika, Vol. I., p. 48.

† See Brit. Ass. Report, 1883, Anthropometric Survey of British Isles.

generally), hair-shade, complexion and hearing—the very characters, in fact, in respect to which fraudulent offenders, those committing crimes of wilful damage and arson, and in one or two instances, sexual offenders, are differentiated from criminals generally. Of particular interest are the hair-shade and complexion percentages in Table 54, where it will be seen that the variability of hair-shade is greater in the upper, than in the lower, classes; and that both dark and light, as opposed to medium shade of hair, and that fair, as opposed to dark, complexion, are also characteristics of the upper class. These characteristics of hair-shade and complexion, be it noted, are precisely of the same nature as those distinguishing fraudulent from other offenders, as described on p. 98. We conclude that the small amounts of significant differences we have found between criminals generally and fraudulent offenders and incendiaries, in certain cephalic and facial characters, in hair-shade, in complexion, and in hearing, are not an expression of psychical differences in criminal tendency, but result mainly, if not entirely, from the fact that these two types of criminals are drawn from extremely differentiated classes of the general community.

In this connection we may here present the following table, contrasting the mean head-lengths, at successive age-periods, of series of individuals in varying states of nutrition and health, (head-length records, 2,501 to 3,000, and 300 supplementary records).

TABLE 55.—NUTRITIONAL DIFFERENTIATION IN HEAD-LENGTH.

Ages.	Stout and strong.		Thin and muscular.		Thin and weak.	
	f.	Mean head-length.	f.	Mean head-length.	f.	Mean head-length.
15–34	209	193·09	157	191·12	37	191·35
35–44	91	194·85	73	193·43	22	191·91
45–54	54	197·18	29	194·03	16	191·31
55 and over	40	194·50	18	195·61	55	195·37
Equalised arrays of all ages	394	*194·66*	277	195·58	130	192·92

MEAN HEAD-LENGTH IN HEALTH AND DISEASE.

Ages.	Healthy and robust.		Delicate and diseased.	
	f.	Mean head-length.	f.	Mean head-length.
15–34	316	192·41	87	191·25
35–44	146	194·33	40	192·57
45–54	69	195·80	30	194·20
55 and over	60	194·93	53	195·34
Equalised arrays of all ages ...	591	194·37	210	193·54

These recorded means are of interest in showing, firstly, how the increasing mean values of head-length with age, and the final falling-off of these values, attendant upon old age, occur independently of any concommitant nutritional and diseased conditions, and are due, as already stated, to a progressive annual growth, and final senile atrophy, of bone; and, secondly, they show us that the relation of head-length to nutrition and general health is independent of class distinctions and age-differences, with both of which nutritional and health conditions are associated. But, as shown in Appendix Tables 196, 197, hair-shade, and complexion, are not significantly associated with either of these conditions. And criminals, moreover, although differentiated to some extent by nutrition and disease (see Appendix Tables 196, 197), are not so distinguished, either to the same extent, or in the same way, as they are differentiated by class. These facts suggest that differences of nutrition and extent of disease have played no important part in producing the small amounts of difference we found between criminals with regard to certain cephalic characters, and to hair-shade, and complexion; which differences we consequently assume are to be explained as due mainly, if not wholly, to the marked class differentiation between fraudulent offenders and incendiaries.

To resume:—the object of our inquiry was to discover whether criminals, because they are criminals, are physically differentiated. The inquiry, so far, has been limited to a comparison with regard to thirty-seven representative physical attributes of criminals distinguished by their conviction for very different orders of crime. Between these contrasted types, the existence of many crude physical differences has been made apparent; but what has also emerged from the inquiry is that, as the conditions of contrast have been more and more restricted, by allowing, according to a plan of analysis consistently adopted, for many disturbing influences (age, stature, intelligence, &c.), upon the statistics, these crude differences have tended, more and more, to disappear. Now, it has obviously been impossible, and always will be impossible, to gather from the whole field of human influences, and duly allow for, every one of the constitutional and evironmental factors which, be the subject criminal or non-criminal, have equally some moulding effect upon human physical structures. We have allowed for the personal equations of *different* observers in the collecting of observations; we have considered, and, when necessary, we have allowed for, the disturbing influences of age, stature, intelligence, occupation in the Services, residence in town or country, class, health and nutrition, upon the attributes observed; and we have never lost sight of the all-important effect of the equation of chance upon the statistical analysis of the collected observations. But there is the personal equation of the *individual* observer, there are equations of locality and circumstance, there are innumerable small influences, that can never be entirely eliminated. Nor would such be attempted here: for our object has not been to estimate the relative values of all factors that may influence the moulding of human structures, but, by eliminating agencies of this kind, which affect all men equally, non-criminals as well as criminals, to measure the residual effect of one special factor—the criminal personality—in producing a physical differentiation, peculiar to criminals only. The most salient of these agencies affecting all men equally have been eliminated during the investigation: with the result that the residual differences between several types of criminals—differences which might logically be attributed to the influence of criminal proclivity—have been reduced to microscopic proportions. From this fact, which has been demonstrated, it must be left to the imagination to reach our final conclusion: which is that, were we, through the medium of the regression equation, to go on multiplying finer general influences on human physique and subtracting their effects, every trace of a residual physical differentiation between our several types of criminals would eventually vanish. We conclude that criminals are not physically differentiated because they are criminals, but because of differences in age, stature, intelligence, &c., &c., and of the different social classes from which they are drawn.

V.—A COMPARISON BETWEEN STATISTICS OF CRIMINALS AS A CLASS, AND OF THE NON-CRIMINAL PUBLIC.

So far, we have been comparing the physical characters of criminals convicted of such widely different crimes as petty larceny, murderous assault, incendiarism, sexual offences, and fraudulence. And the absence of any significant physical differences between such highly differentiated criminal types is itself strong presumptive evidence that criminals, as a class, are equally undifferentiated physically from law-abiding subjects. Particularly does this conclusion follow, in our opinion, from the contrast of the fraudulent group with the group of thieves or habitual criminals. For reasons stated on p. 39, fraudulent criminals—if we withdraw attention from their criminal conviction, which in most cases is the one isolated episode of the kind occurring in their lives—form a fairly representative sample of the well-nourished, well-to-do, non-criminal public. At any rate, amongst criminals, this class approaches the nearest to the non-criminal class. On the other hand, habitual criminals, especially those who have become convicts, go in and out of prison all their lives for relatively trivial and stupid offences; they are incorrigible law-breakers: and, in this sense, are the furthest removed from ordinary law-abiding citizens. Fraudulent criminals are, in the mean, ten years older than thieves; and, between these two groups, physical differences, associated with age, have appeared in our statistics. Similarly, corresponding to differences in stature, intelligence and class, physical differences, associated with these conditions, have also appeared. But, when effects due to these conditions have been eliminated, we find no residual physical differentiation corresponding to the divergent degrees of criminal diathesis which distinguish fraudulent offenders from thieves. The absence of physical characteristics distinguishing these two widely-different criminal groups is singularly strong evidence against the alleged existence of any physical criminal type. We would emphasise this argument because, with regard to many of the physical characters we have been examining, there is a complete absence of any comparative data of the law-abiding classes with which to compare our criminal statistics. By itself, this argument that criminals are not physically differentiated amongst themselves is admittedly insufficient either for, or against, the conclusion that they are not so differentiated as a class. But, fortified by confirmatory evidence of direct comparison between criminals and non-criminals, with regard to certain physical characters, for which reliable comparative statistics are available, the argument becomes strengthened to formidable proportions. Accordingly, to obtain this evidence, we now turn to the direct comparison, in regard to as many characters as possible, of our criminal data with similar statistics that have been obtained for the law-abiding community.

Two sets of material are available for this comparative purpose. Firstly, we can contrast certain of our criminal data, already discussed, with the published returns of several anthropological surveys that have been carried out in the past upon various class sections of the general community. Secondly, we can compare the results of a special section of our criminal survey, not yet presented—the section relating to a Group V. series of characters, referred to on pp. 39, 42—with the results obtained from a similar survey of a company of the Royal Engineers, conducted, as will be explained later, expressly in relation to this investigation.

A. *First Series of Comparative Data.*

These consist of some cephalic and facial measurements, observations of hair and eye shades, of nose-shape, thickness of lips, concurrency and hearing, and some statistics of the prevalence of tattooing, and of left-handedness.

(a) *Cephalic Measurements.*—(1) *Comparison of habitual with non-habitual criminals.* —We will quote firstly, and compare with our own, the results of an investigation carried out by W. R. Macdonell, and published in Biometrika, Vol. I., under the heading "Criminal Anthropometry and the Identification of Criminals." The data on which Mr. Macdonell's memoir was based were obtained "from the central Metric Office, New Scotland Yard, where the register of habitual criminals is kept and their identification effected." The class of habitual criminals here referred to would correspond to the sub-group classed in the present work within the crime category of stealing and burglary. From our point of view, however, an interesting point about Mr. Macdonell's material is that it does not refer to these "habituals," but to another very different order of offender, who is unrepresented in our data—to "prisoners whose crimes and sentences are comparatively slight and may be called non-habitual." Consequently, Mr. Macdonell's statistics which consists of 3,000 measurements of head-length, head-breadth, and breadth of face, are more representative of criminals generally than are our own more selected records relating to convicts only, *i.e.*, to star class or first offenders convicted of serious crime, and to the most pronounced type of habitual offenders—those who, from the frequent repetition of trivial offences, rather than from the gravity of any one crime, have received sentences of penal servitude. Macdonell's data, like our own, consist of long series of measurements: the probable errors of the result of their analysis are consequently small; and the comparison of these results with our own will be correspondingly effective, and cannot fail to be interesting. The contrast is presented in the following table:—

COMPARATIVE TABLE I.

Characters.	Means.		Standard Deviations.		Coefficients of Variation.		Differences.*		
	Non-habituals.	Habituals.	Non-habituals.	Habituals.	Non-habituals.	Habituals.	Means.	Standard deviations.	Coefficients of Variation.
Head-length in mm.	191·66±·08	192·07±·11	6·05±·05	6·18±·08	3·15	3·22	·41±·14	·13±·09	·07
Head-breadth in mm.	150·44±·06	150·99±·10	5·01±·04	5·34±·07	3·33	3·54	·55±·12	·33±·08	·21
Facial-breadth in mm.	136·3 ±·09	137·31±·11	5·02±·06	5·58±·07	?	4·06	·96±·15	·56±·10	?
Head Index (100 B/L)	78·54	78·67±·06	2·79	2·96±·01	?	3·76	·13±·07	·17	?
Age in years	26 ap.	35·725	?	13·09	?	?	9	?	?

* The probable errors of the differences were calculated according to the generally accepted proposition that the most probable difference between the means, standard deviations, &c., of random samples, is equal to the square root of the sums of the squares of the probable errors of the individual samples. Thus, in the above table, the probable errors of mean head-lengths in the two series are respectively ±·075 and ±·115. Consequently, the probable error of the difference ·14 between the means $= \{(\cdot 115)^2 + (\cdot 075)\}^{\frac{1}{2}} = \cdot 1373$

It will be seen from the recorded differences in the above table, viewed in relation to their probable errors, that, whereas differences in variability are slight, and that, whereas only in the case of face-breadths is the difference of variability undoubtedly significant, the differences between the *means* of the three characters, head-length, head-breadth, and

Cambridge material, contrasted with similar results calculated from our data of total criminals, are given in the following table:—

COMPARATIVE TABLE II.

Characters.	Means.		Standard deviations.		Coefficients of variation.		Differences.		
	Cambridge students.	Convicts.	Cambridge students.	Convicts.	Cambridge students.	Convicts.	Means.	Standard deviations.	Coefficients of variation.
Head-length in mm.	193·51±·13	192·44±·09	6·16±·09	6·39±·06	3·18	3·34	1·07±·16	·23±·11	·16
Head-breadth in mm.	153·96±·11	151·02±·08	5·06±·08	5·49±·05	3·28	3·63	2·94±·13	·43±·09	·35
Head index (100 B/L)	79·56	78·52	2·95	3·00	?	3·82	1·04	·05	?
Stature in inches ...	68·86	65·44	2·54	2·65	3·70	?	3·42	·11	?
Age in years	20 ap.	36·23	?	13·09	?	?	16	?	?

	Coefficients of correlation.		Differences.
	Cambridge students.	Convicts.	
Head-length and head-breadth ...	·3448 ± ·0188	·3860 ± ·01	·0412 ± ·02
Head-length and stature	·2816 ± ·0196	·2637 ± ·01	·0179 ± ·02
Head-breadth and stature	·1529 ± ·0208	·1532 ± ·01	·0003 ± ·02
Head-length and age	?	·1525 ± ·01	?
Head-breadth and age	?	·1516 ± ·01	?

It will be seen from an examination of the differences recorded that in correlation there is no difference at all, and that in variability* the difference is barely significant,† between criminals and university men. It is between the means only of the cephalic characters that the recorded differences are significant. In mean head-length there is one mm. difference, in mean head-breadth three mm. difference, between Cambridge university students and convicts. But the latter are also, in the mean, 16 years older, and nearly $3\frac{1}{2}$ inches less in stature, than are the former individuals. Consequently, certain amounts of head-length, corresponding to these age and stature differences, must be added and subtracted from the means for convicts before they can be legitimately comparable with the means of the university students. Amongst convicts, the correlation coefficient of stature with head-length is ·2637, and with head-breadth is ·1532; of age with head-length it is ·1525, and with head-breadth it is ·1516; the standard deviations of head-length, of head-breadth, of stature, and of age, are 6·395 mm., 5·486 mm., 2·652 inches, and 13·094 years, respectively—and according to the theorem stated on p. 36, deviation in head-length and head-breadth equals "r" times deviation in stature, and "r" times deviation in age. Thus, for criminals a deviation of 3·410 inches in stature corresponds to a deviation of $\frac{\cdot 2637 \times 6\cdot 395 \times 3\cdot 410}{2\cdot 652}$ $= 2\cdot 1683$ mm. of head-length and to one of $\frac{\cdot 1532 \times 5\cdot 486 \times 3\cdot 410}{2\cdot 652} = 1\cdot 0807$ mm. of head-breadth. And similarly, a deviation of -16 years in age corresponds to a deviation of $\frac{\cdot 1525 \times 6\cdot 395 \times -16}{13\cdot 094} = -1\cdot 1916$ mm. of head-length and to one of $\frac{\cdot 1525 \times 5\cdot 486 \times -16}{13\cdot 094}$ $= -1\cdot 0162$ mm. of head-breadth. Subtracting and adding these respective amounts of expected differences, we get the following legitimate contrast between the mean head-

* It should also be noted that the university men, even if they be undifferentiated physically from criminals, would inevitably show reduction in *variability* of physical characters because, being students, the distribution of their ages is much less variable than is that of the criminal subjects. As shown on p. 36, the extent to which the variability of any physical attribute, such as head-length, is reduced in a population restricted within definite limitations of age, or of other conditions associated with this attribute, is equal to $\sqrt{1-r^2}$ which, in the present instance, ·1525 being the correlation coefficient (r) of head-length with age, equals $\sqrt{1 - \cdot 0233} = \cdot 9883$. That is to say, the standard deviation value of 6·395, representing the variation in head-length for individuals of all ages, like our criminals, would become, for subjects such as university students, whose ages amongst 95 per cent. of them range from 18 to 22, $6\cdot 395 \times \cdot 9883 = 6\cdot 3201$. Thus, in the same age conditions, the difference between head-length variability of convicts and university students is ·159, a value hardly greater than its probable error ± ·1100.

† If criminals were stigmatised by the possession of extreme degrees of physical characters, the standard deviation of these characters should be pronouncedly different in criminals and non-criminals. Here again the theory of anomaly, as postulated by Lombroso, is directly refuted by facts.

lengths and head-breadths of university students and of convicts, duly corrected for age and stature.*

COMPARATIVE TABLE II*bis*.

Characters.	Convicts.				Cambridge Students.	Difference & p.e. of diff'ce.
	Crude Values.	Corrections for Stature.	Corrections for Age.	Corrected Values.		
Mean head length	192·45	+2·20	−1·25	193·39	193·51	− ·12±·16
Mean head breadth ...	151·02	+1·10	−1·05	151·07	153·96	−2·89±·13

We see, then, that, when compared in similar conditions of age and stature, the sole difference in cephalic characters between convicts and Cambridge university students is one of 2½ mm., which is the extent to which the heads of the latter class are broader in the mean than those of the former. In head-length, in variability, and in correlation, there is no significant difference between these two widely differentiated social classes. It should be remembered, moreover, that the closely cropped heads of criminals would mainly tell upon measurements by leading to a greater reduction of the recorded transverse, than of the longitudinal, diameters of the head. And it is also interesting to note the small difference in skull capacity, corresponding to a difference of 2¼ mm. in head-breadth. Allowing 11 mm. for the average difference between any diameter as measured on the living head and on the skull, and applying Dr. Lee's formula :—†

skull capacity = 6·752 skull-length + 11·421 skull-breadth − 1434·06

we have :—

for the skull capacity of criminals :

$$6{\cdot}752 \times 182{\cdot}39 + 11{\cdot}421 \times 140{\cdot}07 - 1434{\cdot}06 = 1397{\cdot}2\ ;$$

for the skull capacity of Cambridge students :—

$$6{\cdot}752 \times 182{\cdot}51 + 11{\cdot}421 \times 142{\cdot}96 - 1434{\cdot}06 = 1431{\cdot}0\ ;$$

difference between skull capacities of criminals and Cambridge students ... 33·8

This difference of 34 cubic mm. in skull capacity, considered in relation to the total magnitudes, is practically negligible.

3. *Comparison of Convicts with Oxford Undergraduates.* — In Biometrika, Vol. VIII., p. 49 *et. seq.*, E. Schuster publishes some anthropometric data of 959 Oxford University Students, similar in many respects to the Cambridge statistics we have just been examining. The statistical results of the analysed data are contrasted with the results of our criminal statistics, in the following comparative table :—

COMPARATIVE TABLE III.

Characters.	Means.		Standard Deviations.		Differences.	
	Oxford Students.	Convicts.	Oxford Students.	Convicts.	Means.	Standard Deviations.
Head-length	196·05±·13	192·44±·09	6·23±·09	6·39±·06	− 3·61±·16	+ ·16±·11
Head-breadth	152·84±·11	151·02±·08	4·92±·08	5·49±·06	− 1·82±·13	+ ·57±·09
Auricular height	126·62±·15	122·29±·11	5·80±·07	5·21±·18	− 4·33±·18	− ·59±·19
Head Index	78·09±·06	78·59±·04	2·92±·04	3·00±·02	+ ·50±·07	+ ·08±·05
Horizontal circumference ...	563·10±·30	559·72±·23	14·19±·12	15·73±·08	− 3·38±·37	+1·54±·16
Stature	69·49±·05	65·44	2·60±·04	2·65	− 4·05	+ ·05
Age	19·96	36·25	?	13·09	+16·25	?

	Coefficients of Correlation.		Differences.
	Oxford Students.	Convicts.	
Stature and head-length ...	·31±·02	·26±·01	−·05±·02
" head-breadth ...	·14±·02	·15±·01	+·01±·02
" head-height ...	28±·02	·19±·01	−·09±·02
" head index ...	−·13±·02	−·08±·01	+·05±·02
" circumference..	?	·25±·01	?
Age and head-length ...	?	15±·01	?
" head-breadth ...	?	·15±·01	?
" head-height ...	?	·09±·01	?
" head index ...	?	01±·01	?
" circumference ...	?	·17±·01	?

* For the regression equations giving the mean head-length and head-breadth of criminals at any age and for any stature, see pages 54, 56.

† Phil. Trans., Vol. 196, A., p. 235.

Judging from the general trend of the figures, the variability of head measurement is perceptibly greater in criminals than it is amongst Oxford students, although a really significant difference in variability appears only in the cases of head-breadth and circumference—the difference in the former character being five times, and in the latter, ten times, the probable error of the difference. But, as we remarked about Cambridge undergraduates, Oxford students also, even if they be physically homogeneous with criminals, would be expected, on account of their age limitations, to be less physically variable than criminals, whose ages extend over a much wider range. Moreover, another condition which would tend to produce a recorded disparity of variability in the contrasted statistics is that the criminal measurements are subject to the personal errors of several observers. Upon mean values, effects due to conflicting personal equations would tend, in the long run, to cancel each other; but, upon variability, these effects must inevitably tend to increase the measured value. In all the circumstances of the comparison, the trifling differences in variability and in correlation, recorded in the above table, can reasonably be regarded as negligible.* In fact, as we found with the Cambridge contrast, it is in mean values only that cephalic measurements of convicts differ significantly, and to any perceptible extent, from those of Oxford students. But here again, as the values of the correlation coefficients recorded in Tables 1–5 show, the mean values of all the cephalic measurements we are considering increase progressively with age and stature; and Oxford students are, on the average, sixteen years younger and four inches taller than criminals: accordingly, before drawing conclusions from differences between their mean values, allowance must be made for effects upon the statistics due to their disparities of age and stature. Amongst criminals, an increase of 4·05 inches in mean stature is equivalent to an increase of 2·60 mm.† in mean head-length, of 1·31 mm. in mean head-breadth, of 2·32 mm. in mean auricular height, of −·37 mm. in mean cephalic index, and of 6·17 mm. in mean circumference of head. And a decrease of 16·25 years in mean age would correspond to a decrease of 1·25 mm., 1·05 mm., ·31 mm., ·05 mm., and 3·48 mm., respectively, in the same cephalic measurements. Compared, then, on an equalised age and stature basis, the statistical results contrasted in Comparative Table III. become modified as follows:—

COMPARATIVE TABLE III*bis*.

Characters.	Convicts				Oxford Students.	Differences.
	Crude Values.	Corrections for Stature.	Corrections for Age.	Corrected Values.		
Mean Head Length ...	192·44	+2·60	−1·25	193·80	196·05	−2·25±·16
„ „ Breadth ...	151·02	+1·31	−1·05	151·28	152·84	−1·56±·13
„ „ Height... ...	132·29	+2·32	− ·31	134·30	136·62	−2·32±·18
„ „ Index	78·52	− ·37	− ·05	78·11	78·02	+ ·09±·07
„ „ Circumference	559·72	+6·17	−3·48	562·41	563·10	− ·69±·37

The difference of head-index and circumference are neither of them greater than twice their probable errors. We conclude that the convicted felon has the same shape and girth of head as Oxford students, but that, in their three principal head diameters, prison inmates fall short of Oxford University students by 1½ to 2 mm. Before drawing hasty conclusions, however, from these small reported differences, two facts must be remembered. The one is that heads of convicts are closely cropped of hair—a fact which necessarily leads to a relative depreciation of recorded head measurements; the other is that the recorded differences of cephalic measurements between criminals and Oxford or Cambridge students are not greater than similar differences between the respective students of these two universities. In breadth of head, Cambridge exceeds Oxford to about the same extent that Oxford men exceed criminals; but criminals and Oxford men are equally longer-headed than the Cambridge men—index 78 as against 79·6. And if we allot a casting vote to a third University by introducing (4) *Aberdeen undergraduates* into the contrast, the verdict is that prison inmates, as a whole, approximate closer in head-measurements to the Universities generally, than do students of different Universities conform with each other in this regard. In fact, the mean length, breadth, height, index, and circumference of head, which are 194·8, 153·4, 132·3, 78·8 and 562·6 respectively in Scottish undergraduates,‡ are all remarkably close to, and three out of the five are almost identical with,

* *See* footnote, p. 142.

† *See* regression equations, pp. 54, 56, 58, 60, 62.

‡ *See* Macdonell: Proceedings of Anatomical and Anthropological Society, University of Aberdeen, 1906.

him in Biometrika IV., p. 118 *et seq.*, and their statistical constants are set forth and discussed by J. Blakeman and K. Pearson on p. 124 *et seq.* The authors describe the Middlesex Hospital population, which was the source of these statistics, as belonging anthropometrically "to a class intermediate between the class from which criminals are drawn and the lower middle class." The means and variabilities of cephalic characters, contrasted with those obtained from our criminal data, are as follows :—

Comparative Table V.

Characters.	Means.		St. Deviations.		Coefs. of Variation.		Differences.		
	Hospital Inmates.	Convicts.	Hospital Inmates.	Convicts.	Hospital Inmates.	Convicts.	Means.	St. D.	C. of V.
Head-length in mm.	190·36±·35	192·44±·09	5·62±·25	6·39±·06	2·95±·13	3·34	2·08±·40	·77±·26	·39±·14
Head-breadth in mm.	149·34±·34	151·02±·08	5·41±·24	5·49±·05	3·62±·16	3·63	1·68±·35	·08±·25	·01±·17
Head-height in mm.	132·90±·28	132·29±·11	4·51±·20	5·21*±·18	3·39±·15	3·92	− ·61±·91	·70±·27	·53±·18
Head-index $\frac{B \times 100}{L}$	78·48±·17	78·52±·04	2·76±·12	3·00±·02	3·52±·16	3·82	·04±·48	·24±·12	·30±·17
Circumference in mm.	555·79±·99	559·72±·22	15·84±·70	15·73±·08	2·85±·13	2·81	3·93±·82	−·11±·70	−·04±·14
Stature in inches ...	67·16±·19	65·44	3·05±·13	2·65	4·55±·20	2	−1·72	−·40	?
Age in years	49·26±·76	36·23	12·11±·53	13·09	24·60±1·15	2	−13·03	+·98	?

* See foot-note, p. 52.

From the relation of the differences to their probable errors, it will be seen that in both absolute and relative variability, head-measurements of criminals do not differ significantly from the general hospital population.* On the other hand, apart from head-height, differences of mean values are all of them significant. To measure, however, the full extent of these differences, we must allow, as before, for differences in the mean ages and statures of the contrasted populations. General hospital patients are 1·7 inches taller, and 13 years older, than criminals, amongst whom, every inch difference in stature, and every year difference in age, corresponds to certain deviations in cephalic measurements, as presented by the regression equations referred to in note †, p. 144. When these corrections are introduced, the means tabulated above become modified as follows :—

Comparative Table V*bis*.

Characters.	Convicts.				General Hospital Inmates.	Differences.
	Crude Values.	Stature Corrections.	Age Corrections.	Corrected Values.		
Mean head-length ...	192·44	+1·10	+1·00	194·55	190·36	+4·19±·40
Mean head-breadth ...	151·02	+ ·55	+ ·84	152·42	149·34	+3·08±·35
Mean head-height ...	132·29	+ ·98	+ ·25	133·52	132·90	+ ·62±·91
Mean head-index ...	78·52	− ·15	+ ·04	78·41	78·48	− ·07±·48
Mean circumference ...	559·72	+2·61	+2·79	565·12	555·79	+9·33±·82

There is no differentiation in head-shape, *i.e.*, in the relative proportions of head-length and head-breadth ; but in the absolute measurements of head-length, head-breadth, and circumference of head, prison inmates are pronouncedly superior to general hospital patients. The explanation of the differentiation is obvious. When describing the "General Hospital Population" in his memoir, J. Blakeman, referring to the large number of cancer cases it contains, writes :—"It cannot be too often insisted upon that such a population is not a fair sample of the general population of a given district. There is a large amount of what it would be convenient to call 'shrinkage' due to illness and defective nourishment." It is undoubtedly this "shrinkage" of tissue from wasting disease which, affecting all parts of the head equally, has led to a reduction in the measurements of head-circumference and head-diameters of hospital patients, without appreciably modifying the general shape of their heads. This view, that the differences recorded above, showing an *apparent* physical superiority of criminals over hospital patients, are expressions of a general physical differentiation, due to disease, rather than of a special cephalic differentiation, associated with criminality—this view is confirmed, firstly by the absence of any appreciable differences in variability between criminals and

* See footnote, p. 142.

hospital patients,* and secondly by the presence of a remarkable difference in the correlation of cephalic characters with age.

COMPARATIVE TABLE V (3).

Characters.	Correlation coefficients with			
	Age.		Stature.	
	Hospital Inmates.	Convicts.	Hospital Inmates.	Convicts.
Head-length	− ·075	+ ·15	—	+ ·36
Head-breadth	− ·091	+ ·15	—	+ ·15
Head-height	− ·215	+ ·03	—	+ ·19
Head circumference ...	− ·109	+ ·17	+ ·330	+ ·25
Stature	− ·150	− ·153†	1	1
Age	1	1	− ·150	− ·153†

The essential point to be noticed is that the age correlations in hospital patients are all of them negative in sign. In a healthy criminal population, the average values of cephalic characters progressively increase with age; in a non-criminal, but diseased, population, they progressively decrease. We can only conclude—since wasting diseases, with their concomitant atrophy of bone, and shrinkage of soft parts covering bone, are progressively more frequent amongst older hospital inmates—that it is hospital patients, and not criminals, who constitute a class physically differentiated from the general community; the differentiation being due to a shrinkage of tissue with age, peculiar to individuals constitutionally diseased.

Professor Pearson, dealing with this subject, p. 141, Biometrika, Vol. IV., remarks that:—"The possible shrinkage" (or growth) "of the head with age in the general population would form an interesting subject for investigation." The corrections for age we have made upon cephalic measurements find their justification, and the comparisons depending upon these corrections are legitimatised, by the justness of the supposition that, in regard to the correlation of their physical characters with age, our criminals *do* represent such a general population. Personally we are convinced that, when investigated in the general population, the relations of head-measurements with age will be found coincident with the relation we have established for criminals. This conviction, that increase of cephalic characters with age (whether it be due to a progressive growth of bone, &c., or whether it results from individuals with larger heads tending to survive), is an anatomical fact common to humanity, and that it is not a condition peculiar to criminals only‡—this conviction is based upon the following considerations:—

(1) that, amongst criminals, increase of head-length is exactly proportional to increase of head-breadth with age (correlation coefficients ·15), the head-index, representing shape of head, remaining unaffected by age changes (correlation coefficient ·01), [see pages 54, 56, 58];

(2) that the relation, with age, of that most representative of all physical characters —stature—amongst criminals, is approximately identical with the relation statistically shown to exist amongst the general population. In criminals, as well as in all other classes of the community that have been statistically examined, the means of stature progressively increase up to the age of 28, when they begin progressively to decline, (see Part II, Ch. I., p. 191);

(3) that with stature, the relations of head-measurements amongst criminals are approximately identical with the corresponding relations statistically established amongst the general population; and that with increasing stature, the mean cephalic index or shape of head also changes, the skull becoming more dolico-cephalic, (see Table 3);

(4) that the means of *all* cephalic and facial measurements amongst criminals show a consistent progressive increase with age—a concord of facts difficult to explain on any other supposition than that head and face bones grow continuously during the first five decades of life, until senile atrophy of bone commences at age 50, (see Tables 1—8);

(5) that a progressive increase of cephalic characters with age occurs equally amongst all types of criminals, despite the very marked differences of social class from which different kinds of criminals are drawn, (see Figs. 1 to 8);

* Chronic illness, while reducing head-measurements of all patients, would not modify the relative differences between individual patients.

† See Part II., Chap. I., page 191.

‡ *i.e.*, results from individuals with larger heads tending to survive as criminals.

(6) that, although the mean cephalic measurements of criminals differ according to their general bodily conditions, the mean head-length of those described as stout and strong being greater than that of the thin and muscular, which is again greater than that of the thin and weak—yet, within each of these categories of the stout, the thin, and the weak, a progressive increase of mean head-length occurs, associated with increasing age, (see Table 55, p. 138);

(7) that, if the increasing regression of head-length with age is a peculiarity of criminals, the only explanation of the phenomenon would be that criminals with larger heads, *i.e.*, those who are generally more robust, tend to survive criminals with inferior cephalic capacity, *i.e.*, those who are physically weaker: an explanation difficult to accept on *a priori* grounds, and which is contradicted by the last (the sixth), and by the two following, considerations (8 and 9);

(8) that the death rate of criminals, age for age, up to middle life, is identical with the death rate of the general population, (see Part II, Ch. III., p. 232);

(9) that increasing number of convictions to prison, and increasing number of years spent in prison, are associated with a slight decrease in the average height, and with no change in the average weight, of individuals so convicted, (see page 189).

These arguments, all point to the fact that a continuous growth of head up to middle life is common to all healthy people: and consequently they support the legitimacy of the corrections for age we have made upon the means in the preceding comparative tables. We admit, however, that these corrections and comparisons may need revision when the regressions of physical characters with age have been statistically investigated upon a typical sample of the general population.

(7) *Comparisons of English Convicts with Scottish Insane, and Scottish Criminals.*— Some valuable cephalic measurements of Scottish people are published by J. F. Tocher, in a memoir, published in Biometrika, Vol. V., entitled "Anthropometry of Scottish Insane." Local populations of Scotland, however, according to Mr. Tocher's account of them, differ from each other anthropometrically to such a wide extent—a difference of as many as 6 mm. in head-length being recorded between two districts—that direct comparison of our material with any particular series of these data cannot be very fruitful. The mean head-lengths and mean head-breadths of the "entire insane" population, estimated from a sample of 4,436 male individuals, are 195·5 mm. and 151·5 mm. respectively. The age distribution is not given; but the average stature of the series is 65·7 inches—which is to say that the Scottish insane are, on the average, ·3 inch taller than our series of criminals, whose mean head-lengths and head-breadths are 192·4 mm. and 151·0 mm. respectively. Thus the general Scottish insane have heads, on the average, 3 mm. longer than English convicts. Fortunately, however, in his memoir, p. 345, Mr. Tocher contrasts with the data of Scottish insane individuals some measurements of Scottish habitual criminals, whose head-lengths and head-breadths range, in the mean, the former from 195·3 ± ·70 for sexual offenders to 198·4 for those convicted of murderous assault (the average for all criminals being 196·3 mm.), and the latter, from 152·1 ± 1·06 mm. to 153·9 ± ·29 mm., with 153·5 for general average. As shown by the magnitudes of the probable errors, the divided criminal series are, all of them, too short for our attributing significance to the recorded fluctuations of the mean values. The important facts for our purpose are, firstly, that Scottish insane are longer-headed by 3 mm. than English convicts; and, secondly, that Scottish habitual criminals are 1 mm. longer of head than Scottish insane.

(8) *Comparison between Typical Samples of Convicts and Soldiers.* — In an investigation referred to later (see p. 157), some calliper measurements made upon 118 non-commissioned officers and men of the Royal Engineers,* compare with our own as follows:—

COMPARATIVE TABLE VI.

Population.	Mean Head-length.	Mean Head-breadth.	Mean Index.	Mean Age.	Mean Stature.
Convicts	192·4	151·0	78·5	36·2	65·4
Royal Engineers...	193·6	151·1	78·1	26·1	68·5

* See Biometrika, Vol. VIII., p. 123.

seventeenth century plague. The trifling differences in correlation between our data and the various series referred to are as follows :—

COMPARATIVE TABLE VII*bis*.

Population.	Correlation Coefficients of		
	Head Length with Head Breadth.	Head Length with Head Height.	Head Breadth with Head Height.
Non-habitual criminals	$-\cdot010\pm\cdot014$		
Cambridge students	$+\cdot041\pm\cdot022$	—	—
Aberdeen students	$+\cdot080\pm\cdot031$	—	—
Scottish insane	$-\cdot099\pm\cdot014$	$-\cdot134\pm\cdot014$	$-\cdot067\pm\cdot014$
Whitechapel skulls	$+\cdot146\pm\cdot070$	$-\cdot014\pm\cdot070$	$+\cdot053\pm\cdot070$

The only unequivocably significant differences in the table are those between English convicts and the Scottish insane ; and even here the amount of difference is very trifling. The most interesting point of the table is the close agreement between correlation values obtained from measurements of English skulls, 300 years old, and those calculated from the cephalic diameters of English convicts, alive to-day.

(10) *Frequency distributions of Cephalic Characters compared.* The calculating of means and standard deviations with their probable errors, although adequate for most practical statistical purposes, is not sufficient for the complete theoretic description and comparison of series of statistics. For such perfect description of data, the variability of their frequency distribution requires finer analytical treatment. In Fig. IX., p. 122, crude descriptions of 16 physical characters are represented graphically by a series of frequency polygons, whose characteristics had been defined in the text by statements of their first and second moments, *i.e.*, of the values of the means and standard deviations only of the respective distributions. From the general form of these crude distributions, it was assumed that, if completely and properly analysed, the normal curve, or some form of skew curve approximating to the normal, would be found to represent the statistics with sufficient accuracy for all practical purposes. To submit the distribution of all these 16 characters to such complete analytical treatment would be beyond the range of our investigation, whose main purpose, pre-eminently a practical one, is the search for a physical criminal type which, if discovered, should be reasonably serviceable either for criminals' identification, or for testing the soundness of certain current criminological theories. The contrast of mean and standard deviation values is all-sufficient for this purpose. Yet, in the case of some of the characters we have been dealing with, the calculating of their means and standard deviations has depended on the legitimacy of an assumption frequently reiterated : the assumption that the distribution of human physical characters approximates to the normal or Gaussian type. It seems, then, of sufficient practical importance, and it is certainly worth while theoretically, to test thoroughly this assumption in the case of a couple of physical characters. Accordingly, selecting head-length and head-breadth for the purpose, firstly we have calculated the constants of, and have graphically traced, the normal and skew curves which best represent our statistics of head-length and head-breadth ; secondly, we have estimated for each character the "goodness of fit" between the actual statistics and the curves representing them ; and lastly, we have contrasted the constants of the curves with the corresponding values obtained from similar statistics by other observers—notably by Cicely D. Fawcett and W. R. Macdonell, working upon skull measurements, and by Macdonell and Tocher, dealing with length and breadth measurements of the human head.

The constants of the normal and skew curves obtained from our statistics of head-length and breadth, (Records 1 to 2,500), contrasted with those obtained by other observers from similar statistics, are given in Table 56. The actual frequencies of these statistics, side by side with the corresponding theoretic frequencies of the normal curve—the two series of frequencies from whose relation to each other "goodness of fit" is estimated—are presented in Tables 57. And in Figs. XI. and XII. this "goodness of fit," or approximation to type, is represented graphically : the normal and skew curves, theoretically describing them, being traced in direct relation to the frequency polygons, which crudely describe these statistics.

TABLE 56.—ANALYTICAL CONSTANTS OF FREQUENCY CURVES OF HEAD LENGTHS AND COMPARISON FIGURES.

Material.	No.	Unit.	μ_2	μ_3	μ_4	β_1	β_2	κ_1	κ_2	Mean mm.	Mode mm.
		mm.									
Criminals in sample	2,341	4	3·8826	·5858	21·5819	·0193	3·3202	·5627	·0250	192·4489	192·0746
Tocher's Scotch insane	4,486	3	5·1026	−1·2422	97·3150	·0116	3·7566	1·4787	·0080	195·4556	195·7096
Fawcett's Naqada crania	141	1	34·2740	13·5659	3120·00	·0046	2·6560	−·7017	—	184·91	185·17
Macdonell's Whitechapel crania ..	137	1	39·3709	−6·4413	4562·103	·00068	2·9582	−·0457	—	189·06	189·14

ANALYTICAL CONSTANTS OF FREQUENCY CURVES OF HEAD BREADTHS AND COMPARISON FIGURES.

Material.	No.	Unit.	μ_2	μ_3	μ_4	β_1	β_2	κ_1	κ_2	Mean mm.	Mode mm.
		mm.									
Criminals of sample	2,348	3	3·3446	·8879	34·6940	·0388	3·0415	·0368	·0877	151·0196	—
Macdonell's criminals..	3,000	1	25·1488	12·8006	1977·4715	·0104	3·[illegible]	·0042	—	150·442	150·188
Tocher's Scotch insane	4,436	2	7·0448	−2·4439	211·0686	·0134	3·8116	1·1880	·0086	151·8005	151·7369
Fawcett's Naqada crania	139	1	21·8419	[illegible]	1881·18	[illegible]	3·3043	·4812	—	134·77	134·19
Macdonell's Whitechapel crania ..	135	1	27·[illegible]	−[illegible]	[illegible]	·00867	4·3128	2·5406	—	140·67	140·92

Frequency curve of 2,345 Head Lengths (unit 1 mm.)

$$\text{Normal} \ldots \quad y = 146{\cdot}58 \times e^{-{\cdot}012243 \times (x-192{\cdot}4489)^2}$$

$$\text{Skew} \ldots \quad y = 114{\cdot}74 \times \left\{1 + {\cdot}0011065 \times (x-187{\cdot}640)^2\right\}^{-12{\cdot}847} \times e^{3{\cdot}791 \tan^{-1}\{{\cdot}033265\,(x-187{\cdot}640)\}}$$

Frequency curve of 2,348 Head Breadths (unit 1 mm.)

$$\text{Normal} \ldots \quad y = 170{\cdot}73 \times e^{-{\cdot}01661 \times (x-151{\cdot}0196)^2}$$

TABLES 57.

Frequencies of HEAD LENGTHS *observed and calculated from Curve.*

mm.	Observed.	Normal Curve. Calculated.	Normal Curve. $\frac{e^2}{m}$.	Skew Curve. Calculated.	Skew Curve. $\frac{e^2}{m}$.
175 and under ...	11	8·1	1·01	7·5	1·61
176, 177, 178, 179 ..	31	40·7	2·30	36·4	·81
180–	131	138·3	·38	131·9	·01
184–	341	326·0	·69	329·6	·39
188–	531	522·9	·12	544·2	·32
192–	585	570·0	·41	576·6	·12
196–	417	425·9	·19	412·3	·05
200–	193	219·1	3·10	207·0	·95
204–	74	76·1	·06	75·8	·01
208–	27	17·4	5·25	20·8	1·83
212 and over ...	7	3·5	3·53	5·8	·26
Totals ...	2348	2348	17·04	2347·9	6·40

Normal Curve ... $X^2 = 17{\cdot}037$
$P = {\cdot}0735$
Skew Curve ... $X^2 = 6{\cdot}397$
$P = {\cdot}7809$

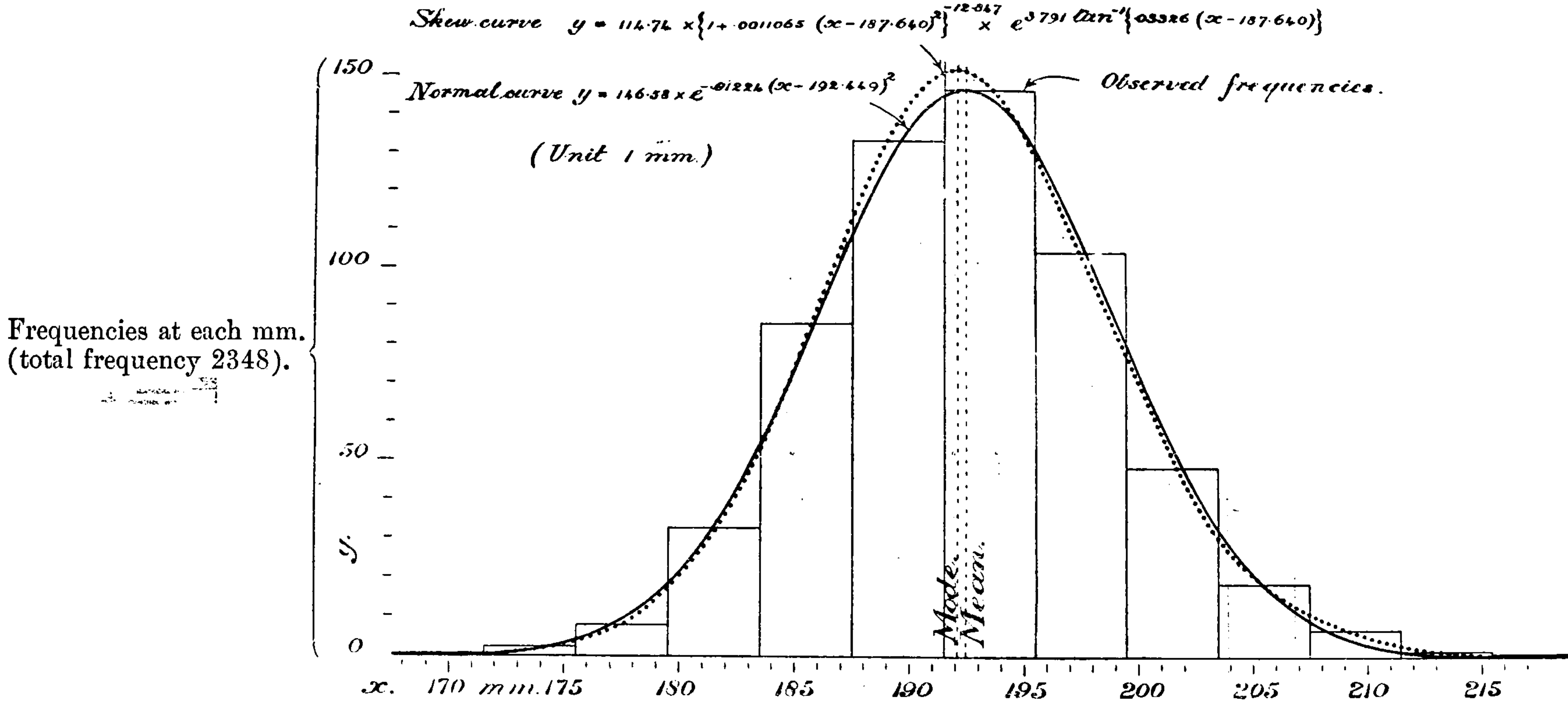
Frequencies of HEAD BREADTHS *observed and calculated from Curve.*

mm.	Observed.	Calculated.	$\frac{e^2}{m}$.
139 and under ...	35	41·3	·96
140, 141, 142 ...	102	99·5	·06
143–	223	229·7	·20
146–	398	391·4	·11
149–	528	497·3	1·90
152–	481	475·2	·07
155–	288	338·5	7·53
158–	175	176·8	·02
161–	87	71·5	3·34
164 and over ...	31	26·8	·68
Totals ...	2348	2348	14·87

$X^2 = 14{\cdot}870$
$P = {\cdot}0950$

FIG. XI.

HEAD LENGTHS OF CRIMINALS.



Whitechapel skulls already referred to, and (3) of the heads of non-habitual criminals, (for the latter see Biometrika, Vol. I., p. 188), and those of Tocher to head-length and breadth measurements of Scottish insane, (Biometrika, Vol. V., p. 314). These references are cited in the first column of the Table. In Columns 2 and 3, the number of measurements, and the units, are given from, and in, which the constants were, in each case, calculated and expressed. In the next five columns, the second, third, and fourth, moments, μ_2, μ_3, and μ_4, and the derived coefficients, β_1 and β_2, are set forth. Then follow the values of the criteria, κ_1 and κ_2, derived from β_1 and β_2, which decide the type of curve best describing the statistics. In the last two columns, the mean and mode of the various curves are recorded, the value of the mean minus the modal value, expressed as a ratio of the standard deviation, measuring the "skewness" of the distribution. In normal curves $\beta_1 = 0$, and $\beta_2 = 3$, and the mean corresponds to the mode, the amount of skewness or value of mean minus mode being nil for all normal curves.*

It will be seen that a slightly skew curve of Type IV. describes our statistics of head-length rather better than does a normal curve, although the deviation from the normal type is very slight. The head-breadth statistics are, however, represented more closely by a normal curve. It will also be noticed that our results correspond closely to those obtained by the other observers quoted; and thus the evidence of the characters examined confirms, for the living head, Fawcett's conclusions with regard to the skull: a conclusion which was based upon the analysis of 26 cranial characters, and which is that—"with series of skull measurements we shall reach for all practical purposes adequate graphical treatment of the frequency by using the normal curve of deviation $y = y_0\, e^{\frac{-x^2}{2\sigma^2}}$

The equations and origins of the curves, deduced from the constants given in Table 56, are recorded in the diagrams, figures XI. and XII. A glance at these figures will be sufficient to show how closely curves of the normal type describe our statistics of head-length and head-breadth. The precise amount of deviation from the normal is to be found by applying Pearson's test of "goodness of fit," which is carried out by contrasting the actual frequencies, given by these statistics, with the theoretic frequencies, calculated from the respective curves. The former, the columns "observed" in the tables 57, are the areas of the several rectangles which make up the frequency polygons; the latter, the columns "calculated," are the corresponding areas bounded above by the curve.† As a result of this contrast with the normal curve, we find that for head-length $\chi^2 = 17{\cdot}037$, and for head-breadth $\chi^2 = 14{\cdot}870$. And the number of frequency groups for which χ^2 is calculated $= 11$. Consulting Elderton's Tables, (Biometrika, Vol. I., p. 161), we find from these values of $n^1 = 11$, and $\chi^2 = 17{\cdot}037$ and $14{\cdot}870$, that the probability, P, of our series of statistics belonging to a chance distribution of a normal or Gaussian type, $= {\cdot}074$ for head-length and ${\cdot}095$ for head-breadth: which is to say that frequency polygons of normally distributed statistics, corresponding numerically to our own, would deviate from the exact normal type of curve, to as great an extent as our head-length statistics, about seven times, and as our head-breadth statistics, about ten times out of a hundred samples.

Thus the fit of both head-length and head-breadth statistics of criminals to a chance curve of the Gaussian type is very good. In fact, as will be seen from contrasting the individual frequencies in Table 57, at every point of the scale the actual frequency corresponds closely, and within sampling limits, to the expected frequency, except at one extreme end, *i.e.*, our head-length measurements of 208 mm., and over, occur more frequently than theoretically would be expected. Exactly stated, out of 2,348 criminal heads, there are twelve instances (·5 per cent.) of large heads (genuine hydro-cephalous ?) which would not have appeared in a population selected solely by chance. Some causes, other than chance, must have influenced the exceptional frequency of these very long heads. And herein perhaps we have extracted the grain of truth in Lombroso's theory of anomaly: that amongst 200 criminals, the head-length of one will be genuinely anomalous—a proportion less than Tocher found amongst Scottish insane people, and probably much the same as would be found in many sections of the law-abiding community.

* Obviously no normal series of statistics, unless it be an indefinitely large one, will possess these characteristics precisely. In other words β_1 will never equal zero exactly, nor will β_2 be equal to 3 exactly; and amounts of positive or negative skewness will appear in all normal distributions. The significance of these values must always be estimated in relation to the probable errors of any existing differences between them and the theoretic normal value.

† The values of the areas or frequencies are obtained by tracing with a planimeter round the contours of the several areas.

(*b*) *Observations of Hair and Eye Colour contrasted.*—Some statistics, giving the proportion of light eyes and various shades of hair in some non-criminal communities, compare as follows with our data for convicts :—

COMPARATIVE TABLE VIII.

Population and Reference.	Eyes per cent.		Hair per cent.			
	Light.	Medium and Dark.	Red.	Blonde.	Light Brown or Fair.	Dark Brown and Black or Medium and Dark.
English Convicts.—This memoir ...	35·1	64·9	3·4	2·5	28·5	65·5
Scottish Students.—Proceedings Anth. Soc. Univ. Aberdeen, 1906, Macdonell.	26·4	73·6	4·8	?	26·4	69·9
Scottish School Boys.—Biometrika, Vol. VI., p. 147, Tocher.	45·0	55·0	5·5	?	25·0	69·5
British School Boys.—Biometrika, Vol. III., p. 461, Pearson.	38·4	61·6	3·7	?	35·0	61·3
General Scottish Insane.—Biometrika, Vol. V., p. 342, Tocher.	44·9	55·1	1·6	?	6·5	91·9

Bearing in mind the extent to which personal equation is bound to influence observations of this kind, and considering also the heterogeneity of age, class, and race, of the several populations compared, the general resemblance in hair and eye-colour of English convicts to the law-abiding sections of the community represented in Comparative Table VIII, is more striking than their differentiation in this regard. And allowing for the tendency in hair and eyes to darken during the passage from boyhood to adult life, the resemblance between English convicts and British schoolboys, with regard to their hair and eye-colour, is particularly striking.

(*c*) *Observations of Defective Hearing compared.*—The only observations of this condition we can find comparable with our own are those of W. Macdonell, who states, in the Proceedings of the Anthropological Society University of Aberdeen, 1901–1908, that, out of 500 Aberdeen medical students, there were none who suffered from abnormality in keenness of hearing. The ages of these medical students may be roughly estimated as ranging between 18 and 28. And out of 387 convicts whose ages ranged between 15 and 28, eight (*i.e.*, 2·1 per cent.) are described as having indifferent or defective hearing (*see* Table 24). Also, as set forth in Table 54, the proportion, with defective hearing, of criminals of all ages, drawn from the middle classes of the general population, *i.e.*, the class returning the majority of medical students, is ·24 per cent., and of those drawn from the lower middle class is 4·3 per cent., and from the very poor and destitute classes, 7·7 per cent. The presumption is, that compared on an equalized age and class basis, defective hearing would not be found to be more prevalent amongst the criminal than it is amongst the law-abiding community.

(*d*) *Comparison of Nose Conformation.*—The only data we can find of nose-shapes to compare with the criminal statistics are those published by Tocher in the Appendix of his Scottish Insane memoir, Biometrika V. The nose-shapes recognised and recorded by Mr. Tocher were (1) those styled "Roman" and "Jewish," which together correspond, apparently, to those designated by us "humped," (2) "wavy" noses, corresponding to our "undulating," and (3) those recorded as "straight," a designation which, excluding a few (1·8 per cent.) described as "concave," embraces all other shapes which are not Roman, Jewish or wavy; and consequently must include all the shapes described by us within the three categories of convex, concave and rectilinear. The following are the contrasted percentages :—

COMPARATIVE TABLE IX.

——	Undulating.	Humped.	Straight.
	Per cent.	Per cent.	Per cent.
Convicts	15·5	4·2	80·3
Scottish Insane	13·5	3·7	82·8

(*e*) *Comparative Statistics of Left-handedness.*—The difficulty in collecting standardised statistics of left-handedness is that no man, possessing two hands, is ever entirely and unequivocally left-handed. All men are left-handed in some exercises: yet, to be styled a left-handed man generally means that the left hand is employed in some particular exercise where, according to general concensus of opinion, the right is the one preferred. Notably, it is by the use of the left hand in certain games—especially at cricket and golf —or for wielding a knife or holding a pen, that the left-handed person receives his distinguishing title. The 38 out of 996 convicts (3·8 per cent.) described in Table 27 as left-handed were so designated by this criterion, that they always held their knife or pen in the left hand.

Comparative statistics of left-handedness are remarkably few, and for Englishmen are practically non-existent. In "L'Anthropologie," March, 1911, Herr Karl von Bardeleben, however, publishes some observations of this condition. He finds that among 266,270 German recruits, 3·88 per cent. are left-handed—a proportion practically identical with our percentage of criminals with this peculiarity.*

(*f*) *Comparison of Tattooing amongst Criminals, with its Prevalency amongst Soldiers and Sailors.*—Contrasted with our own results, (*see* Table 35), some information obtained from the War Office as to the percentage of non-commissioned officers and men in two battalions of the line, and in a company of Royal Engineers, who bear tattoo marks, is as follows:—

COMPARATIVE TABLE X.

—	Proportions Tattooed.	
	On Enlistment.	At the Present Time.
One battalion of line	34 per cent.	52 per cent.
Another battalion of line	32 ,,	58 ,,
Company of Royal Engineers	20 ,,	36 ,,
Criminals (ex-soldiers and sailors) ...	—	57 ,,
Criminals (not served in Army or Navy)	29 ,,	—
Total criminals	43 per cent.	

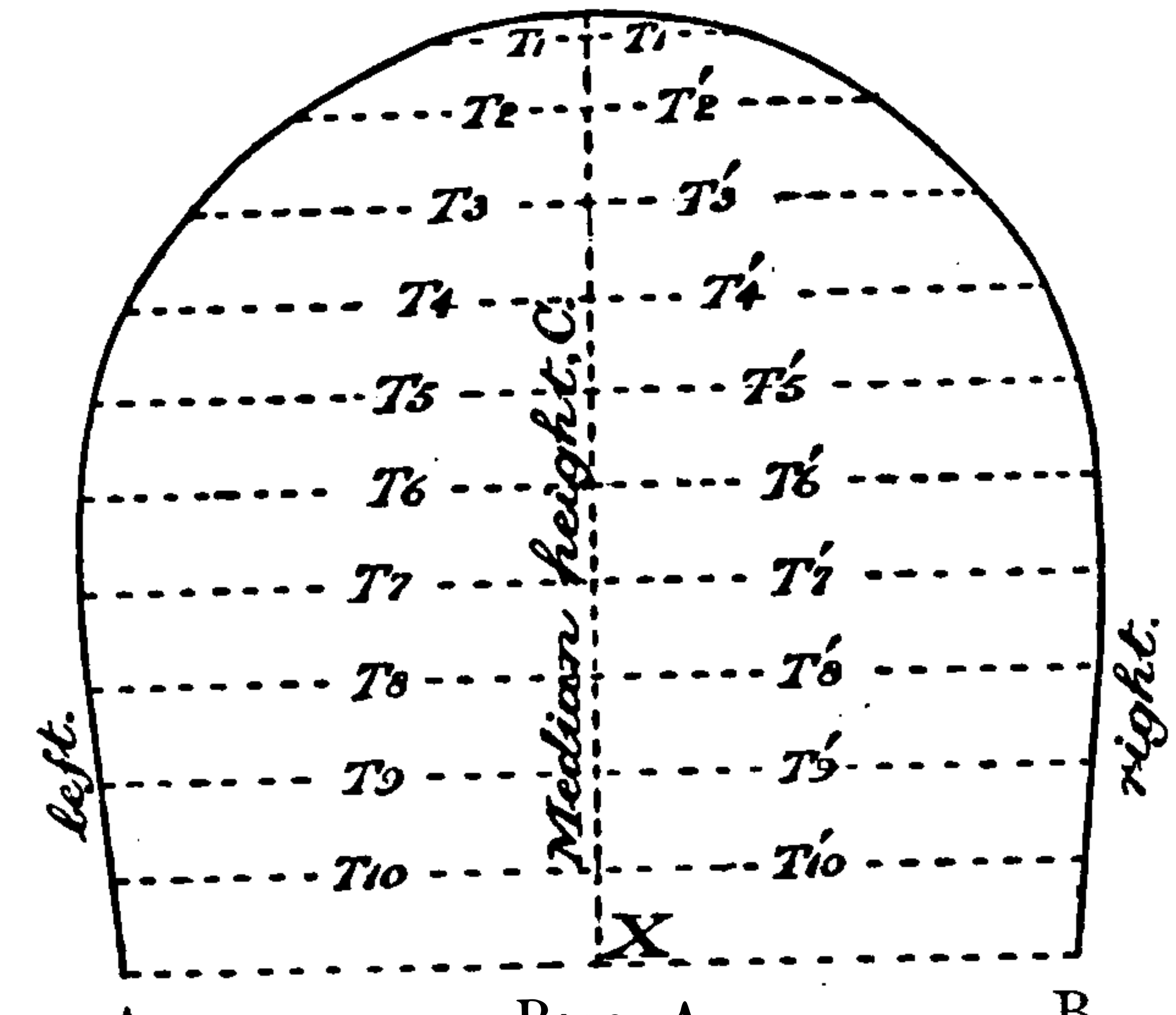
It will be seen that criminals are tattooed to the same extent as soldiers of the Line: and that, like the latter, they are considerably more marked in this way than are soldiers of the Royal Engineers.

B. *Second Series of Comparative Data.*

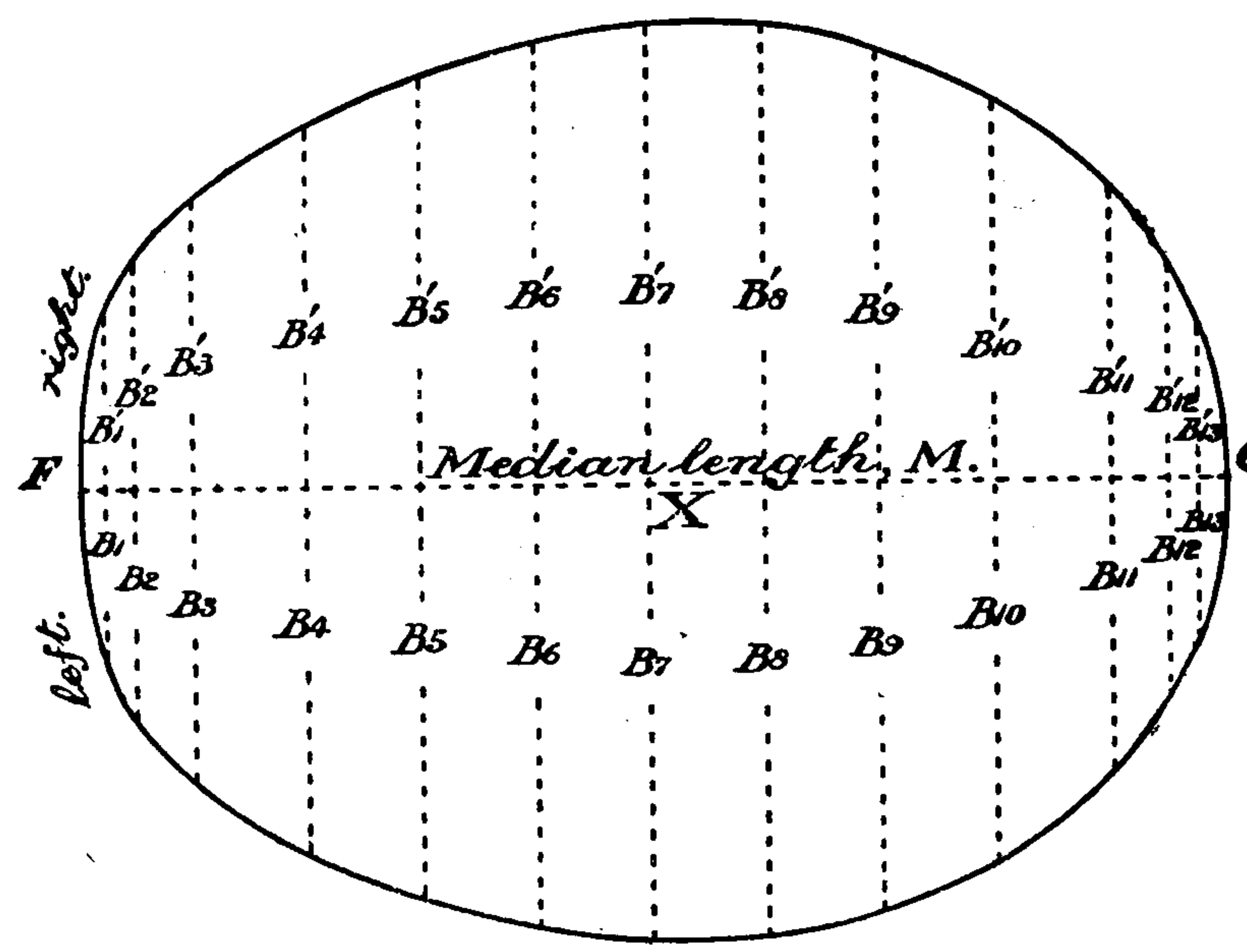
(1) *General Remarks.*—These consist of some very valuable statistics, which we can compare with the results of a special section of our criminal survey, relating to a series of cephalic characters not yet presented, and referred to on p. 39 as "Group V.":—"A group of cephalic characters which, hitherto observed by methods of rough inspection, have been recorded, by the particular method adopted in the present investigation, as series of exact measurements." These characters are height, width and slope of forehead, the projection and slope of the occiput, the relative magnitude of front to back of head, and its general shape and degree of asymmetry These are all characters whose extreme degrees have been described as cephalic anomalies; and it is the preponderance of such anomalies—of low, narrow and receding foreheads, sugar-loaf heads, etc.—which has been emphasised as peculiarly characteristic of criminals. Now, in the past, the chief difficulty of reliably testing this point, *i.e.*, whether the criminal is stigmatised by these so-called cephalic anomalies, has arisen from the lack of an easy, simple, and intelligible method of obtaining the statistical records of these characters, which, distributed, of course, in nature, upon the same quantitative scale as other cephalic attributes, have been regarded nevertheless as non-measurable. Consequently, such statistics as exist of low and receding foreheads, projecting occiputs, dome-shaped heads, etc., of criminals, are not exact and reliable records of the actual prevalency of these characters, but are the observer's, and very often

* And which also compares remarkably with some rather more antiquated records: Hebrew statistics of the proportion of left-handed slingers in the tribe of Benjamin. In the Book of Judges, Chap. XX., v. 15, it is written, "The children of Benjamin numbered twenty-six thousand men that drew sword," and "Among all this people there were seven hundred" (2·7 per cent.) "chosen men left-handed: every one could sling stones at an hair-breadth and not miss."

TRANSVERSE CONTOUR.



HORIZONTAL CONTOUR.



(3) *Procedure for obtaining and tracing the Contours.*—In every case the subject was seated in a chair, with his head held in a vertical position, and his eyes at rest looking at an object their own height above the ground. A strip of lead of about 1 cm. wide, and 1 mm. thick, was then applied closely to the scalp in the meridian of the head under investigation, and was pressed well home to ensure its taking the precise shape of the contour of the head. In taking the median contour, the front extremity of the leaden tape was placed at the nasion, and, behind, a mark was made on the lead at a point on a horizontal level with the nasion. The precise position of this point may be best determined with the aid of an ordinary height-measuring apparatus, which consists of a vertical standard with an arm at right angles which runs up and down. This projecting arm should be adjusted to the level of the nasion in front, and then swung round until it impinges against the lead behind ; and at the point of contact a mark should be made. In taking the horizontal contour, the extremity of the tape was placed in the median line of the forehead, and, having encircled the head, the overlapping portions were fixed together with a small clamp. A mark was made on the lead behind to note the position of the median line of the occiput. In taking the transverse contour, the extremity of the tape was placed immediately in front of the right auditory meatus, on a level with its centre, and the corresponding position on the left side was noted by a mark on the lead. The tape thus moulded and marked was then, in each case, removed gently from the head, and, with its fixed points adjusted to a base line previously ruled, the outline of each contour was traced upon paper.

In taking the median and transverse contours, it is important to guard against two sources of error. Both of these contours are arched shaped ; and, when removed from the head, not only does the leaden arch tend to open out, by virtue of its elasticity, but also it is very easy for the vertex of the arch to become displaced from its position relatively to the base. In fact, in the absence of guiding points, it is impossible to be certain that neither of these errors has occurred. A way to ensure against their occurrence is to determine, by calliper measurements, the exact span of the arch, and the true position of a fixed point marked on its vertex, before the leaden tape is removed from the head, and to record these by corresponding marks upon the paper to which the marks on the leaden tape must be made to coincide when it is adjusted to the base line.

(4) *Measurement of the Contours.*—The method of measuring the contour tracings is indicated on the specimen diagram. The base of each section is divided, by aid of proportional compasses, into ten equal parts ; and the ordinates, drawn at right angles to the base at each point of its division, are measured. As the heads are not symmetrical, the ordinates, on both sides of the median line, are measured in the horizontal and transverse sections. Moreover, as the curvature of the front, back, and top of the head is greater than towards the middle, the ordinates, at $\frac{1}{40}$ and $\frac{3}{40}$ of the base line from each of its e em e , are also measured in order to get this curvature correctly.

(5) The measurements of contour tracings, recorded in the Schedule of Anthropological Data, may be thus defined :—

Median Contour.

Antero-posterior Curve.—This is the length of the median curve of the head from the nasion to a point behind on the same horizontal level as the nasion. It is divided into anterior and posterior segments at the point (X), where it is cut by the central ordinate (H_7).

Base Line.—This is the length of the horizontal between the nasion and the occiput.

$H_{1'}$, $H_{2'}$, $H_{12'}$, $H_{13'}$—These are the lengths of the ordinates at $\frac{1}{40}$ and $\frac{3}{40}$ of the base line from each of its extremities.

H_{3} to $H_{11'}$—These are the lengths of the ordinates at successive $\frac{1}{10}$ths of the base line.

$H_{14'}$—This is the length of the ordinate at the posterior extremity of the base line and the greatest distance from this ordinate to the back of the head.

Horizontal Contour.

Circumference.—This is the maximum circumference of the head, excluding the glabella. It is divided into four segments at point (X), where it is intersected by the central ordinate (B_7), and by the base line.

Median Length.—This is the length of the base line from the median line of the forehead to the most prominent point on the back of the head.

$B_{1'}$, $B_{2'}$, $B_{12'}$, $B_{13'}$—These are the lengths of the ordinates on each side of the median line at $\frac{1}{40}$th and $\frac{3}{40}$ths of the base line from each of its extremities.

B_{3} to $B_{11'}$—These are the lengths of the ordinates on each side of the median line at successive $\frac{1}{10}$ths of the base line.

Transverse Contour.

Transverse Curve.—This is the curve passing vertically over the top of the head from the middle of one external auditory meatus to the other. It is divided into two segments at a point (X), where it is cut by a vertical from the central point of the base line.

Median Height.—This is the vertical height between the middle of the external auditory meatus and the vertex.

Length of Base Line.—This is the shortest distance from the middle of one external auditory meatus to the other.

$T_{1'}$—This is the length of the ordinate on each side of the median line at $\frac{1}{40}$ of the median line from its extremity.

T_{2} to $T_{10'}$—These are the lengths of the ordinates on each side of the median line at successive $\frac{1}{10}$ths of its length.

Cephalic Measurements.

Auricular Height.—This is the same as the median height of the transverse contour.

Maximum Length.—This is the same as the base line of the median contour or the median length of the horizontal contour whichever of these two lengths is the greater.

Maximum Breadth.—This is the same as (B_7) or (B_8), whichever of the two is the greater.

Index.—This is the ratio $\frac{\text{Maximum breadth} \times 100}{\text{Maximum length}}$

(6) During the present survey, 800 sets of the three head-contours were obtained for all kinds of convicts, and were traced upon paper. The measurements of the tracings will be found recorded in the accompanying Schedule of Anthropological Data. Simultaneously, and pursuing closely the same method, similar contours of 108 Royal Engineers were obtained, traced and recorded, by the late Dr. Benington. The question then arose as to how the complex series of contours of different kinds of criminals could be best compared with each other, and how the contours of convicts generally could be compared with those of the Royal Engineers. The plan adopted was the one invented by Pearson for comparing skull contours, which consists in obtaining, from each separate series, the type or mean contour; the several types being then contrasted with each other.

The Typical Contour.—The type or mean contour of a series is that outline which best represents, or approaches with greatest accuracy to, the form of every one of the individual contours in the series. To obtain this average outline, firstly the mean values and standard deviations are calculated of all the recorded measurements, *i.e.*, the measurements of the base lines and several ordinates, made upon the contour tracings. Secondly, a base line, corresponding in length to the average length of all the individual base lines, is drawn upon paper and is divided into 10 equal parts; and also, at $\frac{1}{40}$ and $\frac{2}{40}$ of the line from each of its extremities, additional divisions are made. In fact, this average base line is divided in precisely the same way as the base of each contour was originally divided. Then, at right angles to the base, and at each point of its division, ordinates are set up to the *average* length of the corresponding ordinates of the individual contours. Finally, with the aid of splines, the best possible curve is traced from one extremity of the base line, through the extremities of every ordinate, to the other extremity of the base line. This curve represents the "type" contour of the series. It is clear that, if there be no significant differences in the standard deviations of the measurements, salient differences between series of contours will be represented by corresponding differences between the *type* contours of contrasted series; and that, between homogeneous series, there will be no differentiation in type, beyond an expected limited range of variation due to random sampling. Thus, by directly comparing the types—the type contours of criminals, convicted of different crimes, with each other; the type of total criminals with that of the general population, represented here by a random sample of Royal Engineers—from a comparison of these type contours, we shall be able to judge how, *i.e.*, whether by low foreheads, or projecting occiputs, whether by asymmetry or by any particular shape of head, criminals are differentiated amongst themselves, or from the law-abiding public.

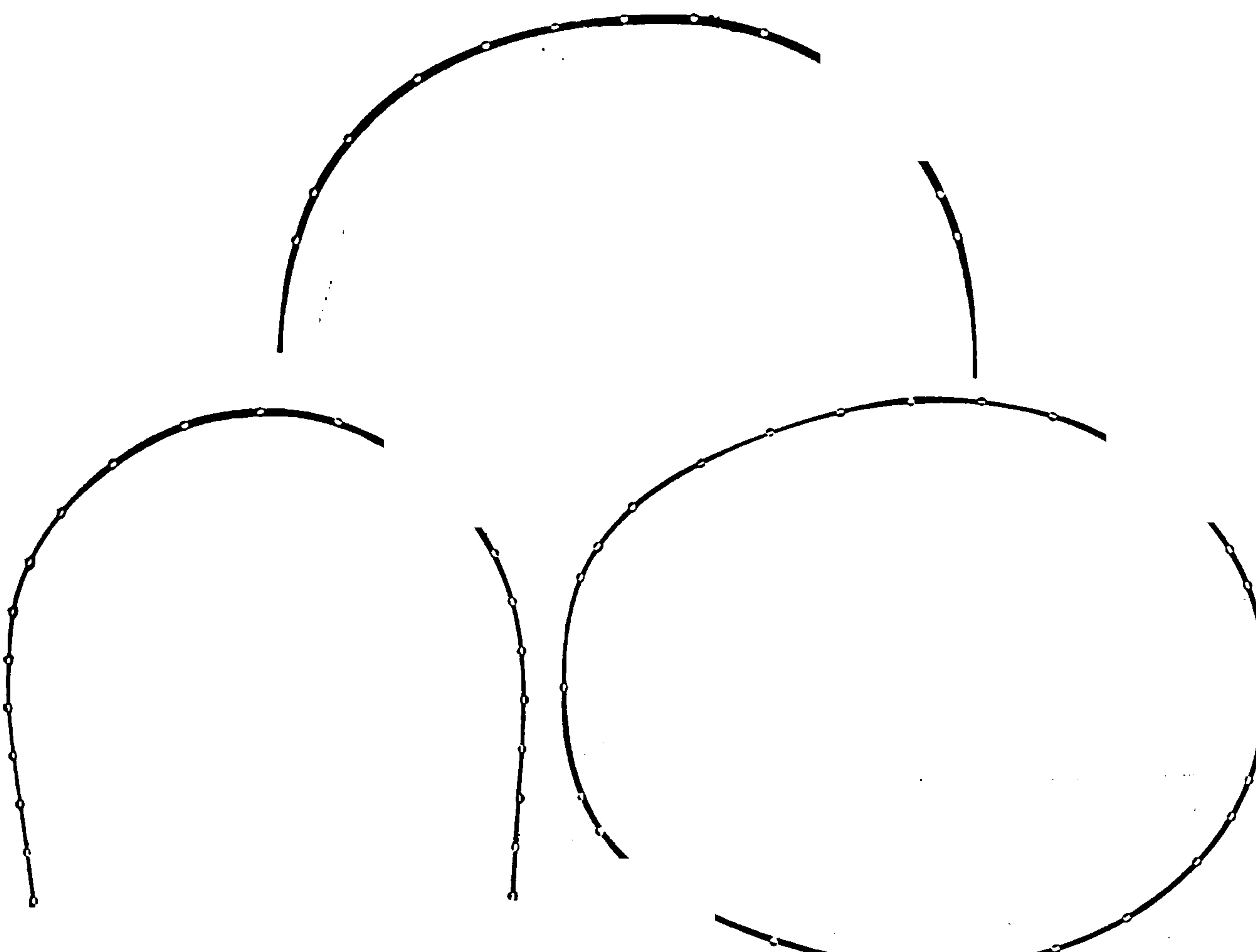
(7) *Test of the Method's Accuracy.*—On p. 28, we deplored the unsatisfactoriness of roughly observing anatomical characters, instead of precisely measuring them; and we tried to demonstrate the danger of drawing conclusions from this kind of observation by contrasting some data of a series of individuals, whose foreheads had been roughly grouped within the three categories of high, medium, and low, with some statistics of identically the same series of individuals, whose forehead-heights had been precisely measured by our method of contour tracing. We showed how, in the particular instance cited, the verdict of our contour measurements contradicted the conclusion of our rough observations. Contradiction is not itself testimony; the superiority of precise measurements over rough observations is, however, not to be gainsaid. But the critic may rightly observe that before the implications of head-measurements, indirectly obtained through the medium of our contours, can be accepted as equivalent to the testimony of measurements directly made upon the head, it is necessary to show to what extent contour-tracings are replicas of the size and shape of the heads it is presumed they represent. For instance, it may be asked, what is the exact relation between the length and breadth, &c. of heads, measured directly with callipers, on the one hand, and, on the other hand, measured through the medium of contour tracings?

As explained on p. 28, 300 of our contours were traced for individuals whose heads, some years before, had been directly measured. The contour measurements of these 300 individuals are those given in the 300 Supplementary Records of the accompanying Schedule; the cephalic calliper measurements of these same 300 individuals will be found amongst the schedule records 1–1,000. The distribution of these two sets of head-length, and of the two sets of head-breadth, measurements, obtained for these same

respectively. Upon the evidence, then, of these two tests, we may consider the verdict of contour tracings equivalent in value to the testimony of precise measurements.*

(8) *Results of comparison.*—The measurements of the 800 contours are presented in the accompanying Schedule. The means, standard deviations, and probable errors of these contour measurements, including the amount of asymmetry between measurements of the two sides of the horizontal contours, for (1) total criminals, for (2) groups of criminals distinguished by their conviction for different types of crimes, and for (3) groups differentiated by the individuals' position within three age, three stature, and three intelligence categories—these analysed results of the measurements are provided in Appendix, Tables 199, 200, 201, 202, 203. And typical head contours, built up from these analysed data, *i.e.*, the types for criminals convicted of the crimes of arson, &c., theft, rape, &c., violence, and fraud respectively, the types for criminals whose ages range between 15–25, 25–40, 40–80 respectively, the types for criminals of stature ranging between 48–64, 64–67, 67–75 inches respectively, and the types for criminals ranked as intelligent, fairly intelligent, unintelligent, and weak-minded or imbecile—are presented in Figs. xiv–xxviii, where each of the types enumerated is drawn in comparative relation with that for total criminals. And, finally, in Fig. xxix, the median, horizontal, and

Fig. xiv.—Difference in head contours of MALICIOUS DAMAGE TO PROPERTY from ALL criminals.



The deep line is the average contour of 802 convicts of all sorts, the dots indicate the average contour of those convicted of malicious damage. The latter number 66; and the depth of the full line shows twice the probable error of samples of 66 drawn at random from convicts of all sorts. Once in six purely random samples, the centre of the dot may be expected to lie outside the limits of the deep line. The contours are half full size.

* On the average, differences between measurements of head-length made by the two methods = ·7 mm. The variability of individual measurements from their mean value = the standard deviation of head-length $\times \sqrt{1 - r^2} = 6{\cdot}23 \times \sqrt{1 - {\cdot}9761^2} = 1{\cdot}35$ mm. Accordingly, the variability in consistency between the two methods, or, in other words, the probable error of a tape measurement, from its expected value based on calliper measurement, is $1{\cdot}35$ mm. $\times\ {\cdot}6745 = {\cdot}91$ mm. That is to say, in 50% of cases, a difference of 10 mm. between two measurements recorded by callipers would correspond to a difference ranging from 9 to 11 mm. between the same two measurements registered by the contour method.

FIG. xv.—DIFFERENCE IN HEAD CONTOURS OF STEALING AND BURGLARY FROM ALL CRIMINALS.

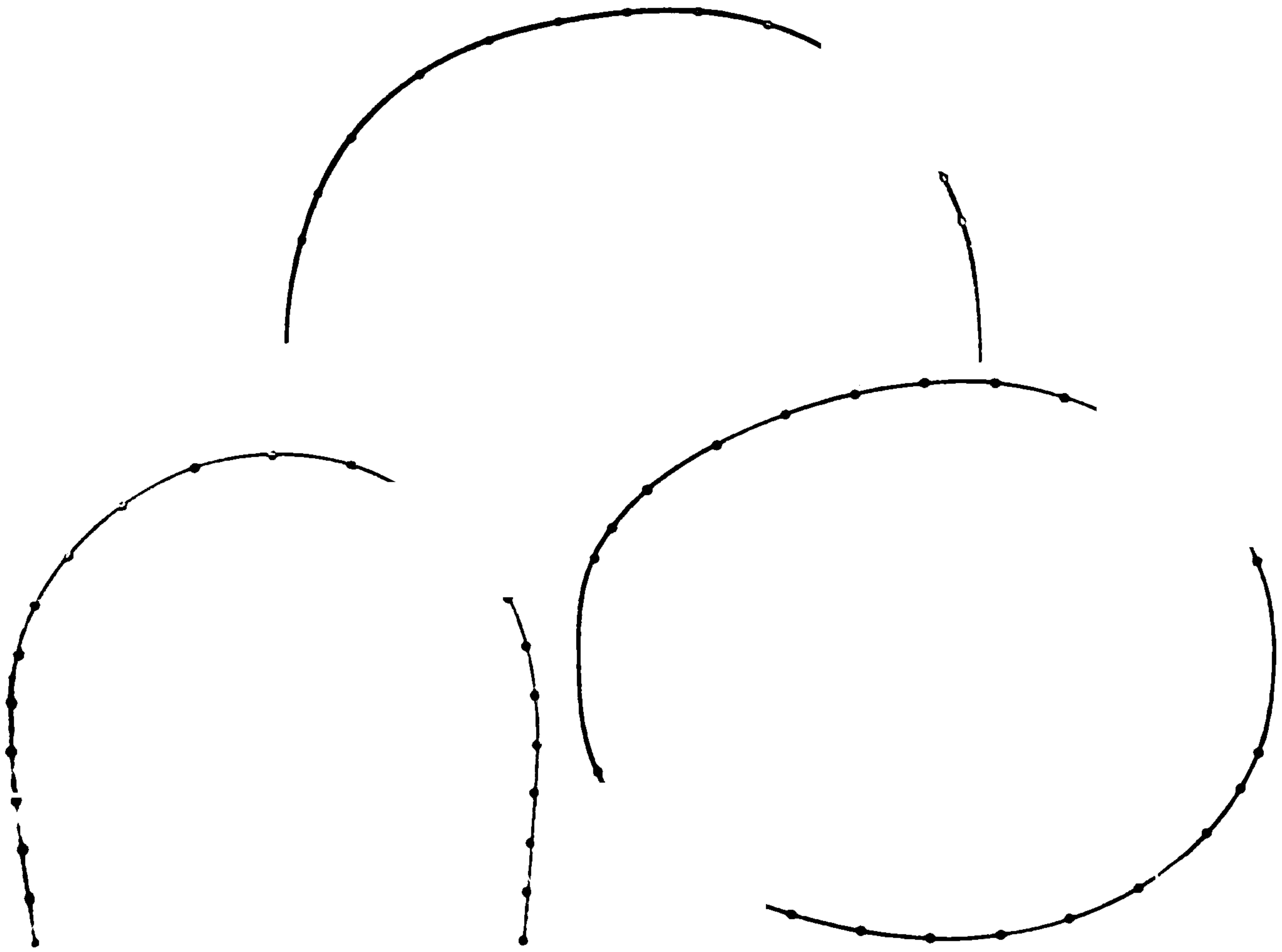


FIG. xvi.—DIFFERENCE IN HEAD CONTOURS OF SEXUAL OFFENCES FROM ALL CRIMINALS.

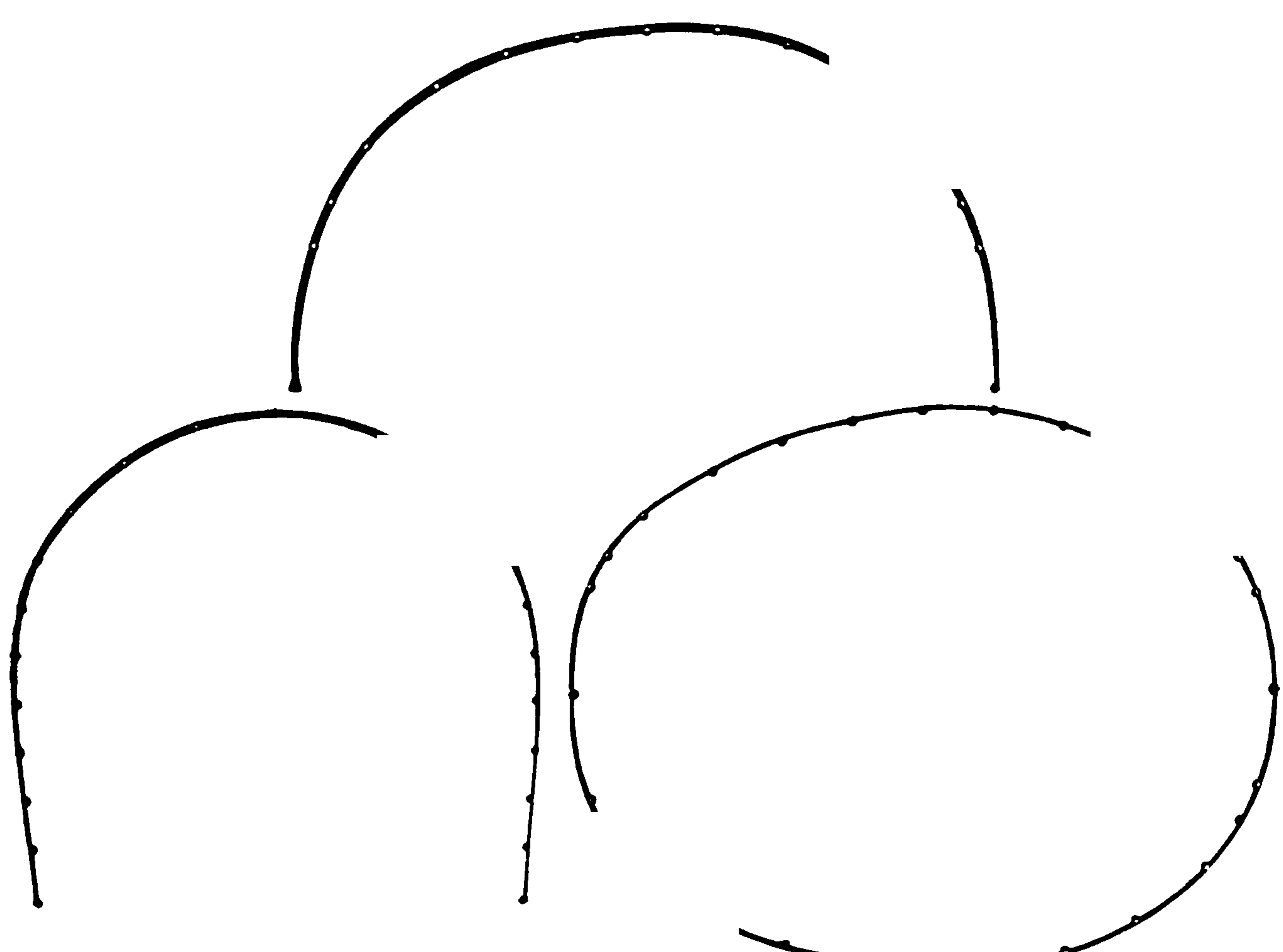


Fig. xvii.—Difference in head contours of VIOLENCE AGAINST THE PERSON from ALL criminals.

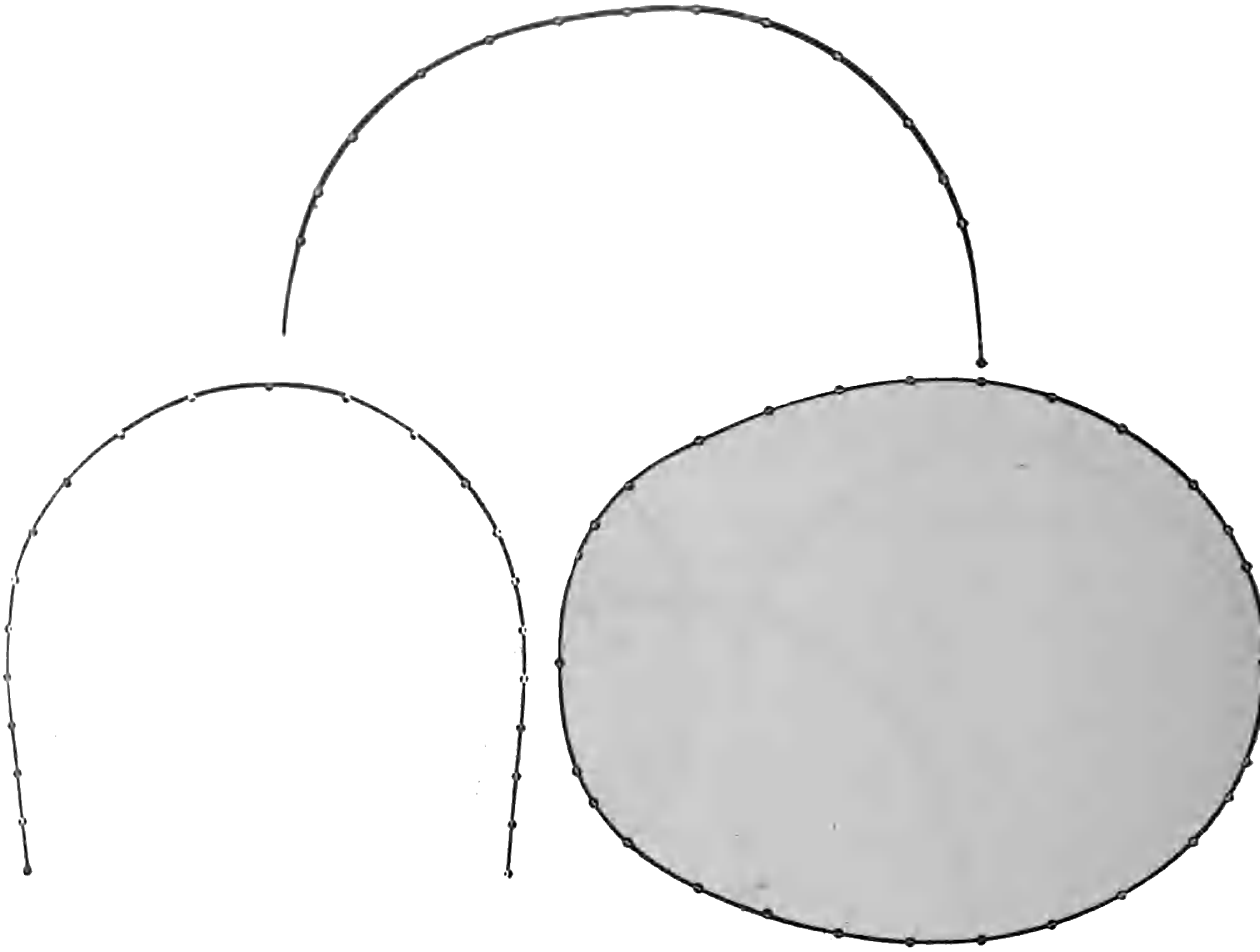


Fig. xviii.—Difference in head contours of FORGERY AND FRAUD from ALL criminals.

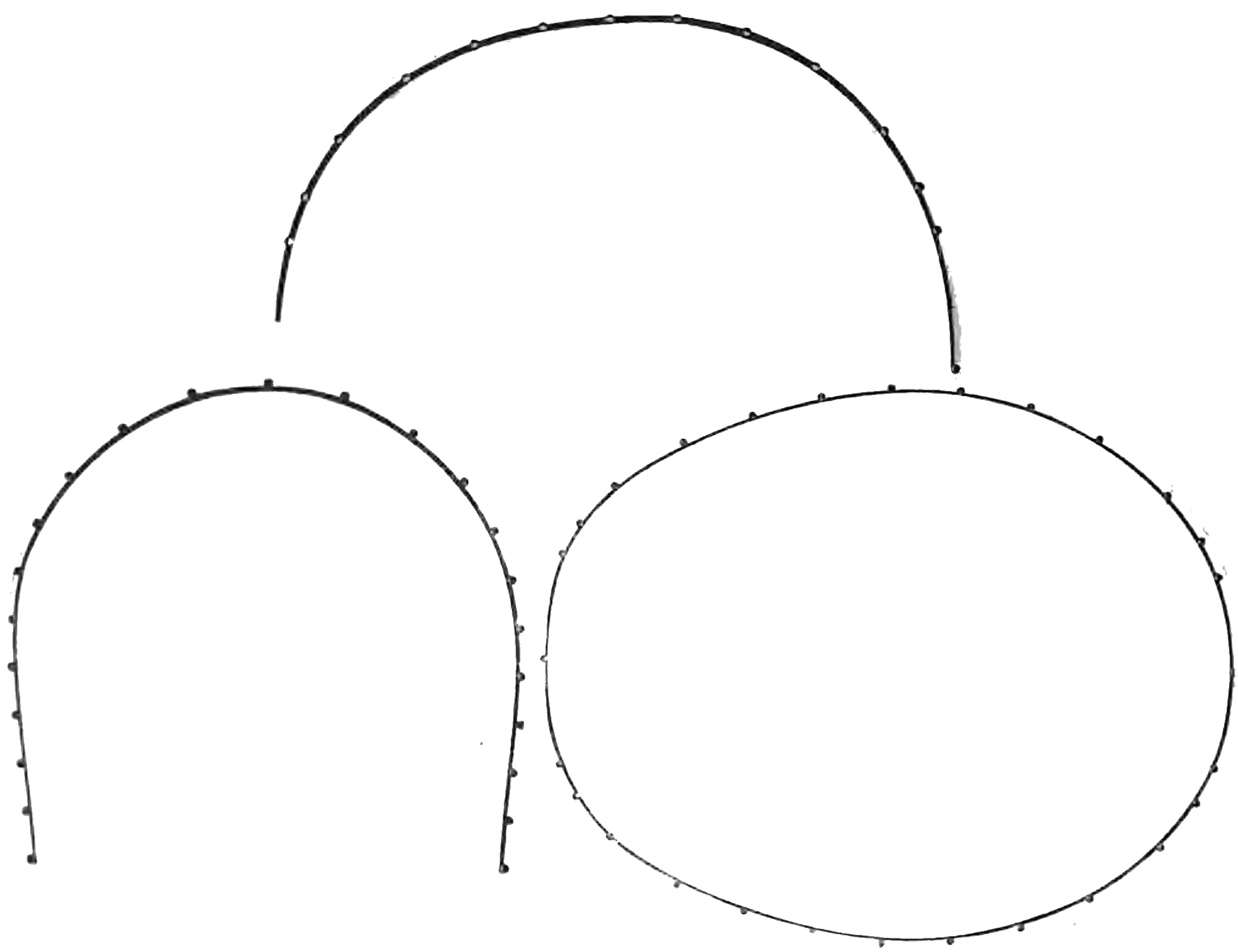


Fig. xxi.—Difference in head contours of AGES 40 AND UP from ALL criminals.

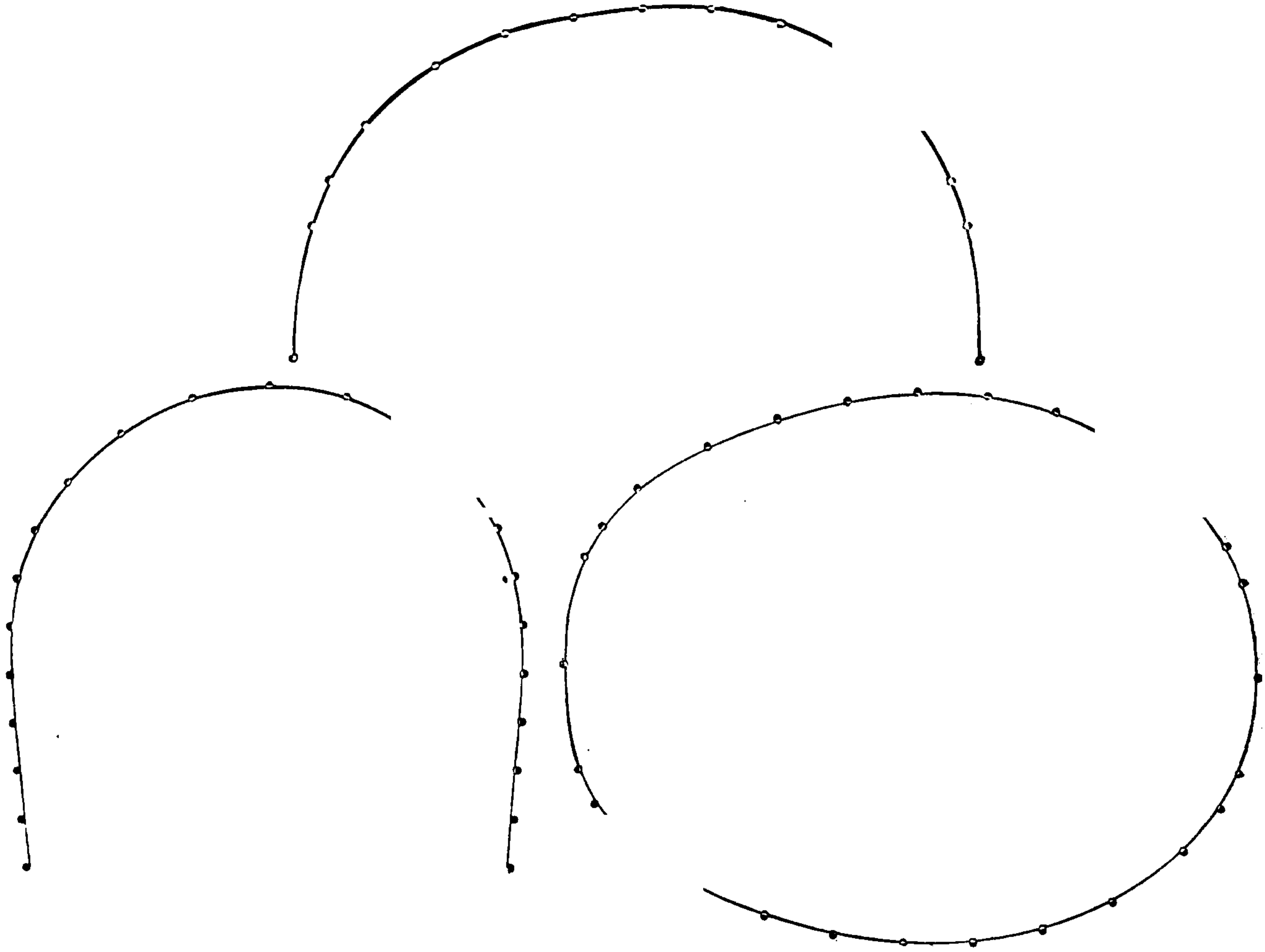


Fig. xxii.—Difference in head contours of STATURES UNDER 5 ft. 4 ins. from ALL criminals.

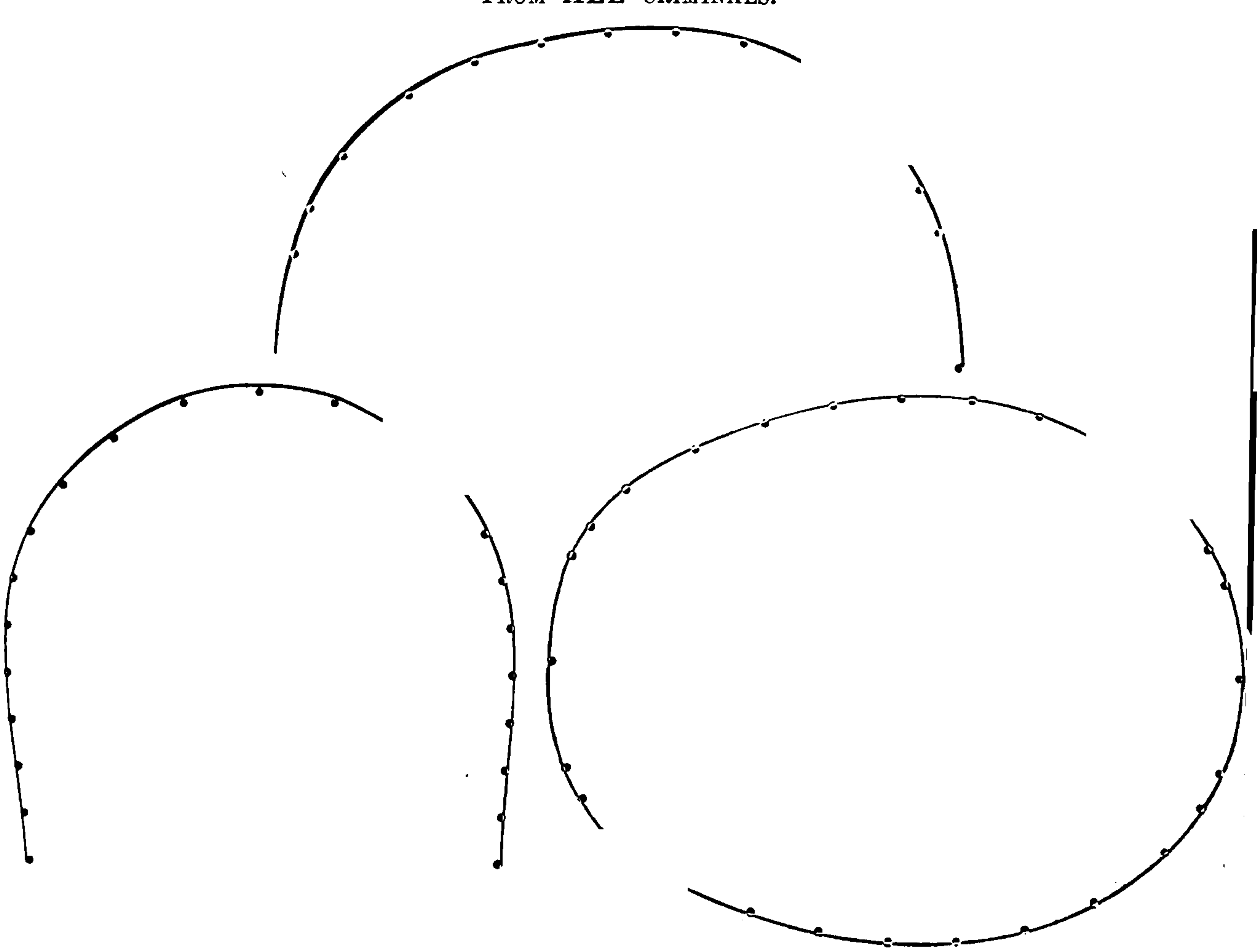


FIG. xxiii.—DIFFERENCE IN HEAD CONTOURS OF STATURES 5 FT. 4 INS. TO 5FT. 7 INS. FROM ALL CRIMINALS.

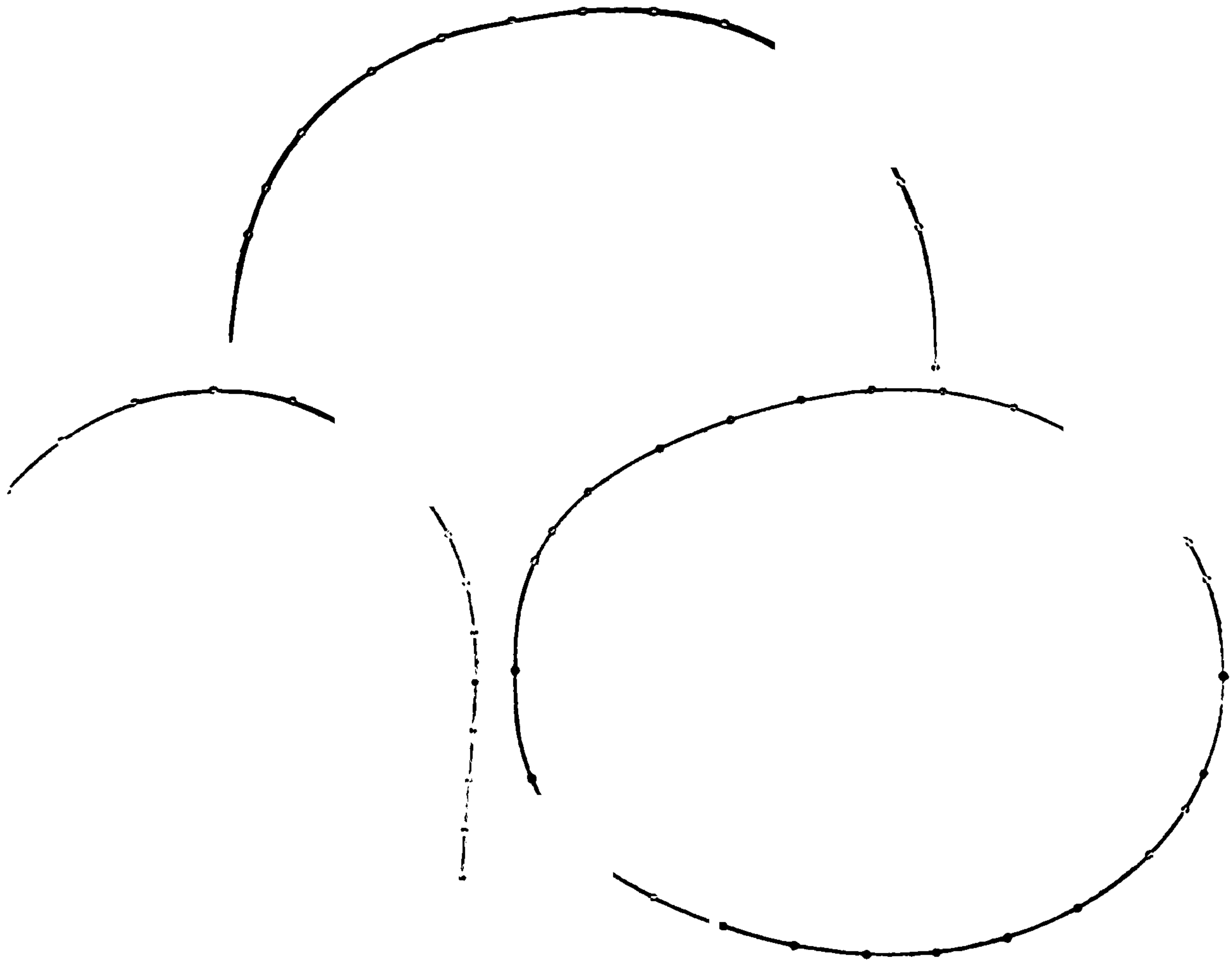


FIG. xxiv.—DIFFERENCE IN HEAD CONTOURS OF STATURES 5 FT. 7 INS. AND UP FROM ALL CRIMINALS.

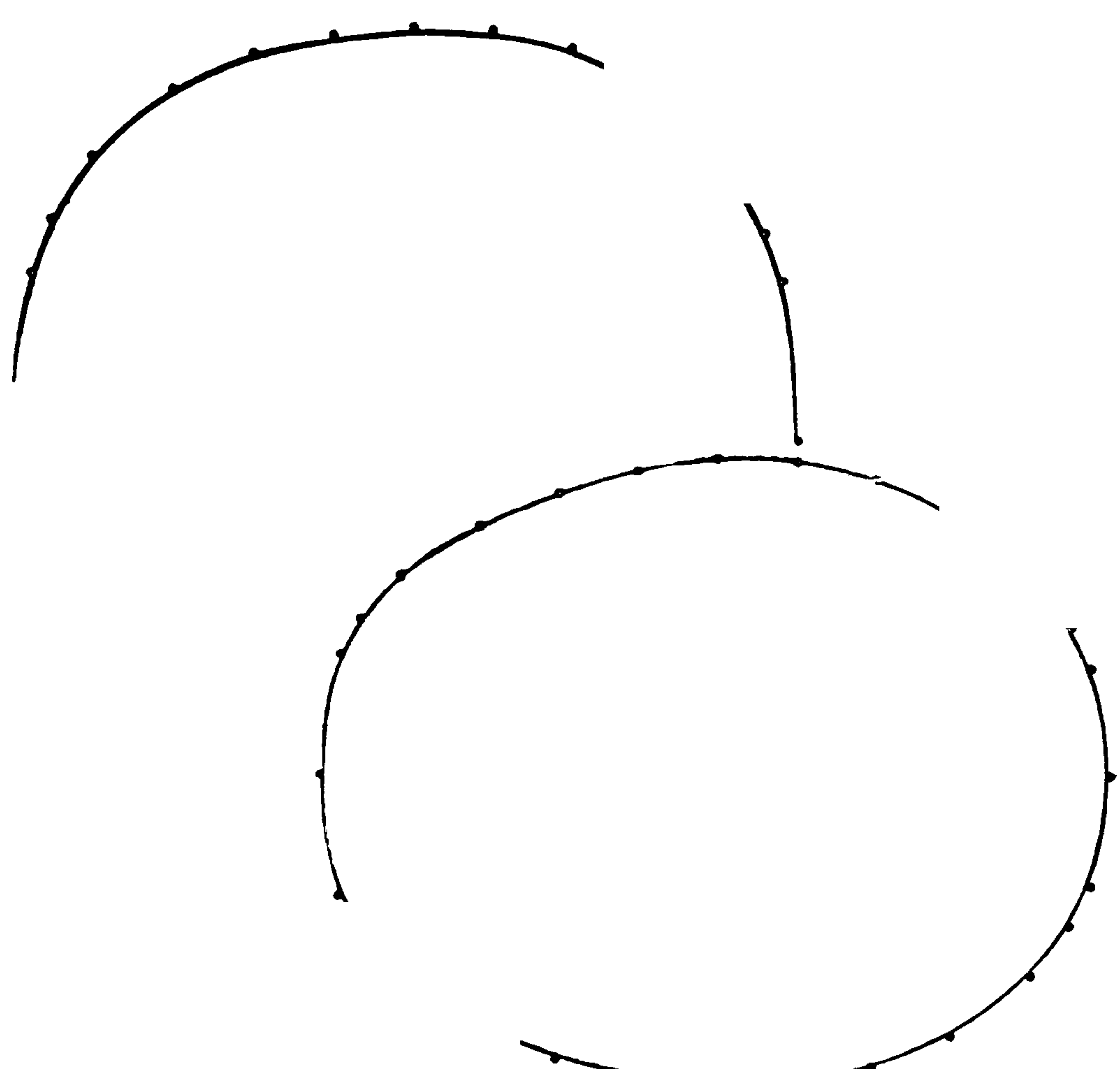


FIG. XXV.—DIFFERENCE IN HEAD CONTOURS OF INTELLIGENT FROM ALL CRIMINALS.

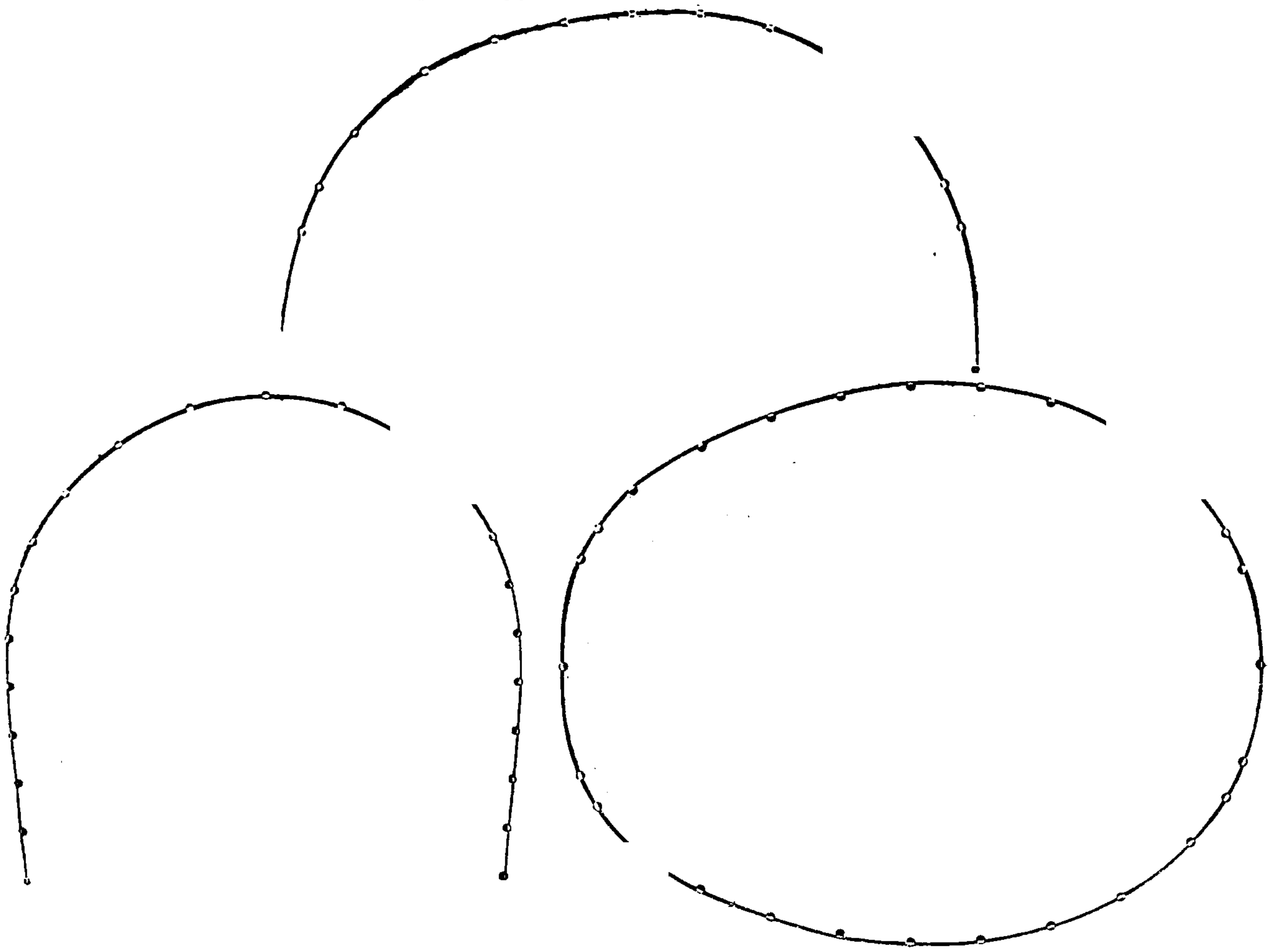


FIG. XXVI.—DIFFERENCE IN HEAD CONTOURS OF FAIR INTELLIGENCE FROM ALL CRIMINALS.

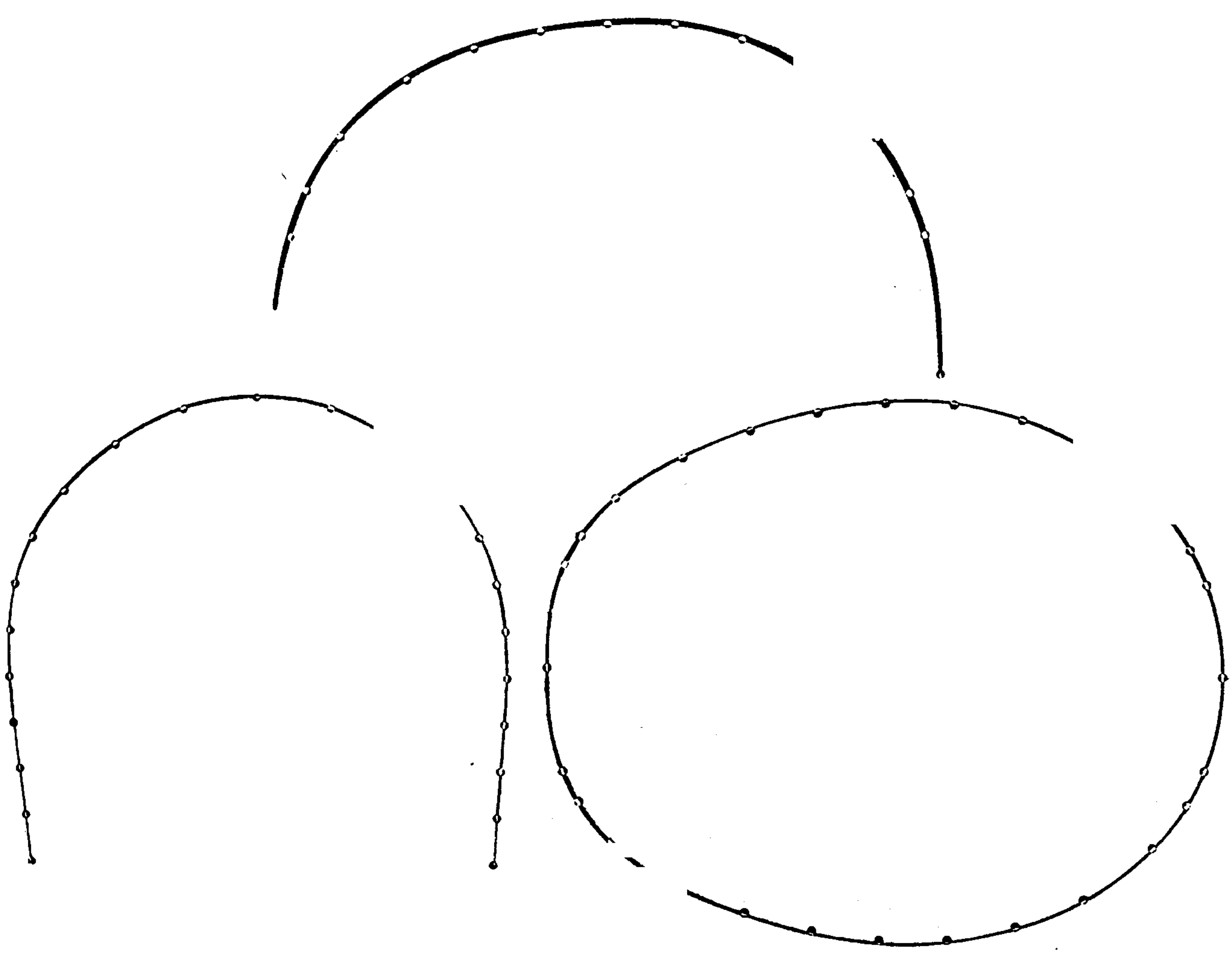
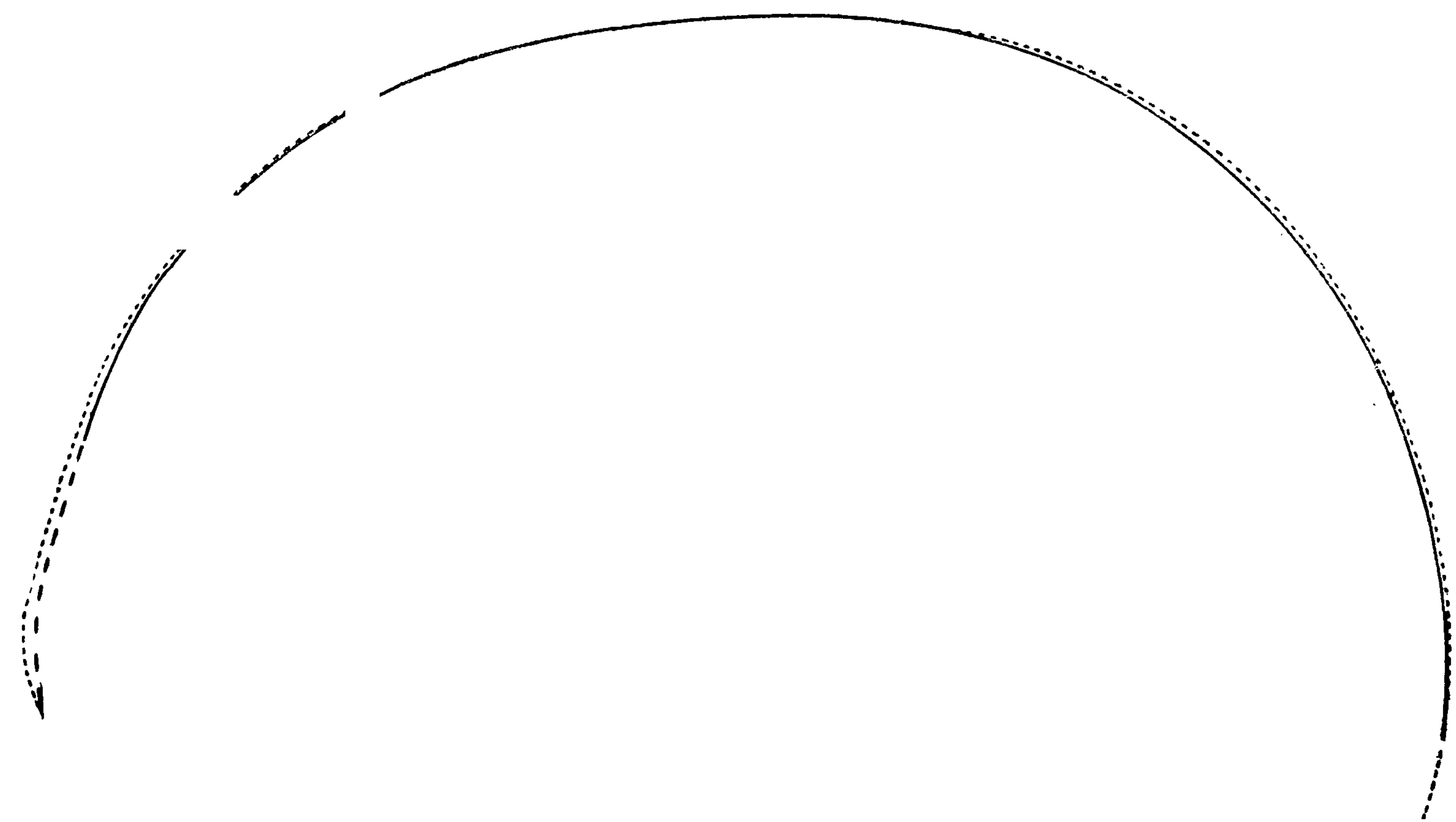


FIG. xxix.—MEAN HEAD CONTOURS OF CONVICTS AND OF ENGINEERS CONTRASTED.

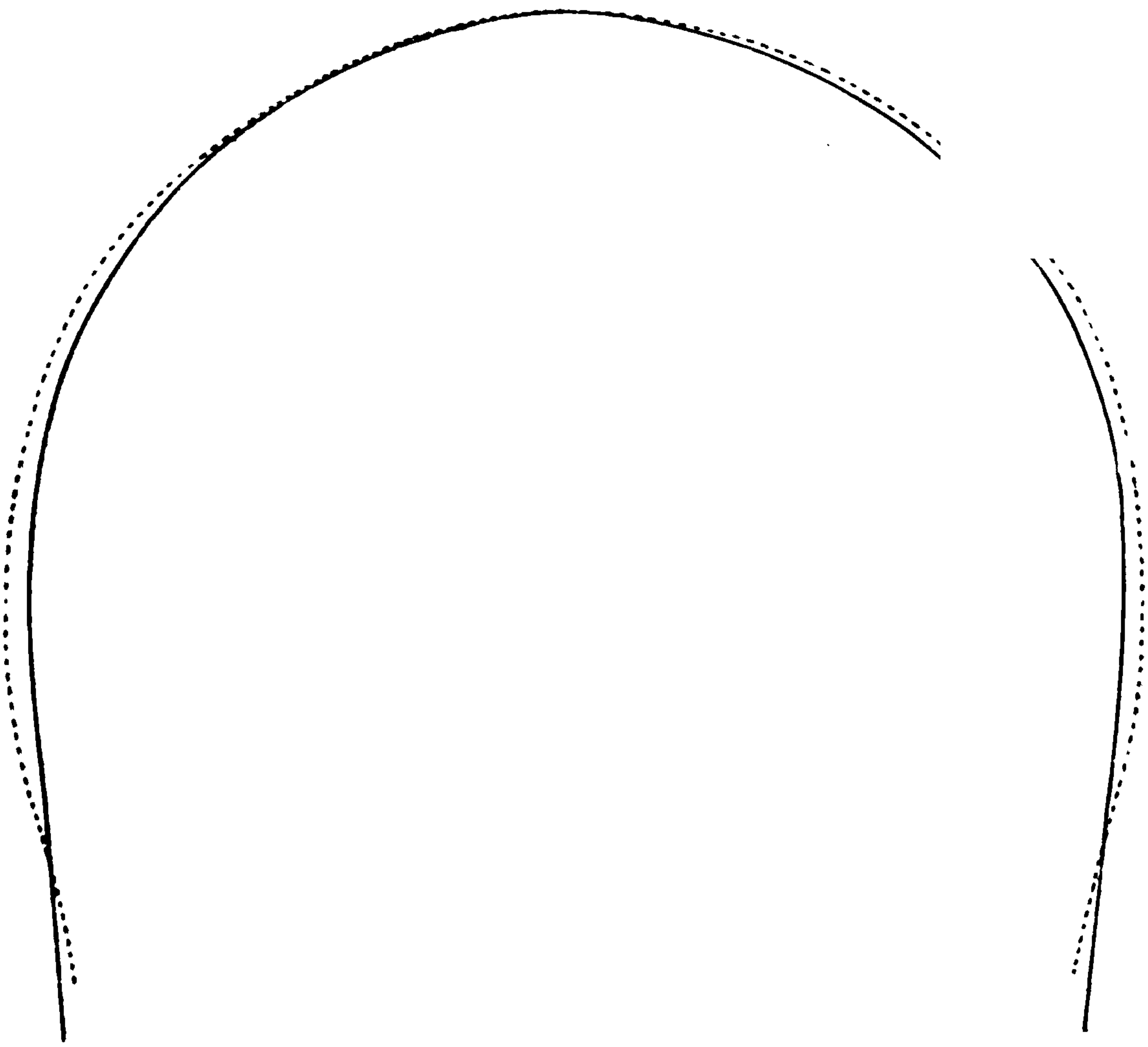
THE MEDIAN CONTOUR.

OF 802 CONVICTS ————

OF 108 ENGINEERS - - - - - - - -



THE TRANSVERSE CONTOUR
OF 802 CONVICTS ————
OF 108 ENGINEERS - - - - - - - - - - - -

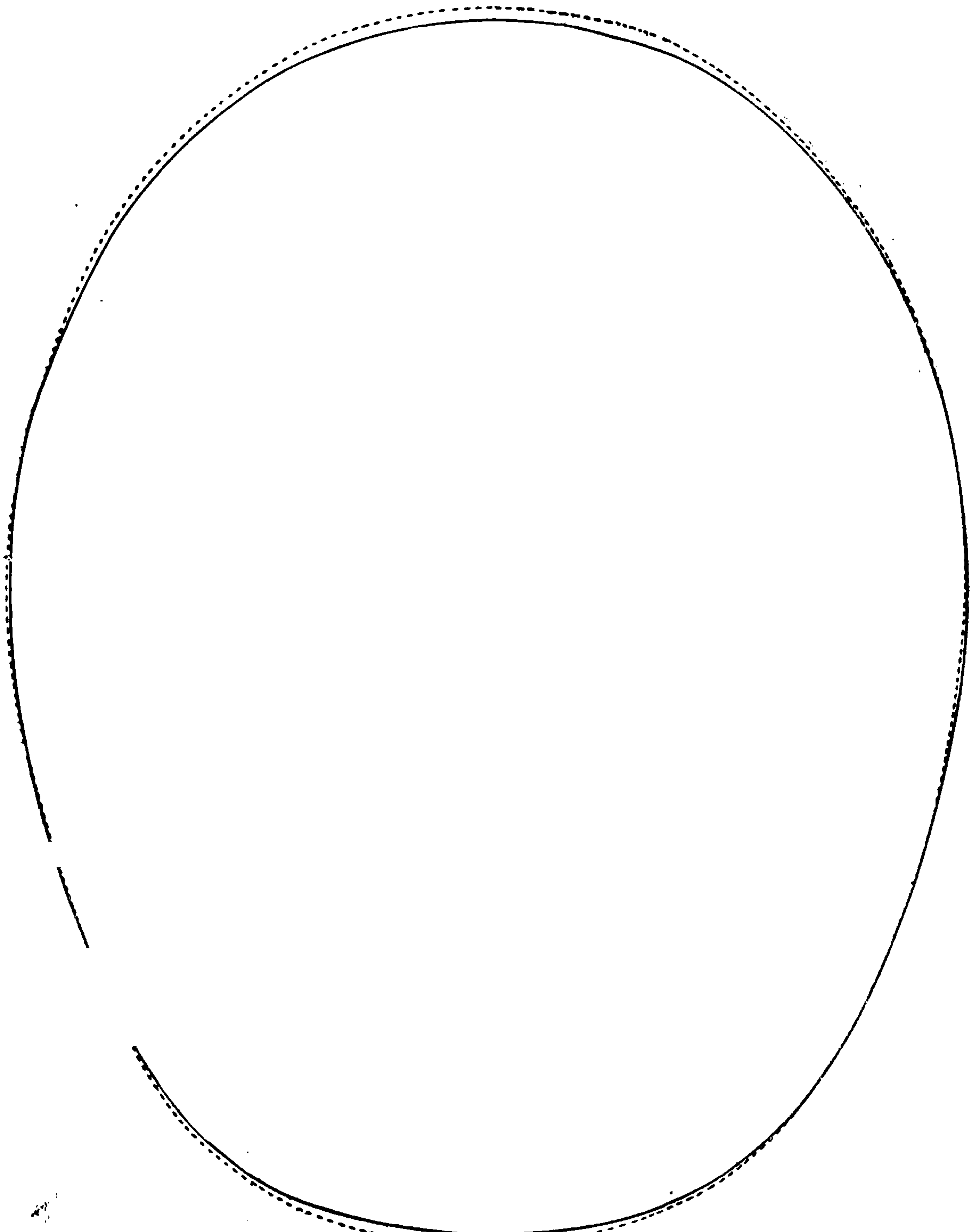


27042

THE HORIZONTAL CONTOUR

OF 802 CONVICTS ————

OF 108 ENGINEERS - - - - - - -



transverse, type-contours for total criminals are presented in juxtaposition with the corresponding types reduced from contour measurements of 108 Royal Engineers. The differences between the several contrasted types, beyond an inevitable range of probable variation—a range represented in each case by the thickness of the contour outlines—should indicate unequivocably, and unprecedentedly, the extent to which different kinds of criminals, and criminals as a class, are differentiated or stigmatised by low and receding foreheads, by projecting occiputs, by asymmetry, and by sugar-loaf, dome-shaped, and other peculiar forms of heads.

With one exception, the respective contours have been fitted in their right positions for contrast by superposing the base-lines upon each other. In the median contour, the anterior extremity of the base-line corresponds to the nasion—a fixed point—and this, combined with the slope of the base-line which, defined as a horizontal through the nasion,

PART II.

CHAPTER I.

The Physique of Criminals.

I. *General Remarks.*

As formulated on p. 18, Part I., the original purpose of this statistical investigation was twofold: (1) the refuting or confirming of the doctrines of certain schools of criminology; (2) the statistical studying of the criminal on scientific lines. These two objects, of course, go hand in hand—they are different but inseparable aspects of the same thing. To refute criminological dogma, the criminal must be scientifically studied; and no legitimate doctrine can be formulated until dogma has been repudiated: consequently, although the results of our investigation are set forth within two main sections—Part I., just completed, and Part II., which forms the remainder of the work—it will be understood that each of these divisions does not rigidly include one, and exclude the other, purpose of our inquiry. Part I. was concerned with an examination of the alleged existence of a physical criminal type. The assumed existence of this type is admittedly at the basis of certain criminological doctrines; but the teaching of Lombroso, and others of his school, is not founded entirely upon the physical characteristics of the criminal; nor is it solely in relation to current criminological theory that a study of the physical characters of criminals derives interest. Lombroso did not postulate only the physical, but also the mental, stigmata of a criminal type; and many of Lombroso's followers describe special conditions and influences affecting the formation of the criminal (as, for instance, social conditions, heredity, &c.): consequently it is as obviously necessary to deal with current contentions regarding heredity, social conditions, and mental stigmata, as it was to examine the question of physical stigmata, if, in any true sense of the term, we are to undertake the refutation or confirmation of criminological doctrines. Moreover, although failing, so far, to discover any veritable physical stigmata, many solid physical *differences* in criminals have emerged, of interest sociologically; and the interpretation of these differences in terms of the varying ages, stature, intelligence, and social class of the subjects under investigation, should help to throw light upon the nature and origin of criminals, and aid the construction of sound criminological theory.

The point we would emphasise is that no single division of the present work pretends to be sufficient and final in itself: the different divisions, with their various aspects of the same subject, overlap. The work is divided into two main sections, and the second section into several chapters, as a matter of convenience, and for lucidity of exposition only: but the chapters and sections are interdependent—they hang together; and it is the complete chain of them that gives the meaning of the work. For instance, such a wide variety of apparently different subjects as the distribution of criminals in the general community, the age-distribution of criminals at the time of their first offence, the marriage of criminals, the extent to which they beget offspring, the associations of illegitimacy, infant mortality, and immigration, &c., with criminals—all these matters contribute, of course, to any special inquiry into the question of, say, heredity and crime, and, in any independent treatment of that question, would support and accompany a thesis on heredity; but they are at least equally important and necessary as independent investigations, and to our investigation as a whole, in many of its other aspects. And, similarly, in the present chapter, which deals with the physique of criminals, we are still, incidentally, occupied with the problematical existence of a physical criminal type; which subject was not theoretically closed with the concluding remarks of Part I.

On page 42, Part I., we stated, in a footnote, that an analysis of age and stature in their relation to criminals would be dealt with in a later section. This reference was then necessary because, in every case where the process was convenient, our comparisons in Part I. were being made subject to a reservation of equality in age and stature between the populations contrasted—that is to say, groups of criminals, convicted of different types of crime, criminals, as a class, and the law-abiding public, when their respective head-lengths and other physical characters were contrasted, were all reduced to a standard age and stature basis. The necessity for this standardisation, before comparison, resulted from the fact that most of the physical characters we were examining are correlated with age and stature. The philosophic legitimacy of thus allowing for age-differences is obvious and indisputable. The physical characters of all criminals, as well as those of all non-criminals, are subject to progressive changes, associated, with *age*: which is a condition coeval, and co-extensive, with life itself. But criminals are not necessarily, and in any similar vital way, the co-equals in *stature* of their law-abiding brethren. Consequently, the legitimacy of allowing for stature, when contrasting physical characters, might reasonably be criticised as a complete begging of the whole question contained in the comparison. The correlation coefficient of head-length with stature is admittedly a measure of the extent to which mean head-length increases with increasing bodily-height; but it is also a measure of the extent to which mean stature decreases with diminishing head-length. It might be objected, for instance, that to claim an absence of differentiation in head-length between criminals and university students, because, when compared stature for stature, these two classes of men show no differences in their mean head-length—it might be objected that to claim this would be equivalent to postulating absence of stature-differences between undergraduates and criminals, because, although the former is on the average four inches taller than the latter class, yet, when selected by equality in head-length, the two classes, in these particular conditions, become co-equal in mean stature. This argume t, though correct, does not invalidate, or in any way weaken, the conclusions derived from the plan of analysis adopted in Part I.; because the object of that analysis was not to prove or disprove the existence of physical differentiation, but to find some explanation for physical differences more simple, reasonable and satisfactory, than the extravagant theory which refers them to the presence of a definite criminal type. In regard to differences in cephalic, facial and other physical characters, dealt with in Part I., such simple explanation was partly found by our proving the association of these differences with age and stature, &c. Our final conclusion was not that criminals are a physically undifferentiated class of the community, but that no physical differentiation exists in criminals beyond an extent accounted for by differences in age, stature, and other similar conditions. But, stature is itself a physical character; indeed it is the most familiar and fundamental of all bodily attributes: consequently, as already stated, the results set forth in Part I. do not completely dispose of the physical criminal type theory; but they do limit the definition of this type to one character only, viz., stature.* And it is with the analysis of this character, and some others allied to it, that we shall be mainly occupied in the present chapter.

The reason for the plan we adopted, viz., the plan of reducing a complex question, involving the analysis of 37 characters, to a simple problem, whose solution depends upon the analysis of one character (stature) only, is this. In our records we have data, and in many published records we have comparative data, for dealing exhaustively with stature in many directions which, from lack of material and especially of comparative material, were closed to us when dealing with the 37 physical characters investigated in Part I. The mean stature of the criminal, like that of many of the non-criminal, sections of the community, depends greatly upon the social class from which individuals belonging to particular sections have been drawn, and is also determined by the extent to which they have been selected, by stature, for the occupancy of any section. Thus, the mean stature of policemen is greater than that of citizens generally, because citizens of small stature are not eligible for the police force; and commissioned army officers are taller on the average than non-commissioned officers, because of the different social classes from which these two types of soldiers are respectively selected; and, again, the labourer is taller than the artisan, probably because only individuals with good physical development can earn a livelihood by performing heavy manual labour. Consequently, when comparing means of stature, or of other physical characters associated with stature, due allowance must be made for differences of social or occupational classes between the contrasted populations. But, unfortunately, in our schedule of data, information of social class (see Records 2500-3000 and supplementary Records) is given in relation to stature only, and not in relation to the other physical characters in criminals dealt with in Part I. Moreover, it is only for the distribution of stature and weight in the different social and occupation classes of the general community that data are available for comparison with our own statistics.

II. *Definition of Characters.*

The present chapter, then, deals with the physique of criminals, the characters included within this category being as follows:—

(1) *Height*, standing, and without boots.
(2) *Body-weight*, in trousers and shirt only.

* The difficulties of the problem are simplified, in fact, almost to a vanishing point. We doubt if a slight differentiation in stature only would be regarded by its most ardent partisans as adequate material for constructing the notion of a physical criminal type.

(3) *Span of arms*, outstretched, and measured, in front of the chest, from the tip of one middle finger to the tip of the other.

(4) *General health*, recorded within the three categories of robust, good, and delicate health.

(5) *Physical constitution*, measured by inspection and palpation, and recorded within the four categories of (*a*) stout and strong, (*b*) fat, (*c*) thin and muscular, (*d*) thin and weak. These data separate into two groups, defining—

(5*a*) *Muscularity*:—Categories (*a*) and (*c*) comprise those with well-developed muscles, and categories (*b*) and (*d*) include those whose muscles are flabby.

(5*b*) *Obesity*:—Categories (*a*) and (*b*) comprising the fat, and (*c*) and (*d*) the lean.

III. *The general plan of presentment of the data and of the results* of their analysis is as follows :—

An account is given of the class differentiation of criminals, or the proportional distribution of criminals drawn, firstly, from broad social classes described as (*a*) the well-to-do, or middle and upper middle classes, (*b*) the prosperous poor, or lower middle class, (*c*) the poor, or lower class, and (*d*) the very poor and destitute classes ; and, secondly, drawn from five broad economic classes, determined by occupation.

The data and statistical constants are presented of distributions of stature, weight and span of arms, of total criminals, and of five sub-groups of criminals, distinguished by different types of crime.

In respect of the above characters, the relation of differences between criminals to the social classes from which they are drawn is discussed, and values are shown of correlations between these characters and crime, for constant social class.

The relation of general health and physical constitution with crime is discussed, upon the evidence of analysed data.

The results are given of a statistical inquiry into the effects of imprisonment upon the physique of criminals.

The stature and weight of criminals, grouped within a series of occupational classes, are contrasted with those of the general community, similarly classified ; and the probable explanations of any significant differences revealed are discussed.

IV. *Division into Crime and Class-groups.*

The annual average frequency of five representative types of crime, viz. :—(1) Wilful damage, including arson, (2) stealing and burglary, (3) sexual offences, (4) violence against the person, and (5) crimes of fraud—the proportional frequencies of these indictable crimes, committed by the total criminal population during the years 1902–1906, will be found in Part I, Table D, Criminal Statistics ; and numerical particulars as to the social class of criminals within each of these crime-groups are given in the schedule-records 2,500–3,000, and supplementary records ; and information of the economic conditions of life represented by occupation will be found in the schedule-records 1–3,000. The tabulated frequencies and percentages of crime and class differences amongst criminals, derived from these statistical sources, are as follows :—

Table 60.

Class and Nature of Crime.

I. Professional. II. Commercial classes—clerks and shopkeepers. III. Selected classes—soldiers, policemen, messengers, servants. IV. Labourers—agricultural, roads, quarries, railways. V. Sailors, including fishermen. VI. Miners—coal, minerals. VII. Artizans—factory operatives, floating traders, and of no occupation.

Crimes.	Social class of parent.					Occupational class of subject.								
	Well to do or Upper Middle. D	Prosperous Poor or Lower Middle. C	Poor or Lower. B	Very Poor or Destitute Class. A	Totals.	Pro-fessional. I.	Com-mercial. II.	Selected. III.	Labourers. IV.	Sailors. V.	Miners. VI.	Artizans. VII.	Totals.	Per cent. observed frequency of crimes.
Damage to property	1	28	28	5	62	—	8	5	73	8	10	33	137	4·6
Stealing and burglary	25	183	87	7	302	20	225	67	492	47	45	702	1,598	53·6
Sexual offences ...	5	42	44	3	94	7	16	18	91	9	32	80	253	8·5
Violence to the person	8	99	69	6	182	8	49	59	182	47	35	189	569	19·1
Forgery and fraud ...	66	39	15	—	120	122	124	16	41	6	9	109	427	14·3
	105	391	243	21	760	157	422	165	879	117	131	1,113	2,984	100·0
Per cent. observed frequencies of class in total criminals.	13·8	51·4	32·0	2·8	100	5·3	14·1	5·5	29·5	3·9	4·4	37·3	100·0	

as will be seen later, in the general population, it is these two classes which are distinguished by relative tallness of stature; consequently, so far as the influence of class is concerned, the mean stature of our sample of criminals ought to be greater, if anything, than that of the mean of the general population, which is 67·2 inches. The mean stature, however, of our sample of criminals, is 65·5 inches. Thus, when the proportional representations of social class is the same for the two contrasted populations, when a sample of criminals and a sample of non-criminals are similarly constructed with regard to the proportional numbers of professional men, shopkeepers, labourers, artisans, &c., represented within each—when this essential condition for legitimate comparison is fulfilled, criminals, on the average, are seen to be 1·7 inches less in stature than the law-abiding community. It is clear, therefore, that criminals are differentiated from the general population in stature; and it is also apparent that the explanation usually put forward to account for the differentiation, and which would attribute it to the influence of class, will not hold good in the face of the facts.* These facts call for some more subtle explanation: they give promise that the differentiation of criminals in stature, and probably in other characters, such as body-weight, and span of arms, allied to stature, may be a *real* physical differentiation. They indicate that the whole subject requires close analysis; that it is one worthy of careful elucidation.

V. *The Distribution of Stature, Weight, and Span of Arms, amongst five representative types of criminals.*

(*a*) The distributed data of stature, weight, and span of arms, (records 1 to 3,000), relating to five groups of criminals, distinguished by the nature of crime committed, will be found in Appendix, Tables 204, 205, 206. The means, with their probable errors, of the several distributions, and the differences between the mean of each sub-group and that of a total group, with the probable errors of the means of the smaller groups,† are as follows:—

TABLE 61.

Crimes.	Stature in inches.		Weight in lbs.		Span in inches.	
	Mean ± p.e.	Exc.	Mean ± p.e.	Exc.	Mean ± p.e.	Exc.
Damage to property	65·49±·15	+ ·02	136·1±1·0	−6·0	67·02±·21	+ ·07
Stealing and burglary.	65·17±·04	− ·30	140·7± ·3	−1·4	66·53±·06	− ·42
Sexual offences ...	65·39±·11	− ·08	139·8± ·7	−2·3	67·61±·15	+ ·66
Violence to the person.	65·55±·08	+ ·08	142·8± ·5	+ ·7	67·14±·10	+ ·19
Forgery and fraud	66·55±·09	+1·08	149·4± ·6	+7·3	67·98±·12	+1·03
Total criminals	65·47		142·1		66·95	

It will be observed by examining the differences of mean in relation to their probable errors, firstly that, for the three characters of stature, weight, and span of arms, fraudulent offenders are markedly superior to, and offenders convicted of violence do not differ from, the average of criminals generally, whereas thieves, relatively to the general average, are pronouncedly inferior in the same combination of characters; secondly, that incendiaries and sexual offenders are similarly deficient in body-weight, but not in stature; and thirdly that, with one exception, within each of the criminal groups the mean span of arms varies synchronously with mean stature. Thus, with regard to this third point, the difference between the mean stature of incendiaries and the mean of all criminals is less than the probable error of the difference, and so is the difference in their mean span of arms; amongst offenders convicted of violence, the difference of mean span as well as that of their stature mean is greater than once, and less than twice, the probable error of the difference; and similarly, amongst fraudulent offenders and thieves, differences of span correspond exactly to differences of stature—the difference of both span and stature being in the former group 14 times, and in the latter 10 times, the probable error of the difference. The one exception referred to occurs in the case of sexual offenders, whose span relatively to their stature, compared with this relation in other criminal groups, is

* In *Biometrika*, Vol. I, p. 38, Powys writes: "The criminal is probably of inferior stature because he is drawn from a differentiated class." Again, in *Biometrika*, Vol. I, p. 190, Macdonell writes: "I do not assert that the source of criminality is to be found in this difference of stature, but only that criminals are drawn from a different section of the community." And also Tocher, in *Biometrika*, Vol. V, p. 349: "There is a distinct difference in type between the class material from which criminals are drawn."

† See note † Part I., p. 53.

disproportionately long. The disproportion, however, is very trifling; and we would not, without further evidence, attribute any significance to the disparity.* Now, for criminals, the distribution of stature in relation to that of span of arms is given in Appendix Correlation Table 207; for the non-criminal population, represented by a sample of English upper middle class males, a similar table is published by Pearson in Biometrika, Vol. II., p. 362; and the results obtained from the analysis of these two tables contrast as follows:—

TABLE 62.

Population.	Mean Stature.	Mean span.	Diff.	St. dev. of stature.	St. dev. of span.	Cft. of var. of stature.	Cft. of var. of span.	Cft. of cor. of span with stature.
	ins.	ins.	ins.	ins.	ins.			
Criminals	65·47	66·95	1·48	2·66	3·18	4·06	4·75	·79
Non-criminals ...	68·65	69·94	1·29	2·71	3·11	3·95	4·51	·80

Between the respective mean values, the differences are strikingly pronounced; but, in all other respects, the recorded values for criminals and non-criminals are almost identical. Compared with the non-criminal standard, and neglecting probable errors, the mean length of span in criminals is out of proper proportion to their mean stature by one-fifth of an inch: this is the most to be said upon the evidence of the figures in the above Table.† The relative and absolute variabilities are practically the same for both classes. The association in criminals between span of arms and stature, measured by the correlation coefficient ·79, is most intimate; and there is the closest agreement between criminals and the general population in the degree of intimacy of this association. In view of these facts, we need give no further independent consideration to the span of arms of criminals. We may safely consider span of arms to be, in every way, an anatomical counterpart of stature, and can be assured that whatever conclusions we may reach concerning the stature of criminals, will apply equally to their span of arms.

Before proceeding, however, to discuss their differences of mean, we must consider the variability in stature, body-weight, and span of arms, of our five criminal sub-groups. This variability, as measured by the standard deviation and coefficient of variation, is shown by the figures in the next table.

TABLE 63.

Crimes.	Stature in inches.				Weight in lbs.				Span in inches.			
	S.d. ± p.e.	Diff.	Cft. of var.	Diff.	S.d. ± p.e.	Diff.	Cft. of var.	Diff.	S.d. ± p.e.	Diff.	Cft. of var.	Diff.
Damage to property.	3·24±·11	+·58	4·96	+·90	16·81±·70	−·38	12·35	+·26	3·42±·15	+·24	5·10	+·35
Stealing and burglary.	2·51±·03	−·15	3·84	−·22	15·80±·30	−1·39	11·30	−·79	3·07±·04	−·11	4·61	−·14
Sexual offences	2·92±·06	+·26	4·47	+·41	15·34±·31	−1·85	10·97	−1·12	3·19±·10	+·01	4·72	−·03
Violence to the person.	2·43±·05	−·23	3·71	−·35	16·15±·26	−1·04	11·31	−·78	3·09±·07	−·09	4·60	−·15
Forgery and Fraud.	2·81±·06	+·15	4·22	+·16	21·37±·40	+4·18	14·44	+2·35	3·28±·06	+·10	4·82	+·07
Total criminals	2·66		4·06		17·19		12·09		3·18		4·75	

Now, the figures in the "difference" columns of this table, considered in relation to their probable errors, show some interesting similitudes to those in the corresponding columns of Table 61.

In the first place, they show us that, for all three characters, fraudulent criminals, who were superior in mean, are also more variable than criminals generally; that offenders convicted of violence who approximated in type, also correspond closely in variability, to total criminals; and that thieves, so pronouncedly inferior in mean to the general average, are also, relatively to other criminals, inferior in standard deviation. Again, we see from

* The difference in the span of arms of this group is four times the probable error, and would occur as a result of random sampling about twice in a thousand samples examined.

† In a book entitled "Criminal Man according to the classification of Caesare Lombroso," it is stated that "the span of the arms in criminals often exceeds the height—a characteristic of apes whose four limbs are used in walking and climbing." Reference to the figures in Table 62 above makes self-evident the nonsense of this extravagant deduction from a partially true statement. The span of criminals does often exceed their height just as more often than not does the span of non-criminals. The human characteristic, according to the figures given above, is that on the average span of arms exceeds stature by 1·5 of an inch in criminals, and by 1·3 of an inch in non-criminals. The characteristic of apes is their relative diminutive stature about one half the length of their span of arms.

the above figures that sexual offenders and incendiaries, who were deficient in mean body-weight, but not in mean stature, are also more variable in stature than they are in body-weight; and finally, that the variability of span of arms within each criminal sub-group is of the same kind, and of much the same degree, as the variability in stature. In fact, for all three characters, as the type changes, so does the variability change—the lower the mean is, the smaller does the standard deviation become. Now, change of variability, accompanying change in type, is always suggestive of some selective agency at the source of the variation. Thus, the Metropolitan police, being selected by stature, are taller in type than are the police generally; and, because they are thus selected, their variability is obviously less, since it is that of a series of tall men whose individual heights range from 5 ft. 10 in. to 6 ft. 4 in., let us say, whereas the variability of policemen generally is that of a series of tall and short men combined, with individual statures ranging, probably, from 5 ft. 6 in. to 6 ft. 4 in. Consequently, in the former case, the individual values cluster more about the mean than they do in the latter case; which is to say that their variability is less. Or, again, to quote another instance, it is conceivable that some social process, such as marriage, might select individuals of average height, and tend to leave unmarried individuals of extremely tall or diminutive stature. In this case the standard deviation of stature in bachelors would be increased by their selection. Consequently, when we find that, relatively to criminals generally, thieves and fraudulent offenders deviate markedly in variability, as well as in type, the presumption is that fraudulent offenders and thieves are selected by stature, or by some condition associated with stature. If criminals were a special breed of human being, characterised by diminutive stature, it is difficult to see how a natural condition of this kind could affect variability as well as type. And, in fact, as we shall now proceed to show, it is the class differentiation of criminals which, since social class selects stature as well as crime, is mainly responsible for the physical differences we have enumerated.

(b) *The extent to which Age and Social Class determine the differentiation of Criminals in Physique.*—We have found that criminals convicted of different kinds of crime differ on the average in stature, body-weight, and span of arms; and from the data given in Appendix Tables 204, 205, 206, we find the exact measure of these differences, on the correlation scale, to be (1) for differences of stature with crime ·17, (2) of body-weight with crime ·19, and (3) of span of arms with crime ·19. We shall now proceed to show how these differences in physique, and the respective values of the enumerated correlation ratios which measure them precisely, depend entirely upon the age-differences of criminals convicted of different types of crime, and upon the social classes from which these several types of delinquents are drawn.

The distributed data from which we have obtained statistical evidence in support of our argument are given in Appendix Tables 182, 204, 205, 206, 210, 211, 212, 213, 214, 215, this evidence itself being as follows:—

TABLE 64.

Characters.	Nature of Crimes.					All Crimes.	Standard deviations.	Measures of correlation.
	Damage to property.	Stealing and Burglary.	Sexual Offences.	Violence to the Person.	Forgery and Fraud.			
Mean stature ...	65·49	65·17	65·39	65·55	66·55	65·47 ins.	2·66	·175
„ weight ...	136·10	140·70	139·80	142·80	149·40	142·10 lbs.	17·19	·192
„ span of arms.	67·02	66·53	67·61	67·14	67·98	66·95 ins.	3·18	·193
„ age ...	35·85	35·73	33·87	33 52	42·71	36·24 yrs.	13·09	·190
„ standard of living.	—·04	·26	·00	·12	1·12	·31	·73	·507

	Ages.														All ages.		
	15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–			
Mean stature ...	65·6	65·9	65·6	64·7	66·1	65·5	65·0	64·2	65·3	65·1	65·1	64·5	63·4	66·4	65·4 ins.	2·73	—·100
„ weight ...	125·9	137·8	138·5	135·2	141·8	141·8	139·6	137·8	131·0	136·1	143·8	134·5	140·5	144·5	138·4 lbs.	16·64	·018

	Standard of living (parents).				All classes.		
	Destitute.	Poor.	Prosperous poor.	Well-to-do.			
Mean stature ...	64·34	65·28	65·32	67·07	65·52 ins.	2·79	·372
„ weight ...	132·12	137·92	138·00	153·45	139·95 lbs.	18·27	·463
„ age ...	35·36	36·10	38·12	44·76	38·36 yrs.	13·57	·297

The crude correlation ratio of crime with stature $(\eta_{cs}) = {\cdot}1751$; of crime with age $(\eta_{ca}) = {\cdot}1903$; of crime with class $(\eta_{cl}) = {\cdot}5065$. The crude correlation coefficient of age with stature $(r_{as}) = -{\cdot}1004$; of class with stature $(r_{ls}) = {\cdot}3722$; and of class with age $(r_{la}) = {\cdot}2969$. The corrected or partial correlation coefficient, whose value we want to measure, of crime with stature for constant age and class $({}_{al}\rho_{cs})$, is found from the following formula :—

$$
{}_{al}\rho_{cs} = \frac{r_{cs}(1-r^2_{al}) - r_{ca}(r_{sa} - r_{sl}r_{al}) - r_{cl}(r_{sl} - r_{al}r_{as})}{\sqrt{1-r^2_{ca}-r^2_{cl}-r^2_{al}+2r_{ca}r_{cl}r_{al}}\ \sqrt{1-r^2_{as}-r^2_{al}-r^2_{sl}+2r_{as}r_{al}r_{ls}}}
$$

$$
= \frac{{\cdot}1751(1-{\cdot}2969^2) - {\cdot}1903(-{\cdot}1004-{\cdot}3722\times{\cdot}2969) - {\cdot}5065({\cdot}3722-{\cdot}2969\times -{\cdot}1004)}{\sqrt{1-{\cdot}1903^2-{\cdot}5065^2-{\cdot}2969^2+2\times{\cdot}1903\times{\cdot}5065\times{\cdot}2969}\ \sqrt{1-{\cdot}1004^2-{\cdot}2969^2-{\cdot}3722^2+2\times -{\cdot}1004\times{\cdot}2969\times{\cdot}3722}}
$$

$$
= -{\cdot}0054 \pm {\cdot}0239
$$

The crude correlation coefficient between stature and crime was ·1751 ; but, when corrected for age and class differences associated with crime, we see that the value of this coefficient is reduced to zero. The mean stature of criminals convicted of fraud differs markedly from the mean of those convicted of theft ; but the value of the above partial coefficient tells us that when fraudulent criminals, and thieves of the same age and drawn from the same social class, are compared, this difference of stature entirely disappears. In fact, had we data sufficiently numerous for every crime-group to be subdivided, as recently described, into 56 age-class groups, we might be assured, from the zero value of this coefficient, that, when contrasting one crime-group with another, no significant difference would appear between the means of stature recorded within each of these several age-class subdivisions. We conclude that the stature of criminals is totally unrelated to the kind of crime they commit ; apparent variations of type resulting solely from the fact that criminals, according to the crime they commit, differ in their age distributions, and are drawn from widely divergent class sections of the general community.

And as with stature, so with body-weight. The crude correlation ratio of crime with weight $(\eta_{cw}) = {\cdot}1935$, and of crime with class $(\eta_{cl}) = {\cdot}5065$, as before. The crude correlation coefficient of class with weight $(r_{lw}) = {\cdot}4628$. The effect of age upon weight (correlation coefficient ·0179) is negligible : and, consequently, the partial correlation coefficient $({}_{l}\rho_{cw})$ of crime with weight for constant class will be given by the following relatively simple formula :—

$$
{}_{l}\rho_{cw} = \frac{r_{cw} - r_{lw}r_{cl}}{\sqrt{1-r^2_{lw}}\ \sqrt{1-r^2_{cl}}}
$$

$$
= \frac{{\cdot}1935 - .4628\times .5065}{\sqrt{1-{\cdot}4628^2}\ \sqrt{1-{\cdot}5065^2}}
$$

$$
= -{\cdot}0535 \pm {\cdot}0239
$$

In relation to its probable error, this correlation coefficient is barely significant in value : and we accordingly again conclude that apart from a derived association dependent upon class differences, there is no direct relation between a criminal's weight and the type of crime he commits.

VI. We turn next to an analysis of *the relation to crime of general health and physical constitution.*

(*a*) Do criminals, according to the crimes they commit, tend to vary in their general health ? Does one type of criminal tend to be more robust or more delicate than another ? Have offenders who commit crimes of violence, on the whole, a finer muscular development than thieves ? Is obesity a physical character peculiar to any particular type of offender ? If criminals do differ in any of these respects, what is the extent of any such differences, and what is their most probable explanation ?

The raw material out of which we have attempted to construct answers to these questions will be found in the scheduled records 2,500–3,000, and supplementary records. The distributed and correlated data are given in Appendix Tables 214 to 226, the means, standard deviations, and other results obtained from the statistical analysis of these tables being as follows :—

TABLE 65.

Characters.	Nature of crimes.					All crimes.	Standard deviations.	Correlation ratios η.
	Damage to property.	Stealing and burglary.	Sexual offences.	Violence to the person.	Forgery and Fraud.			
Mean health ...	·29	·36	·46	·73	·31	·45	·70	·239
„ muscularity	·27	·38	·60	1·08	·04	·52	1·00	·385
„ obesity ...	−·25	−·21	·05	·18	·00	−·06	1·00	·177
„ age ...	39·10	37·36	35·05	33·21	43·33	37·08	13·57	·190
„ class ...	−·04	·26	·00	·12	1·12	·31	·73	·507

Characters.	Ages.														All ages.	Standard deviations.	Correlation coefficients r.
	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-			
Mean health ...	·60	·60	·55	·53	·62	·51	·41	·23	·08	·11	·16	−·30	−·30	·30	·45	·70	−·254
„ muscularity	·43	·92	·74	·92	·98	·31	·44	−·07	−·28	−·65	−·65	−·18	−1·00	−1·00	·48	1·00	−·302
„ obesity ...	·60	·13	−·01	−·08	−·06	−·05	+·19	−·13	−·12	−·48	−·54	−1·00	−1·00	−·43	−·061	1·00	−·155

Characters.	Social class.				All classes.	Standard deviations.	
	Destitute.	Poor.	Prosperous poor.	Well-to-do.			
Mean health ...	·55	·49	·43	·41	·45	·69	−·005
„ muscularity	·43	·56	·53	·11	·48	1·00	−·280
„ obesity ...	−·06	−·12	−·06	−·07	−·06	1·00	+·118
„ age ...	35·26	36·10	39·12	23·36	38·36	13·57	+·297

	Residence.					All localities.	Standard deviations.	
	High Seas.	Nomadic.	Urban.	Port.	Rural.			
Mean health ...	·67	·62	·36	·83	·53	·47	·70	−·085
„ muscularity	1·36	·45	·40	·92	·55	·49	1·00	−·090
„ obesity ...	·10	·03	−·14	·12	·09	−·06	1·00	−·110
„ age ...	33·30	30·51	39·31	35·00	36·45	38·10	15·55	+·124
„ class ...	·26	·57	·22	·26	−·10	·27	·68	+·053

We would here draw attention to the fact that results recorded within this and other tables have not *necessarily* universal application, nor any application outside the particular sample of convicts we are investigating. In many cases, of course, a more general application may exist ; but, unless the contrary is specified, it must not be assumed that every statistical value obtained, or relationship measured, from our particular data, is being presented as representative of corresponding values and degrees of relationship which might be obtained from other statistics—from samples of the general population, or, indeed, from other samples of criminals. To state a case in point, we quote in the above table the respective mean ages of our convicts, within four social class categories ; and from the regression of the means, we state that the relationship between social class and age is measured by the fraction ·2969. Now, all we would imply by this statement of fact is that, in our particular sample, the mean age of convicts tends to increase to a certain defined extent as they go up in the social scale : but it must not thereby be assumed that the upper classes of the general community are similarly older, or that they live longer, than the lower classes. In regard to the particular relation we are discussing, our sample is not necessarily representative of all criminals ; and is certainly not a typical sample of the general population. Thus, relatively to their proportion in a random sample of all criminals, fraudulent offenders are disproportionately represented by our data ; and, moreover, since fraud is the characteristic crime of upper sections of the community, and since fraudulent criminals are, on the average, eight years older than other criminals, it follows that the relation of class to age, given by our data, cannot correspond in any way to the relation between these conditions in the general population. On the other hand, in a previous section, we gave many reasons for the presumption that the relation between age and certain physical characters, although established by our statistics for convicts only, might possibly have universal application to the general community. Criminals being undifferentiated in these characters makes the presumption a plausible one that the relation between them and age would be the same for non-criminals as for criminals—the marked class differentiation of the latter would negative the likelihood of a similar correspondence for the relation between age and class.

Returning now to an examination of Table 65 : in the body of the Table, series of mean values are presented, and in the right-hand outside column, a series of correlation ratios and coefficients is given. Assuming their normal distribution, the mean values of health, muscularity, and obesity were obtained by the aid of Sheppard's Tables, as described on pp. 82, 83. The unit of measurement for age is one year; for health it is that range, on the scale of delicacy and health, described in our statistics as "good health"; and for class it is that range, intermediate between the poor and well-to-do portions of the economic scale, described in our data as "prosperous poor." For measuring the characters of muscularity and obesity, the units employed are the standard deviation of these characters. The values of the several correlation ratios were obtained by the method described fully on p. 82 ; the correlation coefficients of health, muscularity, obesity, class and residence, with age, by the two-rowed table method described on p. 89 ; and the remaining coefficients by the method of the four-fold Table (see p. 341, Chap. VII). When using this last method, the several categories of each character correlated were amalgamated as follows into two divisions only :—

Health.—Robust and good health combined, and opposed to delicate health.
Mascularity.—Stout and thin-muscular combined, and opposed to a combination of the fat and thin-weak.
Obesity.—The strong and weak stout combined, and opposed to the strong and weak thin.
Class.—The well-to-do opposed to an amalgamation of the prosperous poor, the poor, and the destitute.

The figures of greatest interest in Table 65 are those which give the regression of health, muscularity, and obesity with increasing age. It will be seen how, for all three characters, up to the age of 25, the means increase in value ; and then progressively and regularly decline until old age, when the declination becomes more pronounced. The decline of muscular strength with age, however, is twice as rapid as that of general health, which again is nearly twice as rapid as that of increasing leanness.*

In the upper quarter of Table 65, the numerical relation is set forth between crime and health, muscularity and obesity ; and in the lower half, the relation of these characters with social class and with residence is given. Of these latter, the only association of importance is that of muscularity with class ; the correlation coefficient is − ·2304, and measures the extent to which, as they mount the higher in the social scale, criminals show less muscular development. Contrary to expectation, the association of health and stoutness with class, and of health, muscularity and obesity with urban and rural residence, are none of them, in relation to their probable errors, significant in value ; and, consequently, the relative effects of these conditions upon the health, &c., of different kinds of criminals, may be regarded as negligible. Only the effects due to age upon health, muscularity and stoutness, and those due to class upon muscularity, need be allowed for when measuring the partial correlations of these physical characters with crime. As will be seen by examining the relative values of the means recorded in the upper quarter of Table 65, the crude associations of health, muscularity and obesity with crime are significant and pronounced. And it will also be observed that, when arranged in the order of relative health, of relative muscularity, and of relative obesity, the crime categories may claim the same serial relationship to each other. Thus, offenders convicted of violence are the stoutest, the strongest, and the healthiest of the criminal group ; next in order come sexual offenders ; criminals convicted of thieving and fraud occupy an intermediate position ; and incendiaries come last on all three scales, *i.e.*, those who commit arson are less stout, strong and healthy than criminals convicted of any other kind of crime. Now, in relation to age, our criminal categories may also be disposed in much the same order as the one described, *i.e.*, violent offenders are, on the average, the youngest ; and the mean age increases as we pass through the groups of offenders convicted of rape, thieving, arson and fraud. Consequently, since with all kinds of criminals physique is greatly a question of age, before drawing conclusions from the serial relation, with regard to physique, of criminals convicted of different crimes, we must

* As we shall see later, criminals are not markedly differentiated from each other by any of these characters, whose relationship with age, consequently, as measured by the correlation coefficient values given in Table 65, would probably apply to the community at large.

results of a thus legitimatized comparison of the health, muscularity, and obesity of different kinds of criminals upon a standardized age or age-class basis, are as follows :—

TABLE 66.

	Nature of crimes.	Crude means of total criminals.	Cor-rections for age.	Cor-rections for class.	Corrected means of total criminals.	Actual means of sub-groups.	Differ-ences.	Twice* probable errors.
General health.	Damage to property	·45	−·01	—	·44	·29	−·15	±·11
	Stealing and burglary... ...	·45	−·00	—	·45	·36	−·09	±·05
	Sexual offences	·45	+·03	—	·48	·46	−·02	±·09
	Violence to the person... ...	·45	+·05	—	·50	·73	+·23	±·07
	Forgery and fraud	·45	−·08	—	·37	·31	−·06	±·08
Muscularity.	Damage to property	·52	−·04	+·03	·51	·27	−·24	±·16
	Stealing and burglary... ...	·52	−·01	+·00	·51	·38	−·13	±·07
	Sexual offences	·52	+·07	+·03	·62	·60	−·02	±·13
	Violence to the person... ...	·52	+·14	+·02	·67	1·08	+·41	±·09
	Forgery and fraud	·52	−·22	−·07	·22	·04	−·19	±·12
Obesity.	Damage to property	−·06	−·01	—	−·07	−·35	−·28	±·16
	Stealing and burglary... ...	−·06	−·00	—	−·06	−·21	−·15	±·07
	Sexual offences...	−·06	+·02	—	−·04	+·05	+·09	±·13
	Violence to the person... ...	−·06	+·04	—	−·02	+·18	+·20	±·09
	Forgery and fraud	−·06	−·07	—	−·13	·00	+·13	±·12

* The probable errors are calculated from the formula $·6745 \sqrt{1-r^2}\, \sigma \sqrt{\left(\frac{1}{n_1}-\frac{1}{n}\right)}$.

From the above recorded differences in relation to their probable errors, we see that in all three characters, violence and sexual offenders stand out from others—the former in being more healthy, more muscular and stouter than criminals generally, and the latter by their lack of differentiation in these respects. On the other hand, incendiaries and thieves are similarly less healthy, less muscular, and less stout than criminals generally ; and fraudulent offenders also are deficient in health and muscularity. Starting with violence, there is a progressive falling off in health and strength, and, with one exception, a progressively increasing degree of emaciation as we pass through rape, fraud, arson and stealing. Our statement of the relative health, strength and obesity of criminals, applies of course only to criminals ; and is all that can be said upon the evidence of the present statistics. We might convey an entirely wrong impression as to the solution of the practical problem in hand if we allowed this statement to stand alone. For the practical problem to be solved, the kind of question we hope to answer by collecting statistics of criminals, is not only how, and to what extent, different types of criminals differ amongst themselves, but how, and to what extent, each type deviates from a non-criminal standard. The figures in Table 66 answer the first of the above questions, but they establish nothing further : and, consequently, they can provide very little serviceable information until this adopted criminal standard be interpreted in terms of a non-criminal one. For instance, we learn from our analyzed statistics that "violence" offenders are the most healthy and muscular, and that fraudulent offenders are amongst the least healthy and muscular of all criminals. These are the facts : but since they have been attested by referring the health and strengh of fraudulence and violence offenders to a criminal standard only, *i.e.*, to a standard into the composition of which these two types of offenders themselves form an aliquot part—these facts do not provide any answer to the question of practical and vital importance, viz., whether it is the fraudulent offenders, or those convicted of violence, who approach the closest in strength and health to the general non-criminal standard. To answer these and kindred questions, we require statistics of the general law-abiding community with which to compare our statistics of criminals.

(*b*) Unfortunately, such legitimate comparative statistics are not available : nevertheless, in their absence, it seems justifiable and eminently serviceable to make tentative use of an assumption we permitted ourselves on page 38, Part I.—the assumption that our fraudulent group of criminals in very many respects form an approximately representative sample of the well-to-do classes of the general population. In the reference cited, we gave many reasons for this assumption ; and in relation to the present issue it is strongly supported by the fact that, in body-weight and stature—two fundamental physical characters closely associated with health and strength—fraudulent criminals actually do closely approximate to the general law-abiding community. In fact, as will be gathered from the figures in Tables 73, 74, and from the accompanying text, page 194, fraudulents are remarkably and pronouncedly differentiated from all other criminal types in this respect—that within every class of the community, individuals, convicted of crimes technically described as fraud, are almost identical to the typical standard of that class, in their mean weight and stature.

Assuming then, in the absence of more legitimate material, that the mean health, muscularity, and obesity, of fraudulent criminals, represent approximately the means of these characters in the general non-criminal community, we obtain the following comparative table:—

TABLE 67.

Nature of crime.	Crude means of sub-groups.	Corrections for age and class.	Corrected means of sub-groups.	Gen. pop. means represented by fraud-group.	Difference between gen. pop. and criminal groups.	Twice probable errors.
General Health—						
Damage to property	·29	+·01	·30	·39	−·09	±·14
Stealing and burglary ...	·36	+·00	·36	·39	−·03	±·08
Sexual offences	·46	−·03	·43	·39	+·04	±·12
Violence to the person ...	·73	−·05	·68	·39	+·29	±·10
Forgery and fraud	·31	+·08	·39	·39	·00	±·12
Muscularity—						
Damage to property ...	·27	+·01	·27	·33	−·06	±·20
Stealing and burglary ...	·38	+·01	·39	·33	+·06	±·12
Sexual offences	·60	−·10	·50	·33	+·17	±·18
Violence to the person ...	1·08	−·15	·92	·33	+·59	±·14
Forgery and fraud	·04	+·29	·33	·33	·00	±·16
Obesity—						
Damage to property ...	−·35	+·01	−·34	·07	−·40	±·20
Stealing and burglary ...	−·21	·00	−·21	·07	−·28	±·12
Sexual offences	+·05	−·02	+·03	·07	−·04	±·18
Violence to the person ...	+·18	−·04	+·14	·07	+·07	±·14
Forgery and fraud	·00	+·07	+·07	·07	·00	±·16

Assuming the truth of the hypothesis upon which these figures have been calculated, it will be seen that those convicted of violence are the only criminals who differ significantly from the general community in their mean health and muscularity—they exceed the non-criminal standard by an amount equal to one-third of the standard deviation of health, and to three-fifths of the standard deviation of muscularity;* and that, with regard to their relative stoutness, violence offenders do not differ significantly from the non-criminal standard, but that thieves and incendiaries are distinguished by degrees of relative emaciation equivalent to one-fifth and two-fifths, respectively, of the standard deviation of this character. We conclude that, in health and strength, individuals who commit crimes of violence are stringently selected; that health and strength have no relation to the committing of fraud, rape, arson and stealing; and that individuals who commit, and are convicted of, the two last-mentioned crimes, are selected by their relative bodily thinness.

VII.—*The relation of Physique to Increasing Recidivism.*

To complete the inquiry into the health, muscularity, and stoutness of criminals, it will be appropriate to present here the relation of these characters amongst a homogeneous class of criminals, distributed upon scales of increasing criminality. These scales—the one based upon frequency of conviction, and the other upon length of sentence—and the class of offender, *i.e.*, habitual criminals only, whose diathesis they measure, are referred to on page 123, Part I.; and a detailed description of them will be found on page 268, Chapter V. If the explanation we have ventured to give with regard to the differentiation in health and muscularity of violence offenders be unsound—an explanation which would attribute the increased health of this type of criminal to the influence of selection—and if the only other possible explanation be the true one—that exceptional health and strength are stigmata of criminality—then it would be logical to anticipate that changes in the grade

* Three-fifths of the standard deviation of stature would be equal to 2 inches.

of criminality should be associated with differences in the mean degree of health and strength. The distributed data of health, muscularity, fatness and age, correlated with distributions of criminality, will be found in Appendix Tables 227, 228, 276; the distributions of weight and stature, similarly correlated, in Appendix Tables 189, 190; and the correlated distributions with age, of these physical characters, in Appendix Tables 210, 211, 225, 226. The partial correlation coefficients are as follows:—

TABLE 68.

Characters.	Correlation coefficients (r) with frequency of conviction.	Correlation coefficients (r) with length of sentence.	Correlation coefficients (r) with age.	Partial correlation coefficients ($_a\rho$) with conviction for constant age.	Partial correlation coefficients ($_a\rho$) with sentence for constant age.
Stature	$-\cdot03\pm\cdot03$	$-\cdot10\pm\cdot03$	$-\cdot10$	$-\cdot04\pm\cdot03$	$-\cdot07\pm\cdot03$
Weight	$-\cdot07\pm\cdot03$	$-\cdot09\pm\cdot03$	$+\cdot02$	$-\cdot07\pm\cdot03$	$-\cdot09\pm\cdot03$
Health	$+\cdot01\pm\cdot03$	$-\cdot12\pm\cdot03$	$-\cdot25$	$-\cdot02\pm\cdot03$	$-\cdot06\pm\cdot03$
Muscularity	$+\cdot07\pm\cdot03$	$-\cdot16\pm\cdot03$	$-\cdot50$	$+\cdot02\pm\cdot03$	$-\cdot05\pm\cdot03$
Obesity	$-\cdot04\pm\cdot03$	$-\cdot11\pm\cdot03$	$-\cdot15$	$-\cdot06\pm\cdot03$	$-\cdot08\pm\cdot03$
Age	$-\cdot11\pm\cdot03$	$+\cdot24\pm\cdot03$	1	0	0

In relation to their probable errors, the partial correlation coefficients presented in the two right-hand columns of the above table are none of them more than just significant in value; and we can only conclude from their general trend that practically there is no relationship between the stature, weight, health, muscularity or stoutness, of habitual criminals, and either the frequency of their convictions, or the aggregate length of their sentences. The partial correlation coefficients, however, of stature and of weight with length of sentence, have a theoretical significance which must be taken into account when dealing with the next inquiry: which is concerned with—

VIII.—*The effects of Imprisonment upon the Physique of* Convicts.

Before proceeding to discuss the relation to a non-criminal standard of the stature and weight of criminals, we will give now the results of a statistical inquiry into a question of considerable practical importance—a question frequently discussed, but concerning which, we believe, no reliable statistical evidence has hitherto been forthcoming: the question whether imprisonment has a good or bad effect upon physique, or whether it has no influence at all?

We take it that the best test of physique and of constitutional integrity is that of body-weight in its relation to stature; and, undoubtedly, the most satisfactory way to test the effect of imprisonment upon physique would be to compare the body-weights of individuals before conviction to prison with their weights after increasing periods of incarceration. Such comparison, if accomplished, would not necessarily give conclusive results, although this method of obtaining them would be less open to criticism than the one we are forced to adopt—the method of correlating the weight of criminals with increasing periods of incarceration. The chief defect of this method of approaching the problem is that it makes no allowance for the possibility that body-weight itself may be a selective factor determining imprisonment. If individuals of inferior body-weight tend to become criminals more frequently than those whose constitution is more robust—and, as will be shown later, this is the case to a small extent—it would be a logical presumption that the more pronounced their tendency to be convicted of crime, the more markedly inferior would be the delinquents in body-weight: that is to say, they would be thus inferior *by selection*, and apart from any effects upon physique due to their longer confinement in prison. And, in fact, the correlation coefficients of criminality with weight and stature, given in Table 68 (whose significance, although small, we drew attention to), may possibly be measures of an influence of the kind of selection described.

Now, as will be seen later, criminals, as well as being selected by weight, are also selected from the general population by stature; and it may be assumed that however much body-weight may be modified by environmental conditions, these would not add unto, or take one cubit from, the adult stature which, within reasonable environmental limits, is permanent and unmodifiable. It follows, then, with regard to stature, that any degree of relationship between imprisonment and this character would be a measure of the intensity of selection only, and not of the influence of imprisonment. Consequently, since stature and weight are highly correlated characters, (coefficient = ·555, see Appendix Table 209, the intensity of association between imprisonment and stature may be regarded as a probable value for the intensity of selection by weight; and the influence

The crude correlation coefficient between weight and imprisonment is $-\cdot 0905$; but when observation is limited to individuals of the same stature, we find the value of this coefficient shrinks to zero. We conclude that confinement in prison has no effect at all upon the physique of criminals, at any rate in so far as body-weight may be taken as a measure of physical integrity.

IX.—*Comparison between the Physique of Criminals as a Class, and of the General Population.*

(*a*) *Preliminary Comparisons.*—So far our comparisons of stature and of body-weight have been limited to criminals convicted of different types of crime. We have found that such differences as exist between these several orders of criminals are accounted for by their different age-distributions, and by their class differentiation. Compared on a standardized age-class basis, these different kinds of criminals do not significantly differ from each other in either stature or weight. We are now going to consider how criminals as a class compare in stature and weight with the non-criminal public. And in order to make the comparison as interesting and as effective as possible, we will first make a preliminary comparison of our data, which refer only to English convicts, with statistics of some entirely different orders of criminals—(1) statistics of non-habitual criminals, published by W. R. Macdonell in Biometrika, Vol. I., and already referred to on p. 140, Part I.; (2) statistics of Scottish criminals, published by J. F. Tocher in a memoir published in Biometrika, Vol. V., also referred to on p. 148, Part I.; and (3) statistics of New South Wales criminals, published by Powys in Biometrika, Vol. I., in a memoir entitled "Data for the Problem of Evolution in Man."

Macdonell's data consist of 3,000 stature measurements of non-habitual criminals—a class more representative of criminals generally than are our own records, which relate to convicts only. Tocher's statistics refer to 375 Scottish habitual criminals. The following table gives the analysed results of these data contrasted with our own:—

TABLE 70.—COMPARISON OF STATURE.

Order of Criminal.	Means in inches.	Standard deviations.	Coefficients of variation.
Convicts	65·47	2·66 ± ·01	4·06 ± ·02
Non-habitual	65·53	2·54 ± ·02	3·88 ± ·03
Scottish criminals ...	64·80	2·47 ± ·06	3·81 ± ·07

From an examination of these results, it appears that there is no significant difference between the mean statures of English convicts and non-habituals. The slight differences between their respective variabilities is due to the fact that the non-habituals are, on the whole, a more homogeneous class. On the other hand, the Scottish criminal, while not differing in variability, is inferior to the English criminal by half an inch in stature—a fact of importance, because Scotsmen in general, are nearly two inches taller than Englishmen. The interesting results, however, for our purpose, is the close correspondence between the returns for English convicts and English non-habituals—a result which should inspire confidence in the general validity of conclusions we may reach when contrasting our convict returns with those for the general English population.

Turning next to Powys' data of New South Wales criminals, we are struck immediately with their marked superiority in stature over criminals belonging to these Islands. The mean stature of the New South Wales criminal is 66·88 inches as against 65·47 inches for English convicts. (The agreement in variability, however, of these two contrasted criminal classes, is wonderfully close—the respective standard deviations being 2·59 and 2·66 inches, and their coefficients of variation being 3·90 and 4·06 respectively.) This difference in mean stature between the English and Australian convict is an important fact we shall be referring to later. In the meantime it is sufficient to state that, in the opinion of Mr. Powys, the criminal in New South Wales is not differentiated in stature from the law-abiding subject; and that, consequently, "the figures shown for criminals can be regarded as typical for the ordinary population." Mr. Powys also writes: "It seems impossible that the general population of New South Wales is shorter than that of England": from which statement, in conjunction with the previous one quoted, we further deduce that the figures shown by Powys, for New South Wales criminals, may be regarded as typically representative of the general population in England.

(*b*) *Regression of Stature with Age.*—The reason for referring now to these statements and our deduction from them is that, assuming their truth, Mr. Powys' data of New South Wales criminals form an admirable medium for testing our general postulate, formulated on p. 147, Part I., that the alteration in physical characters associated with increasing age, established by our data for criminals only, is common to all healthy people. On p. 46 Biometrika, Vol. I, an exhaustive analysis is given of the influence of age upon the adult stature, based upon the New South Wales criminal experience. The means of stature for each quinquennial period of life from 15 to 80 are tabulated and plotted, and the regression coefficient, or best fitting straight line, from the age 25 and onwards, is calculated. The corresponding means given by our criminal data (Records 1 to 3,000), and the best fitting straight line for the period of decadence, contrasted with those of Powys, are presented in the following Tables and Figure :—*

STATURE AND AGE.

TABLE 71.

Fraudulent criminals.

Stature in inches	Age in years.													
	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–	Totals.
59	—	—	—	—	1	—	—	—	—	—	—	1	—	2
60	—	—	2	—	1	—	1	—	—	1	—	—	—	5
61	—	1	1	1	2	1	2	2	3	—	—	—	—	13
62	2	2	3	5	5	1	2	2	2	3	2	—	—	29
63	1	2	5	2	5	3	2	—	1	1	2	—	—	25
64	2	6	8	6	4	3	6	2	5	1	1	1	1	46
65	9	6	6	10	8	5	2	2	4	4	—	—	—	56
66	2	6	10	7	12	7	4	3	4	—	1	1	—	57
67	2	10	3	7	10	6	5	2	6	5	—	—	—	56
68	4	5	9	6	6	6	5	2	6	—	—	1	—	50
69	4	6	6	3	5	5	—	2	3	1	—	—	—	35
70	—	3	5	3	6	—	1	—	1	1	—	—	1	21
71	4	1	2	1	6	—	—	2	—	—	—	—	—	16
72	1	2	—	2	2	—	1	—	—	—	—	—	—	8
73	—	—	—	3	—	—	1	—	—	—	—	—	—	4
74	—	—	1	1	—	—	—	—	—	—	—	—	—	2
Totals	31	50	61	57	73	37	33	19	35	17	6	4	2	425
Mean statures 5 ft. + ins. ...	7·21	7·04	6·62	7·08	6·63	6·55	5·98	6·33	6·18	5·56	3·77	4·69	7·44	—
P.E. in ins. ...	·34	·27	·34	·25	·22	·31	·33	·43	·32	·46	·77	·94	1·34	—
Mean statures Powys' N.S.W. criminals 5ft. + ins. ...	6·95	7·30	7·21	7·07	6·82	6·74	6·58	6·63	6·40	6·23	5·71	5·49	5·67	—

Fraudulent criminals, ages 25 years and up.

Mean age in years	44·23	S.d. of age in years	12·69.
Mean stature in inches ...	66·55	S.d. of stature in inches ...	2·83.

Coefficient of correlation of stature with age ... ... $-·153 \pm ·033$.

Coefficient of correlation of stature with age, Powys' N.S.W. criminals ... $-·150$.

Regression equation of stature, y, upon age, x.

$$y = 68·06 - ·0341\,x \pm 1·89.$$

Regression equation, Powys' N.S.W. criminals,

$$y = 68·34 - ·0337\,x.$$

* We separate the fraudulent from other criminals in order to limit the investigation to material as homogeneous as possible, there being a marked differentiation in stature (due to the influence of age and class, see page 180) between criminals who have committed crimes of fraud and those who have committed other crimes.

TABLE 72.—*Criminals other than fraudulent.*

Stature in inches.	Age in years.														
	15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–	Totals.
48	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
54	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
55	—	—	2	—	—	—	—	—	—	—	—	—	—	—	2
56	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
57	—	1	1	1	1	—	1	—	—	—	—	—	—	—	5
58	—	—	—	—	1	1	1	—	—	—	2	—	—	—	5
59	2	8	3	1	3	3	1	—	1	1	—	—	—	—	23
60	1	18	14	16	9	10	1	—	2	3	—	—	1	—	75
61	2	23	28	22	12	11	9	5	6	8	3	—	—	—	129
62	14	49	48	43	21	12	10	11	6	12	4	5	—	1	236
63	11	59	57	44	38	25	21	17	9	17	6	2	1	1	308
64	7	60	76	43	45	32	33	17	11	15	8	5	—	1	353
65	10	76	73	65	46	38	20	15	9	16	9	5	—	—	382
66	13	76	84	51	47	24	20	13	8	11	7	2	2	—	358
67	4	69	73	46	40	22	15	11	4	8	5	1	2	—	300
68	3	39	50	32	25	19	12	6	4	3	5	2	—	—	200
69	2	25	29	17	17	12	1	5	—	4	1	1	—	—	114
70	2	10	9	7	6	2	3	—	2	5	—	—	—	—	46
71	—	1	3	2	1	2	1	—	—	—	1	—	—	—	11
72	1	3	2	—	—	1	—	1	2	—	—	—	—	—	10
73	—	3	1	2	1	—	—	1	—	—	—	—	—	—	8
77	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
Totals ...	72	520	554	392	315	214	149	103	64	103	51	23	6	3	2569
Mean statures, 5 ft. + ins. ...	4·87	5·38	5·45	5·25	5·43	5·27	5·06	5·19	4·89	4·85	5·12	5·00	5·27	3·44	—
P.e. in ins.	·20	·08	·07	·09	·10	·12	·14	·17	·22	·17	·24	·36	·71	1·00	—

Criminals (*not fraudulent*), *ages* 25 *years and upward.*

Mean age in years ... ... 39·10 S.d. of age ... ... 11·88

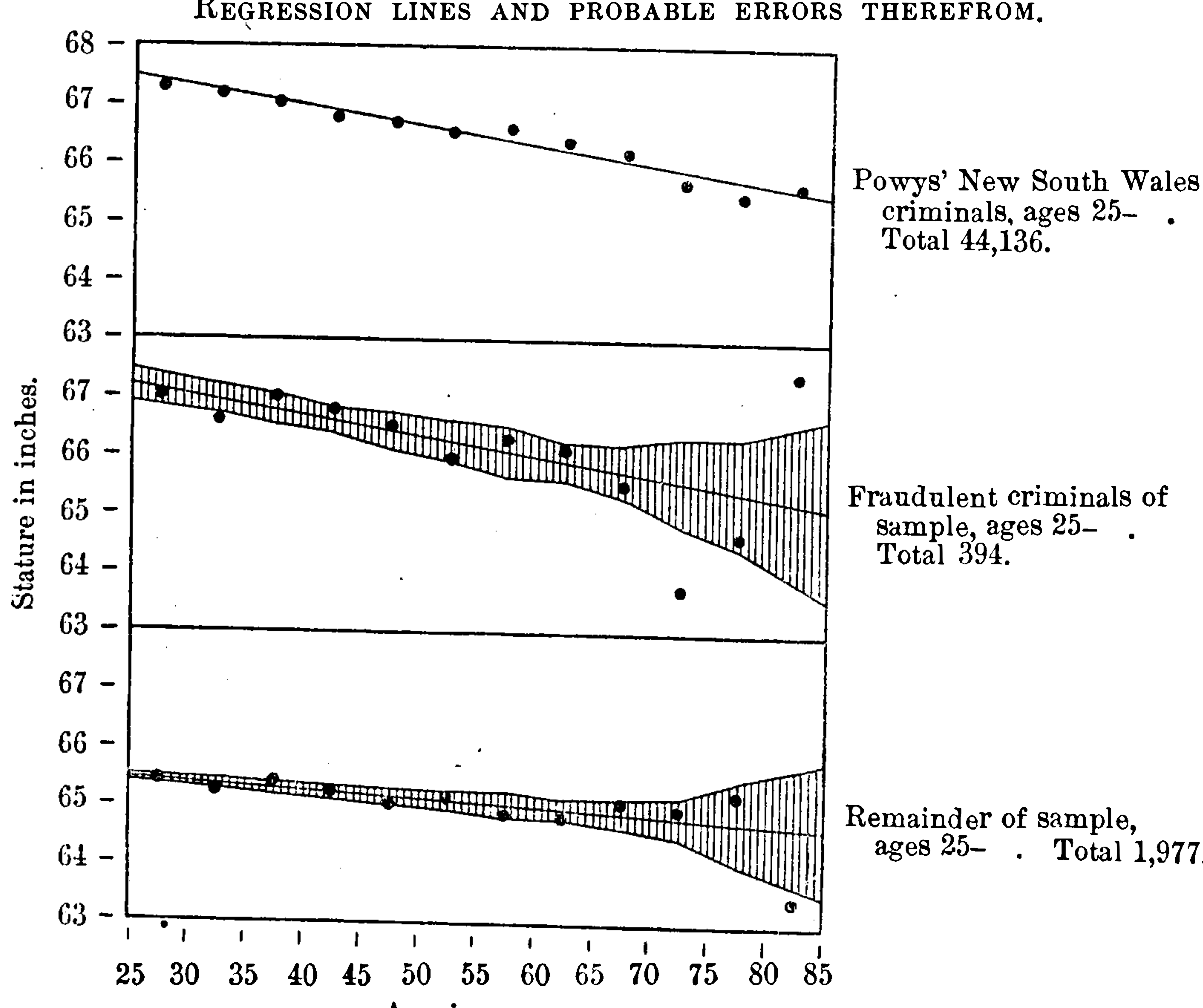
Mean stature in inches ... 65·28 S.d. of stature ... ... 2·58

Coefficient of correlation of stature with age ... ... −·061 ±·015

Regression equation of stature, y, upon age, x.

$$y = 65{\cdot}80 - {\cdot}0133\, x \pm 1{\cdot}86.$$

FIG. XXX.—DIMINUTION OF STATURE WITH AGE FROM MATURITY. OBSERVED MEANS. REGRESSION LINES AND PROBABLE ERRORS THEREFROM.



miners 66·9 inches, amongst artisans 66·8 inches, amongst sailors 66·4 inches; the respective mean weights of these several classes of law-abiding individuals decline similarly, in the main, from 162 to 142 lbs. And the interesting fact disclosed by the results of our own survey is this: that criminals show an occupational decadence in weight and stature precisely similar to that described for the non-criminal population by the British Association experience. Criminals drawn from the professional classes show the maximum of weight and stature, which declines progressively as we pass to criminals drawn from the commercial or selected classes, to criminals who are general labourers, miners and artisans, &c., in order. Our results, moreover, show that this relation between occupation and physique is not only limited to criminals considered together as a class we find it still holds for sub-groups of criminals convicted of different types of crime—criminals convicted of fraud as well as thieves, sexual offenders and incendiaries equally with criminals convicted of violence to the person, showing from 1 to 3 inches difference in mean stature, and from five to fifteen lbs. difference in mean weight, according as they are drawn from the professional, commercial, or labouring classes.* Here, however, correspondence between the physique of criminals and that of the general population ceases; and, upon further contrast, a marked differentiation of criminals from the law-abiding community emerges. Whether we compare, with the general community, criminals as a class, or sub-groups of criminals convicted of different crimes, we find, with one exception only, that, consistently within every occupational class, the mean stature and weight of the criminal is from 1 to 2 inches, and from 3 to 7½ lbs., less than the corresponding stature and weight of the non-criminal public. The one exception occurs in the case of criminals technically convicted of fraud. The average age (43·02 years) of this sub-group of criminals is at least nine years greater than, whereas the mean ages of the other sub-groups (33·5, 33·8, 35·7, 35·8 years respectively) do not materially differ from, the mean age (34·4 years) of the contrasted sample of the general population; and amongst fraudulent criminals and the general population, as we established on p. 193 an increase of nine years of age corresponds to a loss of ·306 of an inch in stature. If we add this fraction of an inch to the mean stature of fraudulent criminals, and then contrast it with the stature of the general population, calculated from a sample with occupational class-frequency, proportional to those in our sample of fraudulents, we find:

the mean of fraudulent criminals = 66·55 + ·31 = 66·86 ± ·09 inches:

the mean of the general population = 67·30 inches.

Thus, the difference of stature between fraudulent criminals and the general population is − ·44 inches ± ·10—a difference which is scarcely appreciable; and, in body-weight, fraudulent criminals are ·96 lbs. ± ·70 in excess of the general population —which is to say they do not significantly differ at all. Other kinds of offenders, however, compared on a standardized occupational class basis with the general population, are markedly inferior both in stature and in weight—offenders convicted of violence being 1·4 inches less in stature and 4·3 lbs. less in weight, incendiaries being 1½ inches less in stature and 3½ lbs. less in weight, sexual offenders being 1·6 inches less in stature and 7·3 lbs. less in weight, and, last of all, upon the list, thieves and burglars being 1·8 of an inch less in stature and 5·6 lbs. less in weight. These facts, obtained from our scheduled data 1 to 3,000 and Appendix Tables 183, 187, are set forth in the subjoined Tables 73, 74. In the upper part of these Tables, the results are given of the British Association Survey, and other independent investigations of the general population. The lower half of Table 73, and the bulk of Table 74, contain the detailed results of our criminal investigation. The means set forth in the extreme right-hand columns of both tables are those calculated for criminals and non-criminals upon the same standardized occupational class-basis—the lower quadrants of these columns giving the differences resulting from this legitimatised comparison of the respective series of means. The figures in the Tables speak for themselves, and are worth detailed examination. The two unmistakable facts they disclose—facts revealed at a glance in Fig. xxxi, which illustrates the statistics diagrammatically—are (1) that in the criminal, as in the non-criminal, classes of England, there is a marked class differentiation in stature and in weight; and (2) that apart from differences due to this class differentiation, in physique, as measured by stature and weight, criminals, with the exception of those convicted of fraud, are markedly differentiated from the non-criminal sections of the community.

* This is in accordance with the conclusion formulated on page 180 that the differences of weight and stature between different types of criminal depend upon their class differentiation.

TABLE 73.

Mean stature in inches of the general population of adult males in each occupational class, (C. Roberts' Anthropometry and other data) and their probable errors calculated as $e_1 = \cdot 6745 \times 2\cdot 34^* / \sqrt{n_1}$. Mean statures, of criminals committing various crimes, in the same occupational classes, and their p.e.'s calculated as $e_1' = \cdot 6745 \times 2\cdot 61^* / \sqrt{n_1'}$. The difference of the latter from Roberts' data, ages 23–50 years, and the p.e.'s of the differences calculated as $\sqrt{e_1^2 + e_1'^2}$. Also, the difference, in mean stature, of all criminals, committing the crime, from a selection of Roberts' general population having like class frequencies as the criminals, and the p.e. of the difference calculated as $\sqrt{\{n_1'^2 (e_1^2 + e_1'^2) + n_2'^2 (e_2^2 + e_2'^2) + \dots\} / n'^2}$, the suffixes ^{12}... denoting the classes.

	Professional classes.	Commercial classes: clerks and shopkeepers.	Selected classes: soldiers, policemen, messengers, servants.	Labourers: agricultural, roads, quarries, railways.	Sailors, fishermen.	Miners: coal and minerals.	Artisans.	Factory operatives.	Floating traders and persons of no occupation.	All classes in frequencies as found in sample of criminals.
Mean statures in the general population:—										
Roberts' general population, ages 23–50.	67·93 ± ·15	67·23 ± ·10	67·22 ± ·02	67·10 ± ·04	66·37 ± ·09	66·91 ± ·19	66·77 ± ·09	66·89 ± ·14	—	—
Roberts' general population, ages 23–30.	68·66 ± ·12	—	67·98 ± ·03	—	—	—	66·43 ± ·12	—	—	—
B. A. Report, 1883, population, ages 25–30.	69·14 ± ·15	67·95 ± ·12		67·51 ± ·05			66·61 ± ·09	65·92 ± ·11	—	—
Galton's South Kensington Laboratory data. Pearson's Chances of Death, Vol. I, p. 311.		67·90 ± ·06	—	—	—	—	—	—	—	—
Macdonell's Cambridge students. Biometrika, Vol. V, p. 347.	68·86 ± ·05	—	—	—	—	—	—	—	—	—
Pearson's English sons. Biometrika, Vol. V, p. 347.	68·68 ± ·05	—	—	—	—	—	—	—	—	—
Pearson's English fathers. Biometrika, Vol. V, p. 347.	67·74 ± ·05	—	—	—	—	—	—	—	—	—
Tocher's Roxburgh and Selkirk volunteers. Biometrika, Vol. V, p. 347.	—		67·69	—	—	—	—	—	—	—
Tocher's Aberdeenshire rural population. Biometrika, Vol. V, p. 347.	—		—	67·72	—	—	—	—	—	—
British recruits (Report on health of army, 1900).	—		66·22 ± ·01	—	—	—	—	—	—	—
Mean statures of criminals and their p.e.'s:—										
Damage to property	—	65·81 ± ·56	64·44 ± ·71	65·03 ± ·18	67·19 ± ·56	65·44 ± ·50	65·92 ± ·30		67·44 ± ·64†	65·49 ± ·1[illegible]
Stealing and burglary	65·89 ± ·23	65·64 ± ·11	65·43 ± ·19	65·21 ± ·07	64·78 ± ·23	64·70 ± ·24	64·97 ± ·07		65·07 ± ·12	65·17 ± [illegible]
Sexual offences	68·29 ± ·60	65·13 ± ·60	65·94 ± ·87	65·60 ± ·17	65·23 ± ·53	64·94 ± ·28	65·04 ± ·19		65·64 ± ·60	65·89 ± ·1[illegible]
Violence to the person	67·19 ± ·56	65·86 ± ·23	66·30 ± ·21	65·91 ± ·12	65·44 ± ·23	66·38 ± ·27	65·13 ± ·13		64·87 ± ·23	65·55 ± [illegible]
Forgery and fraud	67·45 ± ·14	66·52 ± ·16	66·26 ± ·66	66·46 ± ·25	65·44 ± ·64	65·55 ± ·53	65·24 ± ·17		66·40 ± ·81	66·55 ± [illegible]
Differences of criminals from Roberts' general population, and their p.e.'s:—										
Damage to property	—	−1·47 ± ·57	−2·78 ± ·71	−2·07 ± ·18	+ ·82 ± ·57	−1·47 ± ·54	− ·88 ± ·31†		+ ·64 ± ·64	−1·50 ± ·1[illegible]
Stealing and burglary	−2·04 ± ·28	−1·60 ± ·15	−1·80 ± ·19	−1·89 ± ·08	−1·59 ± ·25	−2·21 ± ·31	−1·83 ± ·10		−1·78 ± ·14	−1·81 ± [illegible]
Sexual offences	+ ·36 ± ·62	−2·15 ± ·60	−1·28 ± ·87	−1·67 ± ·17	−1·15 ± ·64	−1·97 ± ·84	−1·76 ± ·20		−1·16 ± ·60	−1·61 ± ·1[illegible]
Violence to the person	− ·74 ± ·56	−1·38 ± ·25	− ·80 ± ·21	−1·59 ± ·13	− ·93 ± ·25	− ·53 ± ·32	−1·67 ± ·15		−1·93 ± ·24	−1·42 ± [illegible]
Forgery and fraud	− ·40 ± ·21	− ·76 ± ·17	+1·08 ± ·29	− ·64 ± ·26	− ·93 ± ·65	−1·36 ± ·56	−1·56 ± ·18		− ·40 ± ·32	− ·75 ± [illegible]

* The standard deviation of stature in the general population, calculated from the B.A. Report, 1883, data for 1,767 individuals, is 2·45 ins., the frequencies of the occupational groups being brought up to the figures shown in Table 60. The correlation ratio of stature with occupation is ·30. The s. d. of stature within the class is therefore $2\cdot 45 \times \sqrt{1 - \cdot 30^2}$ or 2·34 ins. The s. d. of stature of criminals within the class is $2\cdot 66 \times \sqrt{1 - \cdot 20^2}$ or 2·61 ins. The variability of stature in the general population is, thus, about 9 % less than in criminals of the same occupation.

† Mean stature of Artisans and Factory operatives in Roberts' general population 66·80 ± ·07.

TABLE 74.

Mean weight in lbs. of the general population of adult males in each occupational class, and the probable error calculated as $e_1 = \cdot 6745 \times 15\cdot 3 / \sqrt{n_1}^*$. Mean weight of criminals committing various crimes, in the same classes, and their p.e.'s calculated as $e_1' = \cdot 6745 \times 16\cdot 82 / \sqrt{n_1'}$. The differences of the latter from the former, and their p.e.'s calculated as $\sqrt{e_1^2 + e_1'^2}$. Also, the difference in mean weight of all criminals committing the crime, from a selection of the general population having like class frequencies, and the p.e. calculated as $\sqrt{\{n_1'^2 (e_1^2 + e_1'^2) + n_2'^2 (e_2^2 + e_2'^2) + \dots\} / n'^2}$.

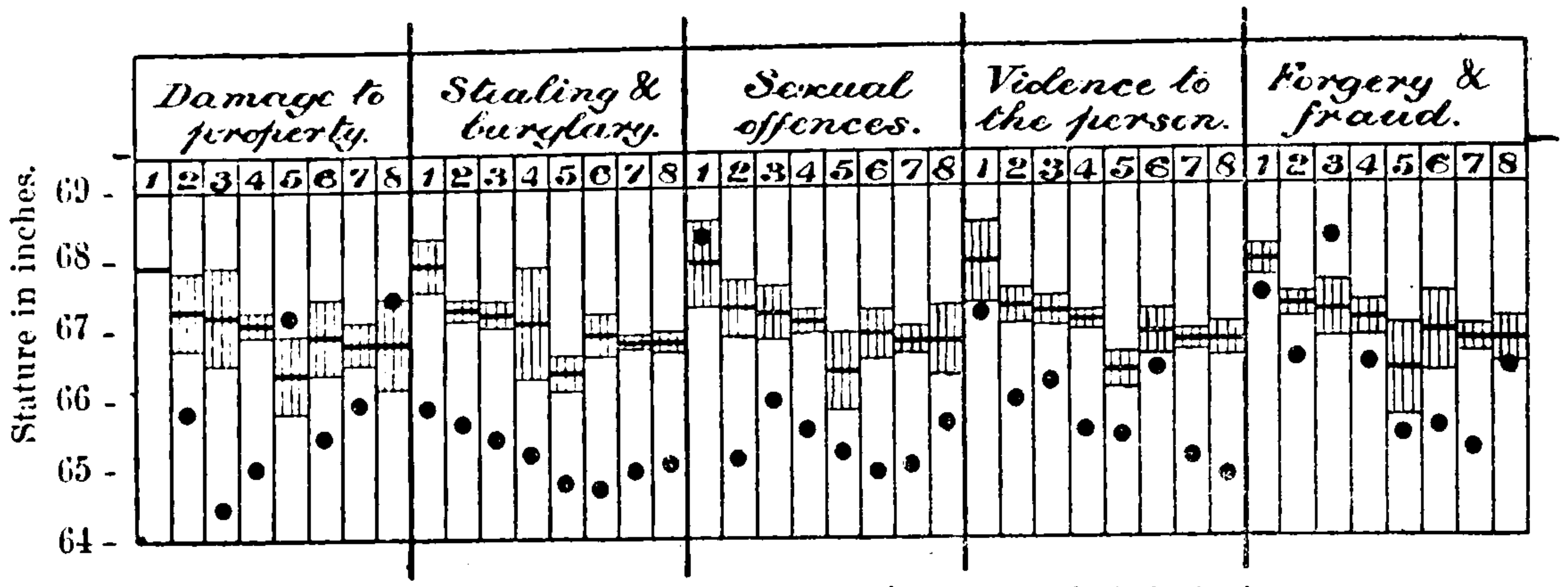
—	Professional classes.	Commercial classes; clerks and shopkeepers.	Selected classes; soldiers, policemen, messengers, servants.	Labourers agricultural, roads, quarries, railways.	Sailors, fishermen.	Miners; coal and minerals.	Artisans.	Factory operatives.	Floating traders and persons of no occupation.	All classes in frequencies as found in sample of criminals.
Mean weights in the general population, and their p.e.'s.	162·1 ± 1·2	146·7 ± ·7	139·3 ± ·2	149·2 ± ·3	163·1 ± ·7	148·2 ± 1·3	142·5 ± ·6	144·5 ± ·9	—	—
Mean weights of criminals, and their p.e.'s:—										
Damage to property		142·0 ± 4·1	130·5 ± 5·2	133·9 ± 1·4	148·2 ± 4·1	135·5 ± 3·7	138·9 ± 2·2		131·2 ± 4·7	136·1 ± 1·0
Stealing and burglary	145·3 ± 2·6	143·9 ± ·8	139·7 ± 1·4	140·6 ± ·5	140·5 ± 1·7	136·5 ± 1·7	139·9 ± ·6		140·8 ± ·9	140·7 ± ·3
Sexual offences ...	151·6 ± 4·4	146·4 ± 2·9	136·7 ± 2·7	141·2 ± 1·2	149·9 ± 3·9	137·9 ± 2·0	136·2 ± 1·4		142·5 ± 3·7	139·8 ± ·7
Violence to the person	145·7 ± 4·1	144·7 ± 1·7	144·7 ± 1·5	143·0 ± ·9	146·6 ± 1·7	147·4 ± 2·0	139·2 ± 1·0		141·2 ± 1·7	142·8 ± ·5
Forgery and fraud ...	157·6 ± 1·0	147·4 ± 1·0	150·7 ± 2·9	144·0 ± 1·8	144·5 ± 4·7	157·8 ± 3·9	142·4 ± 1·3		148·7 ± 2·3	149·4 ± ·6
Differences of criminals from the general population, and their p.e.'s:—										
Damage to property	—	−4·7 ± 4·2	− 7·8 ± 5·2	−15·3 ± 1·4	−14·8 ± 4·2	−12·7 ± 3·9	−4·1 ± 2·3†		−11·9 ± 4·8†	−8·44 ± 1·01
Stealing and burglary	−16·8 ± 2·9	−2·8 ± 1·0	+ ·4 ± 1·4	− 8·7 ± ·6	−22·6 ± 1·8	−11·7 ± 2·1	−3·2 ± ·7		− 2·6 ± 1·0	−5·57 ± ·36
Sexual offences ...	−10·5 ± 4·6	− ·4 ± 3·0	− 1·5 ± 2·7	− 8·0 ± 1·3	−14·2 ± 3·9	−10·3 ± 2·4	−7·9 ± 1·5		− ·6 ± 3·7	−7·31 ± ·77
Violence to the person	−16·4 ± 4·3	−2·0 ± 1·8	+ 5·4 ± 1·5	− 6·2 ± ·9	−16·5 ± 1·8	− ·8 ± 2·3	−3·9 ± 1·1		− 1·8 ± 1·8	−4·27 ± ·52
Forgery and fraud ...	− 4·5 ± 1·6	+ ·7 ± 1·2	+12·5 ± 2·9	− 5·2 ± 1·8	−18·6 ± 4·8	+ 9·6 ± 4·1	− ·6 ± 1·4		+ 5·6 ± 2·3	+ ·96 ± ·70

* The s. d. of weight, within an occupational class in 2,984 criminals, is 16·82 lbs. It was found (see note, Table 73) that the s. d. of stature of 1,767 individuals given in the B.A. Report, 1883, was 9 % less than in criminals of the same occupational class. In the absence of data as to weight in the general population, the s. d. of weight is taken as 9 % less than 16·82 lbs. or 15·3 lbs. in the general population. It must be observed, however, that since the individuals in the B.A. Report were limited in age from 25 to 30 years, these s.d.'s of stature and weight are likely to be under estimated.

† Mean weight of Artisans and Factory operatives in Roberts' general population is 143·1 ± ·5 lbs.

FIG. xxxi.—MEAN STATURES OF ADULTS, AGES 23–50, DRAWN FROM CERTAIN OCCUPATIONAL CLASSES (C. ROBERTS' DATA) .... THICK LINE. MEAN STATURES OF CRIMINALS, DISTINGUISHING FIVE TYPES OF CRIME, DRAWN FROM SIMILAR CLASSES (OUR SAMPLE) .... dot. THE PROBABLE ERROR OF THE SECOND MEAN FROM THE FIRST IN RANDOM SAMPLES .... HATCH. *See* TABLE .

1. Professional classes. 2. Commercial classes. 3. Selected classes. 4. Labourers. 5. Sailors. 6. Miners. 7. Artisans and factory operatives. 8. Floating traders and persons of no occupation (means of non-criminals taken same as 7).



X. *Interpretation of the Criminal's Physical Inferiority.*

How is this physical differentiation to be interpreted? Are the offenders against, like the guardians of, the public peace, differentiated in physique because they are subjected to some stringent process of selection? Or, is the physical differentiation of criminals, originating in, and fostered by, selection, an inbred characteristic of criminals as a class, comparable to the class-differentiation in stature and strength of the law-abiding public? Or, to state a third possibility, are the criminals' inferior stature and weight spontaneous physical variations, or veritable criminal stigmata, associated with some condition of degeneracy, atavism, or other defect of mental integrity, also originating spontaneously, and breeding true?

We need hardly say that in deciding between these possible interpretations of a statistical truth—the truth of the criminal's differentiation in stature and weight—we must pass to some extent from the strict and narrow confines of ascertained certainty into the wider latitudes of theory, where the laws which govern the imagination in the construction of ideas are more paramount than those which regulate the intellect in its analysis of facts. The interpreting of facts involves operations different and distinct from those by which facts are established—it involves "a work of synthesis and exposition, not of analysis and discovery." Criminals are differentiated from the general population in stature and weight: this is the truth, and the broadest statement of that truth to be obtained by statistical science whose ultimate purpose is the converting of raw materials, called statistics or data, themselves valueless for construction, into the finished fabric of statistical fact, from which theory can be elaborated. This conversion is achieved by three well-defined processes—the gathering and recording of data, the analysing of recorded data, the contrasting of analysed data. Without leaving the boundaries of our data, we may state as an indisputable statistical premiss that criminals are differentiated in stature and weight; but, within these confines, we may not justifiably assert more—as did the Committee of the British Association, with their statement that the class-differentiation in stature and weight is an illustration of the check upon growth resulting from defective nurture. To ascertain *why* criminals are physically differentiated, we must go beyond our data into the regions of theory, where facts are weighed, no longer simply upon the statistical balance, but as evidence for conclusions which in their very nature are wider than the facts themselves.

We have stated the three possible ways in which the differentiation of criminals in stature and weight may be interpreted. The question to be answered is which of these possible interpretations is the simplest, the most intelligible, and, upon the evidence in hand, the most likely to be the correct interpretation? All the evidence we can produce points in one direction, *i.e.*, to the conclusion that criminals are differentiated from the general population, in stature and weight, because these bodily conditions are selective factors, determining to some extent conviction for crime.

(*a*) *Physical Inferiority due to Selection.*—(1) In the first place, we know from general experience that stature and strength are qualities which exert considerable selective influence in workaday life; we know that physique counts for much in determining the occupations of many working men—a certain standard of physical

in weight and stature from the law-abiding public than that exhibited by thieves and burglars. Assuming that physique *selects* crime, the physical differences between thieves and fraudulents is explained; but judged from the standpoint of a "criminal type" theory, under which criminal tendencies are stigmatised by physical deficiencies, we are left without any satisfactory explanation why theives and burglars should be inferior in stature and weight to fraudulent criminals, who, in these respects, do not appreciably differ from the law-abiding community.

Again, in Powys' returns for stature and weight of New South Wales criminals, we have similar confirmatory evidence for the view that it is the selective relation of physique to crime, and not the inbred corporeal quality of the criminal, which determines the law-breakers' inferior physique. In New South Wales, a comparatively new country, the disparity between the number of crimes committed and the number of apprehensions for crime is not the same as it is in the United Kingdom; and in England, Scotland, and Australia respectively, conditions determining selection may conceivably be, and in all probability are, vastly different. But if criminals, as criminals, are a physically degenerate class, this inherent inferiority should not be affected by their geographical distribution. In fact, amongst all races, classes and creeds, law-breakers, on this hypothesis, should be inferior physically to their law-abiding brethren. Yet the disparity in weight and stature between criminals and non-criminals is much more marked in Scotland than it is in England; whereas in New South Wales it is practically non-existent. In short, all evidence points to one and the same conclusion: that it is to the influence of selection only that the differentiation of criminals in stature and weight must be attributed.

(2) Some statistical evidence also supporting this hypothesis resides in the general type or form of the distribution curves of stature within the several crime groups. These curves are all of them approximately Gaussian in type—the type of frequency distribution of stature, and of other physical characters, as recorded over and over again for the general population; and the type to be expected for any homogeneous selected sections of the general population, but which would not be found for heterogeneous selections. Now, individuals may be selected by stature from the general population in three ways. Firstly, they may be selected as recruits are enlisted by a serjeant referring them to a defined standard of physique—persons over or below a certain stature being accepted or rejected, according to a definite limitation of size. This process we would call curtailed selection; because a characteristic of the stature distribution of a sample of individuals selected in this fashion would be a curtailment of the distribution curve, which would abruptly terminate at some point on the scale, instead of extending into a tail of unlimited length. A second way individuals might be selected through stature is by what we would call a process of disparate, partial, or biassed selection: a process which would tend to pass individuals, whose stature was within a certain range of values, disproportionately to those whose stature was outside this range. The result of this process upon the frequencies of stature would be the introduction of peaks, waves, or other irregularities, into the distribution curves, such as would appear, for instance, in the distributed results of any series of consecutive throws with loaded dice. If the criminal's inferior stature is to be accounted for by the argument contained in Lombroso's theory of anomaly, that criminals are stigmatised by extreme degrees only of physical characters—by extreme degrees of diminutive stature, as distinguished from all other degrees—we would expect the distribution of the criminal's stature to be represented by irregular or curtailed curves of the kinds described. On the other hand, from the hypothesis of selection we have proposed in order to account for the inferior physique of criminals, their stature distribution curve would not be expected to show either irregularities or curtailments, because, in this case, their selection by stature would be achieved by a third process, quite different to either of the preceding ones, and which we would call a process of unbiassed or symmetrical selection. This process is impartial and without prejudice in its selections, and, when selecting individuals by stature, would show no predilection for certain degrees of stature, but would take or reject individuals from all parts of the scale, although the intensity of its action might tend to be progressively graduated in passing from one end of the scale to the other. As we have already stated, the distribution of stature in the general population follows closely the Gaussian type, a characteristic of which is (see pp. 30, 151, 153 Part I.) that the mean, average, or type of the distribution corresponds, within limits of random sampling, to its modal value. That is to say, the average stature of the general population is the same as that degree of stature for which the frequency in the community is a maximum. Now, an obvious effect which would be produced upon a Gaussian distribution of stature by a selecting process of the kind we are now describing, *i.e.*, a process which would not draw a definite mark on the stature scale, and abruptly cut off all

individuals with stature above the mark and retain all whose stature was below it, and which would not be biassed by selecting disproportionately from any restricted portions of the scale, but would exert an influence, be it graduated in intensity or ungraduated, with equal impartiality upon all and every degree of stature—the obvious effect of such a selecting process would be either to leave the character of the distribution in the general population unchanged in the selected sample of the population, or, if the selecting process exerted a graduated influence, the effect would be to disturb, in the selected distribution, the correspondence between the mean and the mode in the original Gaussian distribution : that is to say, as the intensity of the selecting influence tended to become greater towards one end of the scale, the more would the mean stature of the selected sample tend to deviate in value from the modal or commonest value of that sample, or the more skew would the distribution curve become.

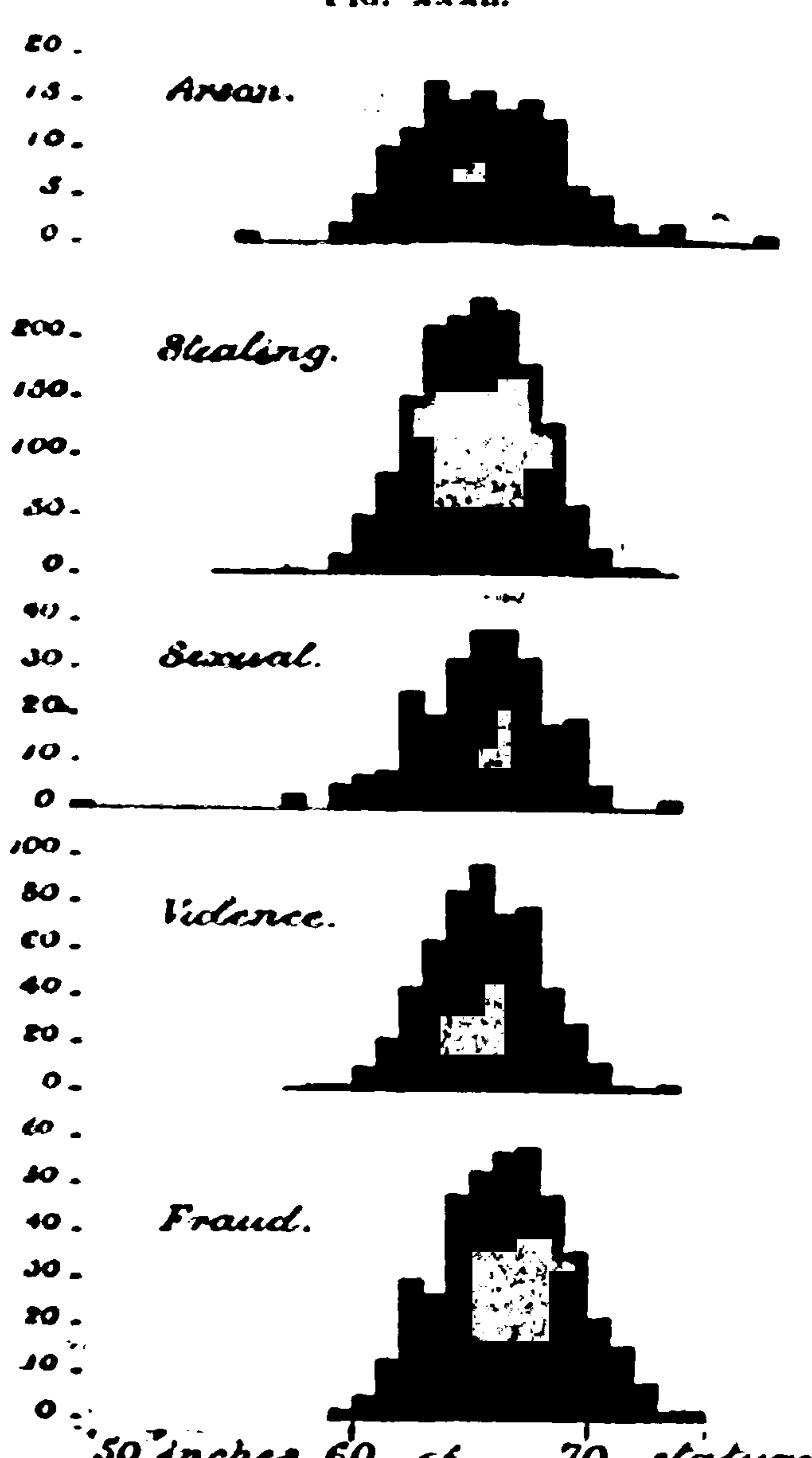
(3) The stature distribution curves within the several crime-groups are given in Fig. xxxii., and the moments of the curves with their contrasted values of mean, mode, standard deviation and skewness, are as follows :—

TABLE 75.—CRIME AND STATURE.

Analytical constants of stature frequency distribution.

Crimes.	Type.	No.	Unit.	μ_2	μ_3	μ_4	β_1	β_2	κ_2	Mean.	Mode.	Diff.	σ	Skewness.
	Normal (Theoretical).						=0	=3	=0	= Mode.	= Mean.	=0		= Nil.
			inch											
Damage to property ...	Normal	187	1	10·5[illegible]	11·470	[illegible]	·112	[illegible]	·062	65·489	65·449	+·040	3·244	·012
Stealing and burglary	Normal	1,506	1	6·325	·074	112·714	·000	2·817	·000	65·167	65·160	+·007	2·515	·003
Sexual offences ...	Skew Type IV	253	1	8·553	−23·489	[illegible]	1·0[illegible]	6·062	·225	63·390	64·160	−·770	2·925	·263
Violence to the person	Normal	5[illegible]	1	5·911	·512	118·079	·002	3·384	·002	65·545	65·504	+·041	2·431	·017
Forgery and fraud ...	Normal	427	1	7·8[illegible]	1·219	160·333	·0[illegible]	2·6[illegible]	−·003	66·552	66·448	+·104	2·809	·037

FIG. xxxii.



It will be seen that relatively to the distribution of stature within the fraudulent group, which is not differentiated in type from the general population, the distributions for offenders committing crimes of violence, for incendiaries, and more particularly for thieves, are distinguished by a conspicuous absence of any change in form. In fact, the distribution of stature which is Gaussian for the general population, is also Gaussian for all these selected sections of the general population. This shows that although, on the whole, taller men tend to be relatively immune, or specially protected, from committing crimes of violence, arson and theft, yet these crimes are not peculiar to individuals of any particular stature, but attract tall men and short, and those of medium stature, in their proper proportion. The one exception is in the case of sexual offenders, a section of those committing offences against the person for which, according to the judicial statistics, "the number of crimes is very little more than the number of persons convicted." With this class of offender, as with other types, the average stature of the selected is less than that of the general population; but unlike thieves, incendiaries, and violence offenders, individuals convicted of sexual crimes are selected with decreasing intensity towards the tall end of the stature scale—very tall men being disproportionately absent from the frequency distribution curve, which is accordingly very skew. In fact, the tendency to be convicted for sexual offences appears to become less intense as stature increases, the modal stature of sexual offenders being greater than the average degree by four-fifths of an inch, and not far removed from the modal value of stature in the general population.* In this connection it is interesting to note the relation between stature and marriage set forth in Appendix Table 233. The fact that taller criminals marry at a greater rate than shorter, if true for the general non-criminal population, suggests a possible explanation of the rather anomalous stature distribution of sexual offenders.

(*b*) *Physical inferiority an inbred characteristic.*—We have concluded that the inferior stature and weight of criminals is the result of selection, and is not an inbred criminal trait. A possibility, however, not to be lost sight of is that this physical inferiority, although originating in and fostered by selection, may tend with time to become an inbred characteristic of the criminal classes, just as, with the passage of generations, the upper classes of the non-criminal community have become differentiated in physique from those lower on the social scale. We shall show in a later section that imprisonment for crime is a tendency that runs in families in the same way as, and with much the same intensities that, diminutive stature tends to be restricted to certain stocks. Convicted parents, selected from the general community, as already explained, by inferior stature, have sons who, while tending to be similarly convicted, inherit the diminutive stature of their fathers. Here we have the conditions which in the course of generations would lead to an inbred physical differentiation of the criminal classes. In the report already referred to of the British Association Anthropometrical Committee, statistics of stature and weight of various grades of school children are presented; and a fact of singular suggestiveness revealed by these comparative statistics is that industrial and reformatory school children are consistently on the average one inch shorter in stature, and several pounds less in weight, than any other class of school children of the same age in the United Kingdom. Unfortunately, the data in question consist of a very short series only, and are unsatisfactory in other ways: and we would be loath to emphasise an argument based upon them until they have been amplified and supported by the analysed results of larger series. But if it be a statistical fact that industrial school children *are* differentiated in stature and weight from other children, this is a very strong argument for the supposition that inferior stature and weight are tending to become inbred criminal characteristics.

XI. *Conclusion.*

To sum up: all English criminals, with the exception of those technically convicted of fraud, are markedly differentiated from the general population in stature and body-weight; in addition, offenders convicted of violence to the person are characterised by an average degree of strength and of constitutional soundness considerably above the average of other criminals, and of the law-abiding community;† finally, thieves and burglars (who constitute, it must be borne in mind, 90 per cent. of all criminals), and also incendiaries, as well as being inferior in stature and weight, are also, relatively to other criminals and the population at large, puny in their general bodily habit. These are the facts: and, according to the results of our statistical inquiry, *they are the sole facts at the basis of criminal anthropology*; they are the only elements of truth out of

* The distribution of stature in the general population being Gaussian, the modal value corresponds to the mean.

† A stout, strong, healthy, thick-set individual, if anything rather below the average stature of his class: this is the typical portrait of a person prone to commit criminal violence.

called *star-class* convicts, (from the badge by which its members are distinguished), consists of individuals who, although they have not been previously convicted, have committed serious crimes—such as violence to the person, incendiarism, rape, fraud—and who have been condemned to terms of penal servitude ranging from three years to life sentences. The latter body consists of individuals—mainly thieves and burglars—who are all more or less habitual offenders. All have been previously convicted, the majority many times, and generally for relatively trifling offences. In almost every case, the first conviction of these "habituals" resulted in a short imprisonment in a local prison. The number of star-convicts being only $\frac{1}{400}$ of the number of ordinary criminals first convicted every year, the age-distribution at first conviction of the latter may be taken as representative of criminals generally.

The curve of the whole distribution is very skew, and illustrates by its rise, summit, and decline, the probabilities of going to prison for the first time. We see from the curve that the average age of criminals at their first conviction is about 22 years; the standard deviation is approximately nine years. Before the age of 13, and after the age of 50, first convictions are relatively very rare; and, roughly assessed, we may take it that the time between the ages of 14 and 32 represents the probable period of life for criminal enlistment. The modal, or commonest age, for recruiting, is between 15 and 20, the number received into prison diminishing greatly between the ages of 20 and 10, and in a less, though marked degree, between the ages of 20 and 32. After 32, the curve extends in a long straggling tail to as late in life as 80 years. These broad facts will be sufficient for most inquiries respecting the age-distribution of criminals. For an exposition, however, of the etiological significance of age in relation to crime, the frequency distribution of the ages when delinquents are first convicted requires closer and more exact analysis.

III. *Age in its etiological relation to crime.*

Etiologically, all estimates of the relation of age to conditions affecting a community must depend fundamentally upon the relation of age to the community's mortality statistics. For instance, before we can measure for any community the strength of association between age and the onset of disease, we must find out, for that community, how many people there are alive at every age, and who are thus exposed to the risk of acquiring disease. And similarly, before we can estimate the relation of age to the initial incidence of crime, we must ascertain the relative age-frequencies of individuals theoretically available at any moment for the committing of crime. In short, the standard by reference to which the etiological significance of the age-distribution curves of first offenders must be estimated is the Registrar General's life-curve for the general population.

In Table 76, we give the relative frequencies of first convictions at successive age-periods. Superficially judged, the decreasing frequency of the series of figures therein set forth might appear to provide convincing evidence that the liability to be criminally convicted decreases rapidly with increasing age. We cannot, however, form any real opinion of the significance of these figures until we know their precise numerical relationship to the corresponding age-frequencies in the general population: until we know how many people there are alive at every age exposed to the risk of being criminally convicted. The question is how, and to what extent, do the age-distributions of criminals convicted of several types of crime, correspond to, or deviate from, the distribution of age in the general population? We see, for instance, that out of 682 star-class offenders, only 33, or 4·8 per cent., are convicted during the quinquennial period of age 60 to 65. This frequency would seem to indicate a disproportionately low prevalence of crime at this age-period; until, referring to vital statistics, we find that the proportion of people alive at this age is only 5·7 per cent. It follows, therefore, that before we are in a position to form an opinion as to whether age influences the occurrence of crime, the first essential is to weigh statistically the observed age-frequencies of criminals at conviction against the expected frequencies of their ages, *i.e.*, against a series of theoretical frequencies calculated on the assumption of these persons being selected at random from the general population—these expected frequencies at every age being given by the Registrar General's supplementary report, 1907.

A. *Star-class convicts.*

(*a*) *Age-distributions of five types of convict*, (*b*) *contrasted with the age-distribution of the general population.*

We will consider first, and compare with their expected frequencies, the statistics of age at which star-class convicts are sentenced for committing the typical crimes of arson, stealing, rape, violence and fraud, respectively.

TABLE 77.—THE AGES OF THE GENERAL POPULATION OF MALES OVER 15 YEARS, AND THE AGES OF CRIMINALS AT FIRST CONVICTION FOR THE CRIME. FREQUENCIES PER CENT. OF EACH.

—	Ages.												Totals.
	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	
General population ...	10·9	10·6	10·3	10·0	9·6	9·1	8·4	7·7	6·8	5·7	4·5	6·4	100
Crimes:													
Damage to property	—	15·4±4·1	7·7±4·0	7·7±4·0	15·4±3·9	23·1±3·8	7·7±3·7	7·7±3·5	3·8±3·3	3·8±3·1	7·7±2·8	—	100
Stealing and burglary	5·9±2·9	29·4±2·9	15·7±2·9	3·9±2·8	15·7±2·6	9·8±2·7	3·9±2·6	3·9±2·5	5·9±2·4	3·9±2·2	2·0±2·0	—	100
Sexual offences ...	12·5±1·6	20·2±1·6	11·2±1·6	13·7±1·6	13·1±1·5	11·9±1·5	4·8±1·5	3·6±1·4	1·8±1·3	5·4±1·2	·6±1·1	1·2±1·8	100
Violence to person ...	3·0±1·3	26·2±1·3	19·7±1·3	12·4±1·2	10·9±1·2	10·9±1·2	6·0±1·2	2·6±1·1	3·0±1·0	3·4±1·0	1·5± ·9	·4±1·0	100
Forgery and fraud...	—	11·8±1·6	8·2±1·6	12·9±1·6	12·9±1·5	16·5±1·5	11·2±1·4	10·6±1·4	5·9±1·3	7·1±1·2	1·8±1·1	1·2±1·8	100
All crimes ...	4·7± ·8	21·0± ·8	14·1± ·8	13·0± ·8	12·5± ·8	12·9± ·7	6·9± ·7	5·1± ·7	3·7± ·7	4·8± ·6	1·6± ·5	·7± ·6	100

Means and standard deviations of above ages, in years.

—	Mean.	s.d.
General population	37·50	17·46
Damage to property	41·15	12·97
Stealing and burglary	34·06	13·34
Sexual offences ...	34·66	13·14
Violence to the person	29·96	12·17
Forgery and fraud...	41·06	12·67
All crimes ...	36·71	13·06

Frequencies of age of criminals at first offence as a percentage of the frequencies of age in the general population.

—	Ages.											
	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-
Damage	—	145	74	77	161	250	92	100	56	67	171	—
Stealing	54	277	151	39	164	108	46	51	87	68	44	—
Sexual	115	191	109	137	136	131	57	47	27	95	13	19
Violence	28	247	191	124	114	120	72	34	44	60	33	6
Fraud	—	111	79	129	134	181	133	138	87	125	40	19
All crimes ...	43	198	136	130	130	142	82	66	54	84	36	11

In the above table, the *expected* frequencies, which in each case correspond to the percentage frequencies of age in the general population aged 15 and upwards, are given in the first row, under "general population." In the succeeding columns, the *actual* percentage age-frequencies are presented, of criminals aged 15 and upwards, within each of the crime categories, together with the probable errors of random samples. At the foot of the table, the means and standard deviations of the several distributions are also given.

It will be seen that in the general community, out of every thousand persons alive over the age of 15—which we take as the minimum age-limit of committal to convict prisons—there are 109 whose ages lie between 15 and 20; and it will be observed that this number declines progressively with increasing years, until, at the advanced period of age between 100 and 105, the number of survivors is less than ·01 per 1000. For convenience, we have placed all survivors over 70 (*i.e.*, 6·4 per cent.) into one group. If there be no relation between age and the committing of the kind of crimes under review, then individuals convicted of these crimes would form, so far as age is concerned, random selections from the general population: consequently, in this case, the age-distribution within each of the crime-groups should correspond, within limits of error due to random sampling, to the age-distribution of survivors in the general population. On the other hand, if convicts found guilty of these crimes are differentiated by age, the nature and extent of the differences in this respect will appear from the respective magnitudes, relatively to their probable errors, of the figures in the contrasted rows of the table.*

Now, these figures contain some interesting statistical facts, and are particularly valuable in showing that although there is no very pronounced degree of age-differentiation amongst convicts convicted for the first time, yet, convicts within each group do tend to be selected by age, according to a more or less definite plan, characteristic of the crime the group represents. The nature of this differentiation, and other points, will be best realised by studying the numerical differences in Table 77 in conjunction with the illustrations in Figure XXXIII., which represent these differences diagrammatically.

* The probable errors of the percentages in table 77 are calculated from the formula given by K. Pearson in the Philosophical Magazine for March, 1907, viz.:

$$\cdot 6745 \times \sqrt{np(1-p)} \times 100/n$$

where (n) is the number in the sample, and (p) is the proportion of individuals within the population possessing any characteristic. See p. 313, Chapter VI.

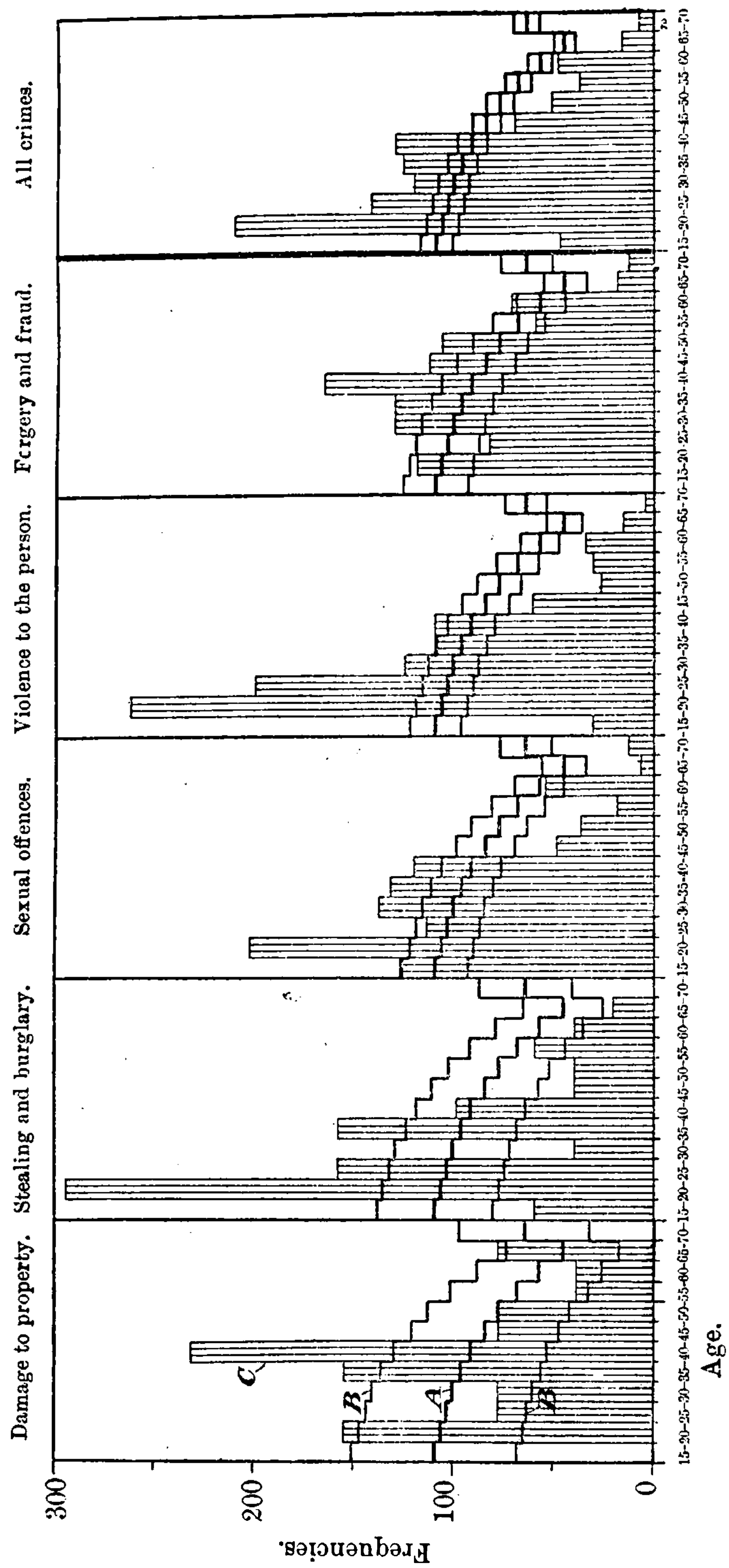


Fig. xxxiii.—Frequencies of age, at first conviction for crime, in 682 convicts; and frequencies of age in the same number of the general population, aged 15 and upwards.

A. General population or expected frequencies. B. Probable errors of sampling. C. Actual frequencies. Plotted to same total of 1,000 for each case.

In the first place, the differences between the age-distribution of total convicts and of the general population form a useful and interesting illustration of the proposition expressed on p. 29, 115, Part I., that "the absence of significant differences in the mean values of any character in contrasted populations is not in itself sufficient evidence for concluding that there is no difference of any kind in the whole distribution of the character." The age-distribution of total convicts differs considerably in form from that of the general population, as will be seen at a glance by comparing the contour (c) of the right-hand shaded diagram in Figure xxxiii. with the staircase band running through it. The age-frequencies, from 20 to 40, are all greater than, and, from 40 to 70, are all less than, the values for the general population; yet, the defect in the latter period so nicely balances the excess in the former that the total distributions yield almost the same mean value of age for both total convicts and the general population. A comparison, however, of the respective standard deviations (13·1 as against 17·5 years) of the two populations, shows immediately that the form of distribution must be different in the two cases: that the age frequencies of convicts cluster more about the mean, or, as the diagrams show, are more curtailed towards old age, than are the age-frequencies in the general community.

The differences of the figures of Table 77, may be regarded, in relation to their probable errors, as measures of selection at successive ages—as measures of selecting

aberrations of the individual frequencies, and with regard to the general form of, the whole distribution. Upon the evidence of the irregularities which have appeared on the surface of this frequency-distribution, we have expressed a confident opinion as to the existence of three age-periods specially conducive to serious crime ; and we have ventured to do this because we know that the surface irregularities of the age-frequencies, upon which we have based our opinion, although not pronounced in extent, are significant in meaning : we know that the probabilities are so many thousands to one against these irregularities occurring as a result of random sampling that we feel confident in assuming them to be realities, and not accidents, to be stable facts requiring explanation, and not mere chance variations that would disappear if the ages of another sample of convicts were analysed. When, however, we come to consider the age-frequencies of convicts convicted of special kinds of crime, we cannot draw conclusions from the relative magnitude of these frequencies, in relation to their probable errors, with the same certainty as before : wide differences between actuality and ideal expectancy may here exist (as, for instance, in the damage group age 40 to 45, where the actual frequency is $2\frac{1}{2}$ times greater than the expected one), but the probable errors of these deviations are so large that, although we may expect the deviations are significant in meaning, we are left critically doubtful as to whether they be anything more in reality than inevitable irregularities, which result from sampling with small numbers. It is at this juncture that the age-distribution of total convicts will be helpful ; for the information we have gathered from the irregularities of this age-distribution curve, the fact we have elicited that three periods of life are specially conducive to crime generally, will strengthen any verdict we may be inclined to pronounce with regard to the influence of these periods upon the commission of particular crimes.

Possessing this knowledge of the age-differentiation of convicts generally, what should apper to be the most reasonable interpretation of our scanty age statistics of first offenders, convicted respectively of the crimes of damage, stealing, rape, violence and fraud ? Firstly, from the values of the standard deviations, we see that all classes of convicts are selected to some extent by age—the individuals' ages within every crime-group tending to concentrate more closely round the mean than do the age-frequencies of the general population. Next, from the values of the means, we further see that, on the whole, offenders committing violence to the person, sexual crimes and theft, tend to be disproportionately selected from the younger, and those convicted of arson and fraud from the older, sections of the law-abiding community. The existence of these selective tendencies is also shown by the general direction of the deviations recorded in the third section of Table 77—their direction, within the stealing, rape, and violence groups, being consistently positive from ages 20 to 40, and negative at all later periods of life. And, moreover, from the respective magnitudes of the differences in relation to their probable errors, we need not hesitate to conclude that sexual offences, theft, and personal violence are crimes closely associated with adolescence and early manhood ; although, upon this direct statistical evidence alone, we would not be prepared to state dogmatically whether an apparent age-differentiation towards middle life is, or is not, characteristic of fraudulent offenders and incendiaries. Bearing in mind, however, the evidence derived from the age-distribution of convicts generally, and judging from the general trend of the age-frequencies within each crime group rather than by their absolute values, the following statements of the salient facts would appear to be substantially correct :—

(*c*) (1) that the tendency to commit, for the first time, serious crime, and to be convicted for it, centres around three distinct periods of age : a period of adolescence and early manhood, rising rapidly to, and falling rapidly from, its culminating point, which occurs between the ages of 20 and 25 ; a more protracted and less emphatic middle-age period, rising and falling less rapidly to and from a point of maximum intensity, which occurs between the ages of 35 and 45 ; and a transient period between the ages of 55 and 65, when an exacerbation occurs in an otherwise rapidly diminishing tendency towards crime ;

(2) that two periods of relative immunity from the commission of serious crime exist : a period of rapidly diminishing immunity, prior to the age of 20 ; and a period which, apart from the transient recrudescence between the ages of 55 and 65, already referred to, extends, with a rapidly increasing degree of immunity, from mid-life to old age ;

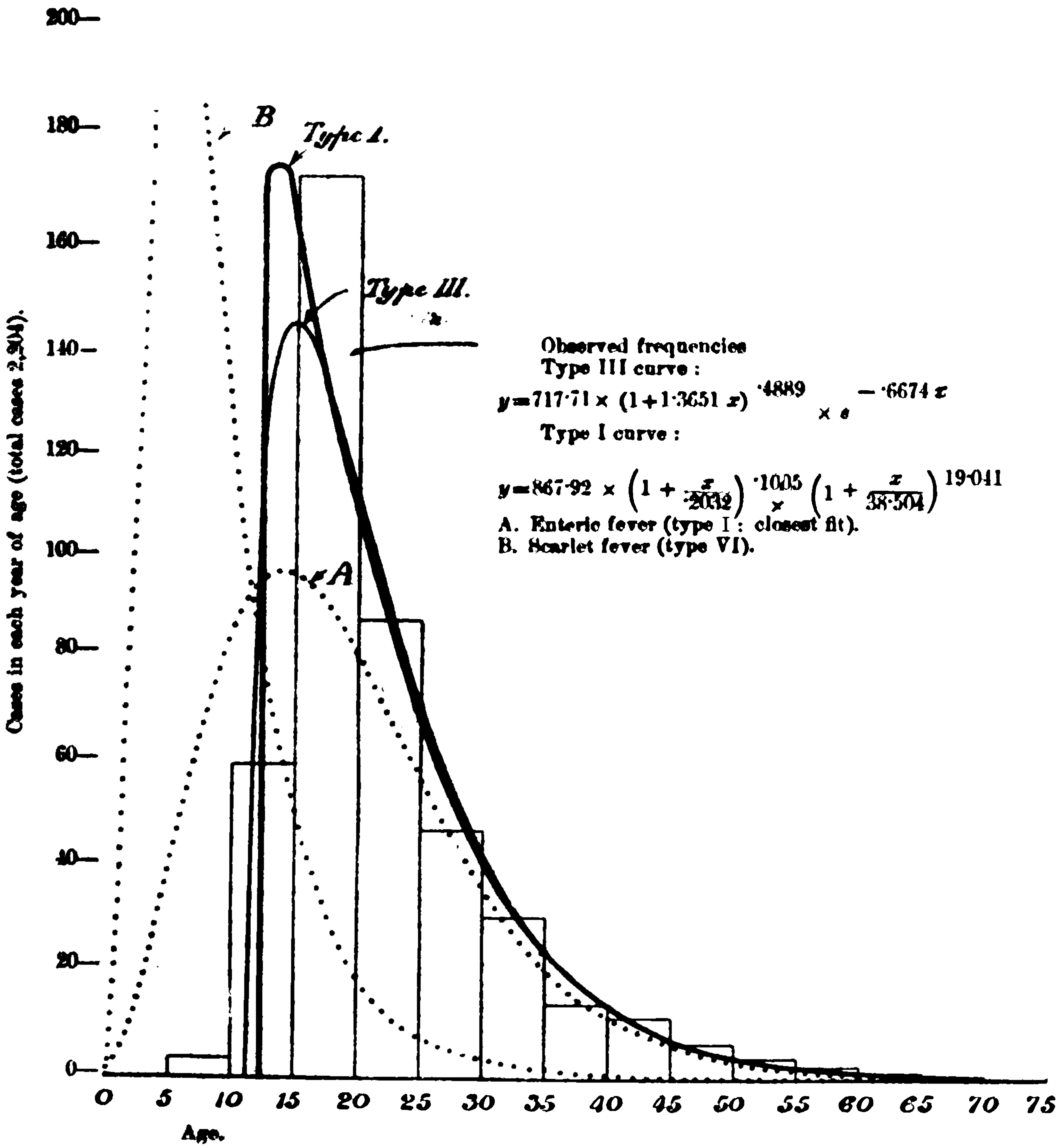
(3) that the early period of relative immunity is most pronounced for the crimes of arson and fraudulence—since individuals do not commit, or are not convicted of committing, these crimes before the age of 20, and it is not until after 30 that they tend to be disproportionately selected by age from the general population ; and that this early period of immunity is least

marked for sexual crimes—persons convicted of sexual offences already commencing to be disproportionately selected by age before 20, and rather earlier than are those who are convicted of stealing and of personal violence ;

(4) that the tendency to be selected for the committing of crime during adolescence and early manhood does not appear for the crimes of arson and fraudulence—persons convicted of these offences, prior to the age of 35, being selected at random from the general population ; and that it is thieves and persons convicted of violence and of sexual offences only who tend to be disproportionately selected during adolescence—the selection of individuals for committing these crimes being most intense between the ages of 20 and 25 ;

(5) that the culmination between the ages 20 and 25, and the rapid decline between the ages 25 and 30, of convictions for theft, correspond closely to the initial rise and fall of the age-distribution curve of habitual offenders (see fig. xxxiv), whose first offence, also, is nearly always theft ;

FIG. xxxiv.—AGE AT FIRST CONVICTION OF HABITUAL CRIMINALS, AND AGE OF INCIDENCE OF ENTERIC FEVER AND OF SCARLET FEVER.



but that the recrudescence which immediately succeeds the initial fall of theft convictions is not represented in the first convictions of habitual offenders—the age distribution, after 30, of individuals sentenced to a convict prison for a first theft, corresponding more to the distribution of those who are convicted of fraud;

(6) that the crimes whose incidence is peculiar to the middle period of life are those of wilful damage, including arson, and of fraudulence—the selection of individuals for committing these crimes being most intense at ages 40 to 45; but that there is a slight recrudescence of crimes of violence, which also culminate at age 40, and of sexual crimes and stealing, culminating between the ages of 35 and 40;

(7) that the transient period of recrudescence of criminality between the ages of 55 and 65 appears in the age-distribution curve of convicts sentenced for the first time for any kind of offence.

These are the facts; but in reference to them it must be remembered that, save during adolescence and old age, the deviations of the actual age-frequencies from independent probability are none of them very great in amount; which is to say that, although selected at certain periods more than at others, yet at no time of life are convicts selected from the general population with any pronounced degree of intensity for committing serious crimes of arson, stealing, rape, violence and fraud. Considering only the positive deviations, *i.e.*, those where the actual age-frequencies are greater than the expected or general population-frequencies, the average amount of difference for fraudulent and sexual offenders is only two-fifths, for violence offenders is three-fifths, and for thieves and incendiaries is four-fifths, greater than the frequencies expected. Moreover, these fractions represent absolute amounts of difference, independently of probable errors, *i.e.*, of those inevitable amounts of deviation from the ideal due to random sampling—these errors themselves ranging in value from one-tenth to two-fifths of the expected frequencies. It is clear that the intensity of convicts' selection by age is at no time of life very great; indeed, the remarkable fact brought out by the figures in Table 77, and illustrated by the diagram in Fig. xxxiii., is not *how much*, but *how little*, the age-distribution of star-class convicts, and particularly those of incendiaries and fraudulents, differ from the age-distribution of the general community. But, turning from star-class convicts to recidivists, *i.e.*, to those convicts who are habitual criminals—we find in the age-distribution at first offence of this class of offender, a totally different account.

B. *Habitual Criminals.*

(*a*) The statistics of age, at first conviction, of 2,204 habitual criminals, were presented in Table 76; on p. 202, the principal constants of the distribution were given, and its more important features were discussed. Proceeding now to a more exact and refined analysis of the distribution, we would first draw attention to Fig. xxxiv., wherein the staircase series of rectangles represents diagrammatically the statistics of age we are about to discuss.

Consulting this diagram, it will be seen that the horizontal base line is divided into a number of equal divisions, each of which, representing a quinquennial age-period, forms the base of one of the series of rectangles, whose heights are proportional to, and, consequently, whose areas represent, the number or frequency of individuals in the sample convicted for the first time during each successive quinquennial period of age—the total area of the whole system of rectangles, called a histogram, representing the total number (2,204) of individuals in the sample.

(*b*) Now, this age-distribution diagram of habitual offenders is very different, in two respects, from the corresponding diagrams we have just been considering of star-class convicts. In the first place, the sequence of age-frequencies of habituals, from 15 and onwards, unlike those of star-class convicts, bear no resemblance whatsoever to the distribution of age in the general population. The mean age of habituals at first conviction is 22 years, and the mean of the general population is 37 years; the standard deviation of age of habituals is 9 years, of the general population it is 17 years; the age-frequencies of the two contrasted populations do not touch at any point of the respective distributions: in short, habitual convicts, in regard to their ages at first conviction, are highly differentiated from, and form a most stringently selected section of, the general population. This is the first point of difference. The second respect in which the diagram before us differs from those previously examined is this: that the successive frequencies, proportionately represented by the heights of the series of rectangles, *progressively* increase to, and decrease *progressively* from, a maximum frequency which occurs during the quinquennial period 15 to 20—that is to say, the point of difference we would emphasise is the orderly regression of the age-frequencies of "habituals," the absence of irregularities such as we found in the successive age-frequencies of star-class

certain formulæ—whose validity has been mathematically proven, and the composition of which depends upon, and frequently varies with, the type of curve used—a series of constants (called the mode, skewness, origin, &c. of the curve) are calculated from the statistics, and the equation of the curve for their graduation is evaluated. Thirdly, from the equation, the frequencies of a variate y (*e.g.*, first convictions) for differential values of a variate x (*e.g.*, age) are calculated, ordinates are set up with length proportional to the values of these several frequencies, and a graph of the distribution curve is traced by a continuous line passing through the tops of all the ordinates. Finally, the extent to which the calculated frequencies do, or do not, correspond to the actual statistics is measured, or, in other words, the extent is determined to which the theoretical distribution curve fits the crude distribution histogram (*i.e.*, legitimately smooths out its accidental irregularities). If, allowing for errors of random sampling, the actual frequencies are found to correspond closely with those theoretically calculated, then it may be assumed that the distribution of the statistics under investigation has been determined by the natural laws which appear to be the laws of all large numbers, and which, regulating, as they do, the occurrence of such phenomena, are called the laws of chance. On the other hand, if the theoretic distribution curve and crude histogram do not coincide within sampling limits, the only conclusion to be derived from the disparity is that some other causes, apart from the natural influence of chance, have been at work upon the statistics: that some artificial human agency has disturbed the inevitable order which occurs when events are controlled only by natural agencies.

Returning, now, to the distribution of frequencies given in Table 76, and illustrated diagrammatically by the histogram, or series of rectangles, in Fig. xxxiv, we wish to find a continuous curve which will best describe our discontinuous age-statistics. Following the plan described, we first find, in five-year units, the moments &c., of the distribution, which are as follows:—

Number of individuals in the sample $= 2204$.

The first moment $(\mu_1) =$ the mean age at first conviction $= 22{\cdot}364$ years.

The second moment $(\mu_2) = 3{\cdot}3425$. (The standard deviation of age $\sigma =$ five times this or $16{\cdot}7125$ years.

The third moment $(\mu_3) = 10{\cdot}0162$.

The fourth moment $(\mu_4) = 73{\cdot}8974$.

$\beta_1 = \mu_3^2 \div \mu_2^3 = 2{\cdot}6865$.

$\beta_2 = \mu_4 \div \mu_2^2 = 6{\cdot}6143$.

Whence κ_1 the criterion, which $= 2\,\beta_2 - 3\,\beta_1 - 6 = -{\cdot}8309$ which tells us that (since κ_1 is negative) our particular statistics will be best described by a curve of type I., or (since κ_1 is small), that a curve of type III. may also be a good fit.

Next, from the formulæ for curves of type I. and type III. respectively, we obtain the equations of the curves:—

$$\text{Type I.}:\!-\; y = 867{\cdot}92 \times \left(1 + \frac{x}{{\cdot}2032}\right)^{{\cdot}1005} \times \left(1 - \frac{x}{38{\cdot}504}\right)^{19{\cdot}041}$$

$$\text{Type III.}:\!-\; y = 717{\cdot}71 \times \left(1 + \frac{x}{{\cdot}7325}\right)^{{\cdot}4889} \times e^{-{\cdot}6674x}$$

—which give the theoretical modal ages of first convictions at $13{\cdot}307$ years for type I. curve, and $14{\cdot}872$ for type III. curve; and tell us that the initial age at first conviction should theoretically be $12{\cdot}291$ years for type I. curve, and $11{\cdot}210$ years for type III.; and enable us to calculate series of theoretical frequencies which, contrasted with the actual frequencies at successive ages, are tabulated below: and these theoretical frequencies form the ordinates of the curves required—the curves being shown in deep line (type I.) and in thick line (type III.) in the graphs, which, in Fig. xxxiv., are contrasted with the frequency histogram.

TABLE 78.

—	Ages.										Totals.
	10–	15–	20–	25–	30–	35–	40–	45–	50–	55–	
Actual frequencies ...	316	859	435	226	153	71	58	33	20	23	2204
Frequencies, Type III. (m)	438	655	458	278	166	94	51	30	15	19	
Difference (e)	−122	204	− 23	− 42	− 13	− 23	7	3	5	4	
e^2/m	34·0	63·5	1·2	6·3	1·0	5·6	1·0	·3	1·7	·8	115·4

Thus contrasting, according to Pearson's method,* the actual frequencies with the theoretical frequencies given by curve, we see that for type III. $\chi^2 = 115{\cdot}4$; and by referring to Elderton's Tables,† we find that in this case the fit is not a good one : we learn that if the age-distribution of convicts at first conviction is governed solely and entirely by the natural laws which determine the distribution of frequencies given by curves type I. or type III., then the probability that our statistics would deviate from these theoretical frequencies to the extent they do, by errors of sampling only, would be a very remote one. It is also clear from the plotted curve that type I. is but little better than type III. in goodness of fit. Where, then, we ask, do the greatest differences between fact and theory occur ; and can we find any reasonable explanation to account for the discrepancies ?

Referring to the comparative figures in Table 78, and to the contrasted graphs in Figure xxxiv, it will be seen at once that the only discrepancy of any consequence between the actual and determined frequencies, that the only misfit of any importance between the distribution curve, Type I. and the frequency histogram, is at the age-periods 10 to 15, and 15 to 20. In fact, contrasting the graphs, we see at a glance that if the apex of the curve were shifted slightly forward, until it coincided with the centre of the adjoining rectangle, the fit between the curve and histogram would be almost perfect : the curve, in these circumstances, would pass through the centres of the tops of the whole series of rectangles—the criterion of a close fit. We may say, then, with assurance and exactitude, that the age-frequencies at first conviction of habitual criminals do obey natural laws of frequency—with this one proviso : that the age-period between 10 and 20 be excluded from consideration. And an interesting fact related to this proviso is that it is precisely at this early age-period, between 10 and 20, that a discrepancy between the actual and theoretical age-distribution of criminals might have been anticipated : because, as we have said, all chance distribution curves describe the frequencies of events which are determined solely by natural, and are uninterfered with by artificial, agencies ; and between the ages of 10 and 20 is the period of life when inflexible natural agencies, influencing conviction for crime, do tend to be modified by artificial human endeavour—by the efforts of the law to postpone its penalties in the case of juvenile offenders.‡ During the quinquennial period, 10 to 15, the actual frequency of conviction is 25 per cent. less than, and during the succeeding five years, 15 to 20, it is 31 per cent. greater than, the laws of frequency would lead us to expect. But could the statistics be readjusted by our entering 163 individuals, actually convicted between the ages 15 to 20, into the group convicted prior to this age-period, the age-distribution of habitual criminals at the time of their first offence, then given by the actual data, would conform closely throughout with the theoretical distribution given by the curve Type I. Of course we must not thus manipulate the data, because we do not precisely know, and have no way of ascertaining, to what extent the conviction of persons at the early ages between 10 and 15 do tend to be artificially postponed. Nevertheless, there can be no doubt that some amount of postponement is a fact ; and it is worth noting that—assuming conviction to have been delayed in the case of 19 or 20 per cent. of persons sentenced between 15 and 20—the actual distribution of age of habitual convicts at first conviction would fit the calculated distribution curve, with error measured by $\chi^2 = 24{\cdot}1$, and with probability of error measured by $\cdot 0042$: or, in four cases out of a thousand, random sampling alone would account for a divergence from the ideal as great as that shown by our statistics. Accordingly, in consideration of all these facts, we do feel justified in concluding that, at any rate for practical and comparative purposes, the curve given in Figure xxxiv is a very good graphic representation of the age-

---

* *Philosophical Magazine*, Vol. I., pp. 157–175.

† *Biometrika*, Vol. I., p. 155, *et seq.*

‡ Many of the individuals whose age-distribution we are discussing were sentenced, at first conviction, to reformatory schools, or to corporal, and other, punishments, not necessarily involving imprisonment. It must be remembered, however, that these first convictions have occurred during the past thirty years, when the penal law has undergone many modifications, and that during recent years many more youthful offenders have been conditionally pardoned than heretofore. Juveniles thus pardoned would, of course, not appear in our statistics of first offenders. In this connection it is interesting to note that under the Children's Charter, 1908, the following enactments were enrolled (1) that no young person, under 16 years of age, shall be sentenced to death or penal servitude ; (2) that no child under 14 years of age, shall be sent to a State prison ; (3) that no young person, between 14 and 16 years of age, shall be sent to a State prison unless he be certified as too unruly or depraved to be sentenced to detention under the Act ; and (4) that any person over 12 years of age and under 16, may be sent by the Court of conviction to a reformatory school for not less than three, and not more than five, years, the period not to extend in any case beyond the age of 19 years.

distribution of habitual criminals, and that it may be regarded as a sound basis of fact when considering the etiological influence of age upon their first conviction.*

(*d*) Our statistical inquiry, then, into the age-distribution of first offenders, has provided us with one very definite fact, indicative in a broad way of the nature of the general influences which, in the long run, conduce to the committing of crime. We see that, determining the criminal's fate, there must be a number of natural and inevitable, as opposed to conscious and artificial, influences, at work, of such a kind that his selection by age occurs in an orderly and predicable way: in other words, that his age-distribution at first offence can be identified as a perfectly regular chance distribution, *i.e.*, as "one in accordance with law and one the nature of which can for all practical purposes be closely predicted." But we do not imagine because criminals are selected by age, in accordance with natural law, that age is itself the natural agency determining selection. Between 15 and 20 is the age-period of selection for first conviction. But we do not imagine that this is so because young persons are more criminally disposed than older persons, nor because the State tends to convict the young and to spare the older transgressor—as we have said, human influences tend to act in an opposite direction, favouring the acquittal of juvenile offenders. We would be disposed rather to conjecture that the majority of habituals are first convicted during adolescence because a relative predisposition to transgress, or, it may be, a relative incapacity to keep, the law, like most human predispositions, tends to become manifest at the earliest opportunity. Thus those who excel at most exercises learn, it is said, to become excellent, in childhood; those who are attacked by the so-called children's diseases (measles, whooping-cough, &c.) acquire these, it is generally accepted, early in life;† and similarly with intellectual capacities, aptitudes, and insight: those who possess special talents or genius seldom fail to give indication of their presence at an early age. Assuming, then, the existence of variability in criminal proclivity—assuming the existence of social or anti-social predispositions, variable amongst individuals, but possessed to some degree by all people, it should not be surprising that more than a half of habitual criminals give evidence of their own peculiar anti-social proclivities before the age of 25. We would not assume that the natural causes behind the age-distribution of criminals refer to special environmental influences associated with age, or to any special modification by age of criminal predisposition; we would assume, rather, that the sources of individuals' selection for conviction by age must be sought for in the particular conjunction of opportunity to commit crime with the intensity of criminal predisposition—a conjunction which obviously is highly correlated with age.

In support of this notion of the etiological relation between age and crime, we may draw an analogy from the relation of age to the onset of certain diseases; and in order to realise the justice of the analogy, we have appended two diagrams in Fig. xxxiv. which show the distribution with age of cases of enteric and scarlet fever.‡ Both of these fevers are universally recognised as diseases of constitutional, as well as of environmental, origin; and thus, for purposes of etiological comparison, they can be thought of as bearing some resemblance to crime, if this latter can be regarded as a phenomenon also depending upon constitutional as well as environmental conditions. Enteric and scarlet fever are environmental diseases because the occurrence of both maladies depends upon the invasion of the body by certain living particles, or environmental infective agencies; they are constitutional diseases because, notwithstanding invasion, no fever results unless the character of the bodily tissues favours the development of infection. Now, the external infective agents of scarlet fever are so omnipresent that they cannot, save in exceptional circumstances, be for ever avoided; consequently, individuals with sufficient constitutional proclivity to develop the disease when infected become victims at the earliest opportunity, the

* Type III. curve is one based on a binomial distribution; and if a binomial curve be fitted, it would be found to be $2204 \times (1{\cdot}3991 - {\cdot}3991)^{-2{\cdot}1556}$—the interval being 8·3 years, and the first frequency occurring at 15·2 years. Were this written as approximately $2204 \times (\frac{7}{5} - \frac{2}{5})^{-2}$—the age-distribution of habitual criminals at first conviction could be interpreted as the age-frequencies of a population holding two black balls drawn from a bag; the conditions of the draw being that it commences at age 6·9 years, that a ball be drawn at this age and at every subsequent 8·3 years, and that the bag from which the balls are drawn contain many black and white ones in the ratio of five black to two white, (*see* K. Pearson, *Biometrika*, Vol. IV., p. 209.)

† When measles was first introduced into the East, persons of all ages were attacked, the population of all ages, old as well as young, was decimated by it.

‡ See *Contributions to the Mathematical Theory of Evolution* by Karl Pearson, Philosophical Transactions, Vol. 197, p. 459, and Vol. 186, p. 390.

The statistics of scarlet fever were taken from the *Report of the Metropolitan Asylums Board* (Statistical Part, 1899) and involve 39,253 male cases.

The statistics of enteric relate to 8,639 cases received into the Metropolitan Asylums Board Fever Hospitals, 1871–93.

interim conclusion, upon the evidence of the age-distribution of first offenders, is that some mental constitutional proclivity is similarly the primal source of the habitual criminal's career.

CHAPTER III.

The Criminal's Vital Statistics.

(Health, Disease, Mortality, and Enumeration.)

I. *General Remarks.*

In the present chapter we present statistics of the criminal's health, diseases and mortality, and of his enumeration relatively to that of the general population : in other words, we shall here be dealing, with what may be comprehensively described as the Vital Statistics of the Criminal.

These statistics have a special interest in the relation they bear to the etiology of crime. Just as, in criminological notions, physical conditions observed in criminals have been put forward, without any legitimate statistical basis, as stigmata of the criminal né, so have many conditions and circumstances been propounded and accepted, equally without foundation in statistical fact, as proof of the "force of circumstances" by which criminals are made. Amongst these conditions, ill-health generally, and many morbid states in particular, such as epilepsy, alcoholism, tubercular disease, insanity, &c., have figured prominently as assumed "causes" of crime. If every criminal were insane, epileptic, or otherwise morbidly constituted, and if only the diseased committed crime ; or, allowing a wider latitude of definition, if it could be proved that the presence of epilepsy, insanity, &c., in a person always neutralised the independent action of coexisting criminal tendencies, and that criminality itself were an infallible safeguard against the occurrence of such morbid conditions—in these circumstances only might it be asserted with justice that epilepsy, insanity, &c., were causes of crime. But, since it is manifestly only a proportion of offenders who are thus afflicted, any assertion of a causal relation between these morbid conditions and crime is worse than misleading. Alcoholism, tubercular disease, epilepsy, insanity, &c., on the one hand, and criminal proclivity, on the other, being separable human phenomena, may occur independently, or may be associated organically, in the same individual : but never can either one be legitimately described as causing the other. In short, the etiological problem we are considering is one of association, and not of causation : its solution depends not upon the discovery of morbid conditions causing crime, but upon the measurement of the extent to which the committing of crime is correlated with unhealthy conditions ;* and it is partly with the measurement of these correlations that we shall be occupied in the present chapter.

---

* In illustration of the above contention, we quote the following case, (*see* schedule records No. 2689) :—e 132 J.C., a soldier, with a good record after ten years' service in the Indian army, was convicted of shooting a woman in a brothel ; and a death sentence was commuted to one of penal servitude for life because of extenuating circumstances connected with the crime. The man was a heavy drinker, he suffered from syphilis, and was reputedly an epileptic ; and the plea put forward by the defence was that the apparently motiveless crime was automatically committed by the prisoner when in a transient state of epileptic unconsciousness. The man, when subsequently under observation in prison, admitted that he shot his victim in self-defence, she having attempted to rob him of £5 ; and at the same time it was also discovered that he was a genuine epileptic and had fits periodically. After a series of epileptic fits, he eventually died in prison ; and the autopsy revealed in him the presence of a syphilitic cerebral tumour which had evidently been the source of the fits he had experienced during life. Viewed, then, in the light of subsequent events, can we even now affirm that epilepsy was the cause of the particular act of homicide we have described ? Assuredly not. His epileptic state can with no more logic be called the source of the man's crime, than his alcoholism, his syphilitic disease, his licentiousness, the fact that he carried a revolver, the fact of the cupidity of his victim, or an indefinite number of other factors, also bound up with the crime, could any one of them be called its cause. All we know as fact is that an alcoholic person, suffering from a cerebral tumour which induced in him periodical fits, committed a certain crime. From the nature of the facts we may *infer* that the epilepsy, alcoholism, or any other of the factors, were not independent conditions, but were organically associated with the homicide. Such inference would be valuable as evidence, and would be much enhanced if supported by scientific knowledge of the general intensity of correlation between these conditions and murder. But inferences from facts have no scientific value. It is only the facts themselves—in the present case, the facts that an alcoholic person, suffering from epilepsy, &c., has committed a crime of murderous violence—which are of importance scientifically, in relation to etiological problems of crime ; which problems do not seek to discover whether any particular crime is or is not related to this or that condition, but to determine the intensity with which several conditions occur amongst criminals relatively to the intensity of their occurrence amongst the law-abiding public.

II. *The prevailing Health and Sickness of Prisoners.*

A. *General Remarks.*—On page 182, Chapter I., Part II., the relation of crime to general health was discussed—the examination of this relation being then based upon the analysis of statistics of *health* amongst *convicts*. We are now going to re-examine the same relation, but this time upon the basis, not of health statistics, but of statistics of sickness; and from records, moreover, relating not to convicts only, but to prisoners generally. The conclusion we reached from our convict records of health was formulated on p. 187, Part II., Chapter I., and may be repeated. It is, that "those convicted of violence are the only convicts who appear to differ significantly from the general community in health and strength." This conclusion, as we have stated, applies only to a selected section of criminals, *i.e.*, to those first offenders and habitual criminals who, from the exigencies of their crimes, have been sentenced to penal servitude in convict prisons. The present examination of health, estimated from the point of view of prevalent sickness, is based upon a much wider, more definite, and probably more accurate, series of statistics; and any conclusion we may reach from their analysis, will have this particular virtue, that it will apply, not only to a selected class of prisoners, but to the inmates generally of all state prisons.

B. *Source and definition of the Criminal Statistics.*—The statistics upon which the present examination is based are not contained in the schedule of records; they were obtained by Sir Herbert Smalley, M.D., the Medical Inspector of Prisons, from information embodied in the Medical Officers' Quarterly Reports filed at the Home Office; and they refer to the proportion of sick prisoners out of the daily average number of inmates of all prisons, during the decennial period 1900–1909. The adopted definition of a sick person is one who has been under treatment in a prison hospital for 24 hours, or any part of 24 hours; and thus, in accordance with the definition, prisoners receiving casual treatment out of hospital would not count amongst the sick, individuals going into hospital for treatment more than once during 24 hours would each count only as one sick prisoner, and those remaining in hospital for more than 24 hours would be entered more than once into the count—the total number of entries for each of these cases corresponding to the consecutive number of days each individual is sick.

C. *Source and definition of the Non-Criminal Data.*—The sickness statistics of the general population with which we are going to compare our criminal data are those published by John Spencer in Biometrika, Vol. III., p. 52, in a memoir entitled *Graduation of a Sickness Table by Makeham's Hypothesis.* The particular data upon which Mr. Spencer bases his memoir were obtained by him from "Mr. A. W. Watson's important work on the sickness experience of the Manchester Unity Friendly Society for the five years 1893–1897."* Describing these statistics, Mr. Spencer explains that they refer to persons engaged in occupations involving no special hazard, and whose lives during the quinquennium were exposed to risk of sickness for 2,352,099 years, and who experienced on the aggregate 5,289,586 weeks of sickness; and he concludes by remarking: "The magnitude of these data and the care and accuracy with which the observations have been analysed and tabulated entitles the results described in the (Mr. Watson's) volume to a degree of authority to which no previous investigation of the same character can lay claim." The definition of a sick person in Mr. Watson's material tallies in all essentials with our own: any individual, so classified, being one receiving pay from the Society's funds, and being absent from work on account of sickness for at least one whole day.† The comparative data, then, that we are going to employ, corresponds closely to our own in definition, accuracy, magnitude and representativeness; and, consequently, the contrasted statistical results obtained from the two series should provide an unimpeachable account of the intensity of sickness amongst criminals, relatively to the intensity of this force in the general population.

D. *Statistical treatment and Comparison of Data.*—The average daily number of male inmates in all State prisons, *i.e.*, the number of prisoners exposed to the risk of illness,

---

* Published in London by C. & E. Layton, 1903.

† The entry of a workman on a Society's sick pay list corresponds in form, and should correspond in substance, to the admission of a criminal into a prison hospital.

and the average number who received treatment in prison hospitals, during the decennium 1900–1910, are shown in the following table :—

TABLE 79.

Year.	Daily Average Number of Prisoners.	Average Number under Treatment in Prison Hospitals.	Rate per 1,000
1900	14,383	459	31·92
1901	14,459	466	32·23
1902	15,868	474	29·87
1903	16,240	477	29·37
1904	17,418	511	29·34
1905	18,167	554	30·49
1906	18,398	548	29·78
1907	18,102	556	30·71
1908	18,045	559	30·98
1909	19,268	572	29·69
Average for ten years ...	17,035	518	30·38

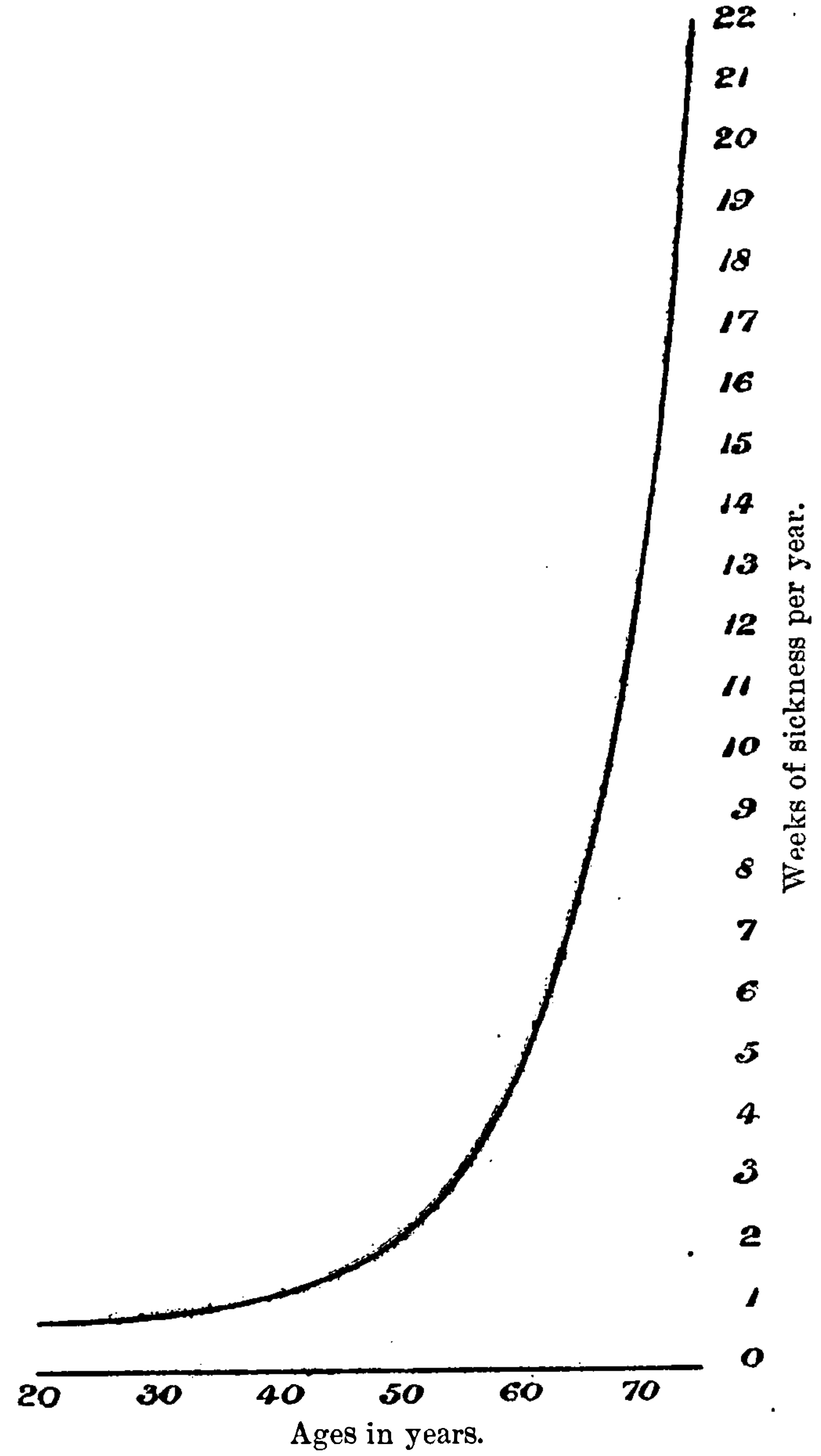
It will be observed that, during the last decennium, the average number of sick prisoners has steadily increased from 459 in 1900, to 572 in 1909 ; but also that, during the same period, the daily average number of prisoners exposed to the risk of illness has proportionally augmented : consequently, as the several rates per thousand show, apart from trifling variations, which are inevitable and negligible, the annual amount of illness in English prisons is a very constant quantity ; and 30·38 sick per 1,000 may be taken as a good approximate value of the general rate of illness amongst English criminals. Now, according to our definition, this rate of 30·38 per 1,000 expresses the fact that criminals exposed to risk for a thousand days will, on the average, be actually under hospital treatment during 30·38 days ; which is to say that, on the average, they will experience $\frac{30{\cdot}38 \times 365}{7 \times 1000} = 1{\cdot}5841$ weeks of illness per annum. This is the conventional form for expressing the force of sickness within any community ; and since it is the one employed by Watson, whose rates we are going to compare with our own, we will also adopt it, and say that the rate amongst English criminals is equivalent to an average sickness of 1·5841 weeks per annum.

This amount is, however, only a crude rate, which, before it may be contrasted with any other crude rate, must be standardized or corrected ; only corrected rates of sickness being legitimately comparable with each other. For this is a point always to be borne in mind, when comparing "percentages," "rates," or other similar statistical values : that such values, calculated from any local population—as for instance, the number of individuals per thousand, within any district, who die, or marry, or who are sick—are fundamentally dependent upon the age-distribution of the population in question. When the age-distribution is *not* taken into account, the actual proportion of deaths, marriages, sickness, &c., being estimated from the face-value of these statistics, the rate quoted is called the "crude" death-rate, the "crude" marriage-rate, the "crude" sickness-rate, &c., for that locality. A modified rate, obtained by making allowance for the particular age-constitution of the population under observation, is called its "corrected" marriage-rate, death-rate, or sickness-rate. Obviously then, when comparing rates of any kind with each other, it is the "corrected" rate and *never* the "crude" rate that must be ascertained. For instance, to compare the crude death-rate in a school with that in a workhouse infirmary, or to compare the crude sickness-rate of young adult criminals with that in the general population, would, in both cases, be evidently futile, and could never be effective until allowance had been made for differences in age of the classes under comparison. Consequently, before we can legitimately compare the intensity of sickness amongst criminals with the prevalence of this condition in the general community, we must first standardise the respective age-distributions of these two populations, and calculate their corrected sickness-rates on the basis of such corrected distribution. How may this be done ?

In our preceding anthropometric investigations, we have had frequently to correct mean values of physical characters for differences in the age-constitution of populations under contrast ; and on most occasions we have achieved this object by *allowing* for differences of mean age, through the medium of the regression formula. This method, however, we cannot employ in the correcting of our crude rate of sickness amongst criminals, for two

Fig. xxxv.

Graduated Sickness Rates.



This curve fits closely to, and is the best theoretic description of, the Manchester statistics; and it may be accepted as an ideal representation of the force of sickness within the section of the general population these data refer to. From it can be ascertained, either the exact intensity of sickness at any exact age, or the approximate average rate of sickness during any rough period of life—the former being given by the height of the curve's ordinate at any stated age (*e.g*, at age 33 sickness rate = ·988 weeks), and the latter by the height of the curve's ordinate at the centre of any age-period (*e.g.*, the average rate of sickness during the period 35–45 = 1·254 weeks ap.). The curve illustrates the facts that sickness increases progressively with age, but that the regression is not linear in character. At early ages—between 15 and 30—the increase is certainly fairly uniform; but, after 30, the rates of sickness increase with an acceleration of intensity until, between 79 and 80, the rate, which at 30 was barely one week of sickness, has increased to 33 weeks per annum. The futility of comparing crude sickness-rates, without taking regard to age, is illustrated by the curve. Our crude rate for criminals at all ages is 1·5 weeks per annum: if this figure were compared with the rate of sickness within a section of the Manchester population consisting mainly of young adults, the criminal would appear to be the more sickly of the two contrasted populations; but, compared with a section in which old people preponderated, the force of sickness in the general population might appear to be twenty-five times as great as is its intensity amongst criminals. It is clear that, if the result is to be effective, our criminal sickness-rate must be compared with the rate of the general population having the same age-distribution as that of criminals found in prison. Such a general sickness-rate, for a section of the Manchester Unity Friendly Society having the same age-frequencies as those given for criminals in the Registrar General's Census Returns, and the numerical details for calculating it, are shown in the following table :—

TABLE 80.

Ages	Prison Population Mean of Census of 1891 and 1901.		Sickness Rates. Weeks per Year.	Expected Weeks of Sickness.
10-	31			
15-	1,464	4420	·807 (rate at age 20)	3,567
20-	2,925			
25-	4,497		·922 (30)	4,146
35-	2,990		1·254 (40)	3,750
45-	1,563		2·215 (50)	3,463
55-	903		5·002 (60)	4,519
65-	294		13·079 (70)	3,852
75-	32	36	32·878 (79)	1,184
85-	4			

Total population ... 14,705. Total weeks of sickness ... 24,481.
24,481 ÷ 14,705 = 1·665 weeks' sickness per individual.

In the first column of this table are given the numbers of convicted criminal prisoners within each of the stated periods of age—these are the standardized age-frequencies of persons exposed to the risk of sickness ; in the second column are recorded the rates of sickness, or number of weeks' sickness per annum, experienced on the average by each of the lives enumerated within the several age-periods—these are the rates given by the Manchester statistics for the central year of each age-period (see Fig. xxxv.) ; and the figures in the third column, obtained by multiplying together those in the first and second columns, represent the total weeks of sickness which would be experienced by the aggregate of individuals within each age-period.

E. *Conclusion.*—It is clear that a general non-criminal population of 14,705 persons, with an age-distribution of the adopted criminal standard, and with rates of sickness at each year of age corresponding to those of the Manchester Friendly Society—it is clear that such a population would experience altogether 24,481 weeks of sickness per annum. In other words, assuming the representativeness of the Manchester data, the corrected rate of sickness in the general non-criminal population, *i.e.*, the rate legitimately comparable with our criminal rate of 1·5851 weeks, is $\frac{24481}{14705}$ = 1·6648 weeks per annum : which is to say that criminals in prison experience, on the average, ·08 of a week, or approximately half-a-day, less sickness per year than does the non-criminal population in Manchester.

It may be objected that, although the figure ·807 can be taken with justice as representing the average rate of sickness for age-periods prior to 25, our adopting the corresponding central year-rate, for all periods subsequent to the age of 25, might lead to fallacious results. The objection is a valid one, because, towards middle life and old age, the number of persons exposed to illness in prison falls off every year at a greater rate than it does in the population at large. To meet this criticism, we have graduated the age-distribution statistics given in Col. 1, Table 80 ; and, using the same graduated rates for sickness as before, we have calculated anew the corrected sickness-rate for the general population, upon this more legitimate age-basis.* This calculation yields 23,771 weeks per annum as the amount of sickness experienced by 14,705 persons ; in other words, it yields the value 23,771 ÷ 14,705 = 1·617 for the sickness-rate in the general population, to be compared with the rate of 1·585 found above for prisoners. The result hardly differs from the one obtained by the previous rougher method, giving as it

* Following the lines suggested in the above quoted paper, the age-distribution we have adopted was assumed, between the years 25 and 85, to follow a geometric law represented by the formula $a\,r^x$ where, x, is any year of age, and, a and r, are constant values yielding the total frequencies 9,051, between the ages 25 to 55, and 1,230 between the ages 55 and 85. The value of r is ·9356. The frequency of age being $a\,r^x$, and the sickness rate $A + Bc^x$, the frequency of age of sick is $a\,r^x \times (A + Bc^x)$ and the mean sickness-rate for any period commencing at age x and terminating at age x^1 is $\int_x^{x^1} ar^x \times (A + Bc^x)\,dx \,/ \int_x^{x^1} .ar^x.dx$: which is $A + B \times \frac{\log_{10} r}{\log_{10} cr} \cdot \frac{1-(cr)^{x^1-x}}{1-r^{x^1-x}} \cdot C^x$.
This formula yields the following corrections of the rates in column two of Table 80 :—
·922 1·254 2·215 5·002 13·079 32·878
·911 1·222 2·123 4·735 12·303 34·238

27043

does, for the sole difference between criminals and non-criminals, ·03 of a week, or one-fifth of a day less sickness per annum, within the former class. Upon the evidence of these statistical results, we can only conclude that there is no etiological relation between sickness and crime; or that, if any difference there be, it is law-breakers who, on the whole, enjoy slightly better health than law-abiding people: a conclusion which is substantially the same as the one recorded on p. 187, Part II., Ch. I., and which was reached from an entirely different series of statistics.

This conclusion refers, of course, only to amounts of health and sickness amongst criminals and non-criminals respectively; it contains no verdict upon the nature of the ailment and kind of diseases at the source of their sickness. Herein we have the substance of an entirely different inquiry, to which we will now turn.

III. *The prevailing diseases and other morbid conditions of criminal prisoners, and their etiological relation to crime.*

A. *General Remarks.*—The chief object of ascertaining the nature of the criminal's ailments, and the prevalency of morbid conditions, amongst prisoners, is the proper proportional evaluation of the extent to which these morbid conditions are associated with crime; or in other words, the object is to form a just appreciation of the truth of the allegation that diseases and physical infirmities are part of the "force of circumstances" by which criminals are made. This etiological question is a thorny one: and to effect a passage through all its menacing entanglements would demand a longer and more complicated investigation than we are prepared, or might be able, to give to the subject. All we are going to attempt, and hope to achieve, is a preliminary statistical survey of the position.

Now, the fact which an unprejudiced investigator must bear in mind when approaching this question is that disease and death are the constant menace of all people; and that, consequently, a certain chance concomitance between all kinds of morbid conditions and the committing of crime is inevitable. In the case of some diseases, as for instance, phthisis—which ultimately kills one out of every ten persons in the British Islands—the general prevalence of these conditions, if realised for the first time when studying the criminal, may seem to justify amply their predication as etiological factors of crime. Yet, in accordance with Nature's economic plan of distributing her chance favours and catastrophies equally amongst all kinds and conditions of men, it will at once be obvious that if the chances of dying of phthisis are one in ten outside, they must be considered—until statistical information has been obtained to the contrary—to be equally one in ten inside, the prison walls. The postulate, then, upon which we start our investigation, is this: that any estimate of the etiological relation between morbid conditions and crime must rest ultimately upon a statistical basis, *i.e.*, upon the basis of an exact statistical calculation of the prevalency of morbid conditions amongst prisoners, relatively to their occurrence in the general population. The present attempt to deal with the intricate problem connected with the etiological relation of disease to crime aims only at the laying of these statistical foundations.

B. *Prevalency of Diseases based upon Death-rates.*—We take it that the safest estimate of the relative prevalency of mortal morbid conditions in contrasted populations is to be obtained from the respective corrected death-rates from such conditions. Now, the death-rate, at any age, from a particular disease, may be expressed as the proportion of persons who die from it either per 1,000 living, or per 1,000 dying from all causes, at the stated age. Of these two forms of expressing the same thing, the latter undoubtedly gives numerical values of death-rates which are more reliable and effective for comparative purposes. If the expectation of life were greater in one community than another, the death-rate from any particular cause—expressed as per 1,000 living—would appear to be lower in that community whose individuals were generally longer lived, because, thus expressed, its death-rate from all causes would be lower than in the contrasted community. On the other hand, expressed as the proportion of persons dying from all causes, the death-rate from any particular disease would necessarily be independent of the general death rate; and thus might be more legitimately quoted for purposes of comparison. In the present investigation, we are going to employ death-rates as measures of prevailing diseases; and since, as we shall see later, the death-rate of prisoners from all causes combined is less than the rate in the general population, the death-rates we shall quote for particular diseases will be those calculated as per 1,000 dying from all diseases, and not as per 1,000 living.

Estimates of prevalency based upon death-rates are particularly valuable because the

morbid conditions in contrasted populations is to be obtained from their death-rates. In the rates of a community's death from any disease, we have an index of the prevalency of that disease, which is precise in definition, and is a measure of its prevalency entirely free from the bias of personal equation. In other words, the self-recorded facts that, within a community, so many deaths out of a thousand have occurred from this disease, and so many from that, are certain proof, resulting from a test superior in delicacy to any other, of the existence within that community of certain measured degrees of tendencies to be afflicted with the stated diseases. Consequently, the results of contrasting, as we shall now proceed to do, the death-rates of prisoners with those in the general population, should put the etiological relations between morbid conditions and crime upon a firm basis of statistical fact.

C. *Source and Definition of the Statistics.*—The statistics upon which we have developed our inquiry consist of the records of 3,530,537 deaths of male persons over 15 years of age, which have occurred in England and Wales during the 22 years 1886–1907; and out of which, 3,968 deaths are those of all persons who have died in English State prisons during the same period, 1886–1907. The records of the criminal deaths have been obtained from the twenty-three Annual Reports of the Commissioners of Prisons, 1886–1907; the records of deaths within the general population have been drawn from the Registrar General's Annual Reports for the same years. Both of these series of volumes provide information as to total number of deaths, the cause of each death, and the ages of persons at the time of death. The collecting of the crude data from the above-mentioned sources has involved the expenditure of so much time and labour that, to save its repetition by future investigators, we publish these statistics *in extenso*, in Appendix Table 234. The frequencies of death from all causes, amongst criminals and in the general population, abbreviated within twenty-one categories and contrasted upon a standardized age-basis, are shown in the following comparative table:—

TABLE 81.

Deaths in the prison population (p.p.) for 23 years (the numbers released on medical grounds being added to the totals dying from the cause and distributed under the ages as those dying), and the probable errors of the totals dying from each cause. Comparison figures of the numbers dying from each cause, among like totals at each age, in the general population (g.p.); the totals of such numbers in the general population dying from each cause representing its experience, at like ages, to the prison population.

Causes of death.	Ages.																		Totals.	
	15–		20–		25–		35–		45–		55–		65–		75–		85–		Prison population.	General population of like ages.
	p.p.	g.p.	p.p.	g.p.	p.p.	g.p.	p.p.	g.p.	p.p.	g.p.	p.p.	g.p.	p.p.	g.p.	p.p.	g.p.	p.p.	g.p.		
Accidental negligence ..	1·5	18·8	3·0	41·7	15·2	73·6	9·1	62·8	7·6	40·4	10·6	22·3	1·5	7·9	1·5	1·6	—	—	50± 4·8	269·1
Suicide	16·1	1·3	31·1	6·6	54·2	17·5	56·3	18·9	35·2	14·2	23·1	8·3	6·0	2·5	1·0	·3	—	—	223± 9·8	69·7
Contagious fevers	20·3	7·7	13·7	11·7	25·3	19·8	24·5	15·9	20·0	8·8	16·4	4·9	12·7	2·0	6·2	·4	1·0	—	140± 7·9	71·2
Enteric fever	12·1	9·4	19·0	23·0	20·8	31·2	10·4	15·6	3·5	6·0	5·2	2·2	—	·4	—	—	—	—	71± 5·7	87·6
Intestinal obstruction, peritonitis	4·7	3·0	9·3	5·0	17·5	7·5	23·3	6·8	10·5	5·9	15·1	5·3	4·7	3·0	—	·7	—	—	85± 6·2	37·3
Profound anæmias	—	·5	3·1	1·1	6·3	2·4	1·6	3·4	1·6	3·3	4·7	2·8	4·7	1·0	—	·1	—	—	22± 3·2	14·6
Diabetes mellitus	—	1·2	1·7	3·3	10·0	7·2	5·0	6·5	1·7	6·2	5·0	6·3	1·7	2·9	—	·4	–	—	25± 3·4	34·1
Alcoholism	—	—	2·0	1·1	24·2	11·8	24·2	17·8	39·4	11·4	8·1	4·5	5·1	·8	—	·1	—	—	103± 6·7	47·5
Syphilis and aneurism ..	—	·2	1·5	1·2	13·2	7·0	11·8	10·5	14·7	7·9	7·4	3·9	2·9	·9	1·5	·1	—	—	53± 4·9	31·6
Apoplexy, &c.	3·4	·9	14·6	2·6	31·4	11·1	46·0	26·1	63·9	41·5	37·0	56·5	22·4	43·7	2·2	12·5	—	·1	221± 9·7	194·8
Diseases of the urinary system.	7·3	3·1	12·1	9·3	39·9	25·1	45·9	36·9	45·9	38·5	58·0	36·7	24·2	22·4	9·7	6·0	—	—	243±10·2	178·0
Cirrhosis of liver . ..	—	·1	—	·3	9·0	5·0	19·3	15·5	16·8	17·9	7·7	12·9	5·2	3·9	—	·4	—	—	58± 5·1	55·9
Cancer	1·4	1·2	—	3·8	4·2	12·2	22·5	30·3	32·4	52·8	39·5	56·6	22·5	27·5	1·4	4·7	—	—	124± 7·4	189·1
Bronchitis and emphysema	—	1·3	—	3·8	3·6	14·3	18·0	31·1	35·9	53·6	37·1	72·5	35·9	51·7	15·6	15·7	—	·1	146± 8·0	244·1
Other diseases of the heart and blood vessels	8·0	12·1	8·0	24·2	68·8	62·1	112·4	95·3	100·9	114·3	87·1	126·0	47·0	80·1	13·8	19·5	—	·1	446±13·4	533·7
Old age	—	—	—	—	—	—	—	—	—	—	12·9	5·3	42·3	30·3	36·8	32·2	—	·5	92± 6·4	68·3
Pneumonia and influenza ..	17·4	12·5	45·0	36·6	96·1	88·0	103·3	106·2	76·7	83·0	72·6	57·4	37·8	25·4	8·2	5·6	—	—	457±13·5	414·6
Tuberculous diseases	38·4	47·0	182·7	161·3	281·0	308·7	218·0	248·6	130·5	129·1	105·9	48·3	43·0	8·8	15	·5	—	—	1001±18·5	952·3
Insanity	—	·4	—	1·4	4·6	11·7	36·6	5·6	13·7	13·6	9·1	6·3	—	3·1	—	·8	—	—	64± 5·4	42·9
Epilepsy	1·1	2·7	8·9	6·5	30·2	11·9	35·8	10·0	21·1	5·8	6·7	3·5	1·1	1·5	—	·3	—	—	104± 6·8	41·8
Other causes	11·9	20·2	28·1	39·6	47·4	74·8	43·0	103·0	48·9	65·7	26·7	53·5	25·2	26·3	8·9	6·2	—	—	240±10·1	389·4
Deaths from all causes ..	143·5		384·0		802·9		866·8		719·8		595·9		345·9		108·2		1·0		3968	

Concerning the information given in this table, attention must be drawn to certain points.

Firstly, the fact must be mentioned that, owing to the artificial reckoning of a prison year, from the 1st of April in one year to the 31st March in the next, the statistics of criminal deaths refer to a period of time extending from April 1st, 1886, to the 31st March, 1909, whereas, the period referred to by the general population statistics, extends from the 1st of January, 1886, to December 31st, 1907; and thus the former period extends over 23 years, and the latter over 22 years only. Unfortunately, this discrepancy of one year between the two series of records was not discovered until it was too late for the matter to be rectified. But, of course, apart from the fact that, in order for them to be comparable with the total deaths in the general population, the total deaths in prison should be $\frac{1}{23}$rd less than the actual number stated, the discrepancy has no effect upon the respective death-frequencies quoted in the table for criminals and non-criminals, nor upon the legitimacy of comparing these quotations with each other. When constructing correlation tables, &c., where the discrepancy of total deaths might have some slight effect upon the resulting coefficient, the error in every case has been properly corrected.

A second point of importance to be borne in mind is that all prisoners notified in the Commissioners' reports as having been discharged from prison on medical grounds have been regarded by us as dying in prison; and have been included in the statistics of criminal deaths. Our justification for this procedure is that, save in very exceptional cases, it is on the grounds of impending death only, that prisoners are discharged on medical grounds. Exception occurs in the cases of persons suffering from contagious fevers, such as small-pox, typhus, or scarlet fever, &c.; and consequently the records of deaths from these conditions are probably very much over-stated in the above table. But, with regard to persons suffering from other conditions, those of them discharged on medical grounds are so evenly proportioned to the general prevalency of their several complaints that any error, resulting from the plan we have adopted, is hardly likely to affect appreciably the relative death-rate from any particular condition. Of more doubtful consequence is the fact that, since the ages of prisoners discharged on medical grounds are not stated in the records,* we have been obliged to distribute the ages of all such persons on the assumption that, in the long run, they would correspond to the ages of persons dying in prison. It is, however, difficult to believe that this procedure can have led to any appreciable source of error in the tabulated death-rates.

A third point, requiring explanation, concerns the grouping adopted for some of the causes of death. Influenza and pneumonia are grouped together, because deaths from the former disease are sometimes notified as influenza, sometimes as influenza-pneumonia, and sometimes as pneumonia only; similarly, all kinds of disease associated with the tubercle bacillus are united into one group, to avoid error from wrongly interpreting the frequently ambiguous nomenclature of the many forms of tubercular disease; deaths due to syphilis are combined with those resulting from aneurism, because the former condition is a common antecedent of the latter disease, and the frequencies of both are too small for their separate consideration; peritonitis and intestinal obstruction are combined, because death from either of these causes invariably depends upon the result of an antecedent surgical operation; and finally, diseases of the urinary system, which include stricture, surgical kidney and all morbid conditions of kidney, ureters, and bladder, are grouped together, because of their frequent occurrence in combination, and because of the difficulty of classifying Bright's disease, which is so often ambiguously quoted as a cause of death.

D. *Comparison of Death-rates.*—Finally, the plan upon which the above table is constructed, and the precise meaning of the figures recorded therein, must be explained. The root idea of the table is to provide the proportional frequencies of death, from various causes, amongst prisoners, which may be legitimately comparable with the corresponding death-frequencies in the general population. Now, a community's death-rate from any particular cause, like its sickness-rate, is greatly a question of the age-distribution of the individuals comprising it. For instance, old people do not die from scarlet fever at the same rate as children, nor do juvenile adults die from senility. It is clear that the only death-rates amongst criminals which will be legitimately comparable with those in the general population will be death-rates duly corrected for any differences of age between the two populations. Accordingly, the main object in preparing the above table has been to make due allowance for any existing differences in this respect. The figures under columns (p.p.) are the distributed frequencies, according to age and disease, of the 3,968 actual deaths (or, more

---

* The importance of always stating ages in human statistical records is illustrated by the above omission.

correctly, of the 3,048 deaths, plus 920 discharges on medical grounds) in the prison population; the contrasted figures, under columns (g.p.), are the deaths from each cause to be expected in like totals at the age of the general population, as shown by the experience of Table 234. Thus, the contrasted figures, within each division of the several columns of the table, give the respective frequencies of criminals and non-criminals dying from particular causes, at stated ages, out of a given number of total deaths from all causes, at the same stated ages. For instance, the contrasted figures show that, out of 143 deaths occurring in prison at ages 15–20, 38 are from tubercular disease, and that out of the same number of deaths (143) occurring at the same age (15–20) in the general population, the number caused by the same (tubercular) disease is 47; the figures show also that out of 803 deaths, occurring at ages 25–, the number due to cancer is 12 in the general population, but is only four amongst prisoners; and they show that out of 720 deaths at ages 45–, as many as 59 are due to chronic alcoholism, amongst criminals, whereas, in the general population, the number due to this cause is only 11. It is clear that the contrasted figures in the extreme right-hand column of the table (*i.e.*, the totals obtained by adding all those in the preceding columns), will give the respective rates at which criminals and non-criminals die from the several diseases, and other causes of death enumerated.

Confining attention, then, to this last column of corrected frequencies of deaths from all causes, and at all ages, we will consider first:

(1) *Deaths from accidental negligence, suicide, contagious fevers, enteric fever, and intestinal obstruction and peritonitis.*—This is a group of conditions whose death-rates must evidently be directly modified by prison environment. The figures show that the death-rate from accidental negligence is, for prisoners, 12 per 1,000, and that, in the general population, it is 67 per 1,000 deaths from all causes. It would be absurd to imagine that the lives of prisoners are constitutionally more immune from accidental termination than are those in the general population; the only rational explanation of the lower mortality of the former class in this respect is that prison environment affords special protection against the occurrence of fatal accidents from negligence. On the other hand, according to the figures we are considering, the death-rate from suicide, which is 17 per 1,000 deaths in the general population, is over three times as great, 56 per 1,000, amongst prisoners. Is this increased incidence of suicide also a direct effect of prison environment; or is it due to the fact that persons with marked suicidal tendency are more liable to be imprisoned for crime? This question cannot be definitely answered from the statistical evidence before us, although, in the circumstances of the case, there can be little doubt as to what the correct answer should be. We know that the suicidal act does require a certain conjunction of favourable conditions for its successful accomplishment; and that these conditions would be least likely found in the prison environment, which, with its constant supervision of, and restrictions upon, a prisoner's actions, operates in every direction against his committing suicide easily. Consequently, we should assume that the greater the intensity of the suicidal tendency, the less would be the likelihood of the suicidal act deferred until a time particularly unfavourable for its consummation; but, on the other hand, we would conjecture that, amongst persons possessing an *equal* tendency to commit suicide, the additional strain of imprisonment would inevitably lead to an increased desire of death amongst suicides. Next, with regard to deaths from contagious fevers (small-pox, typhus, scarlet fever, &c.), we formally attribute the increased incidence of these, as tabulated above, amongst prisoners (35 as against 18 per 1,000 in the general population) to prison environment; because the death-rate quoted is considerably over-estimated, being based upon our reckoning that all persons suffering from these diseases, and thereby released on medical grounds, actually die from these causes. As already explained, in these particular cases, it is the danger of contagion, and not the imminence of death, which forms the grounds for a prisoner's release. The fact that the prison environment, if it affects their occurrence at all, protects against infectious diseases, is illustrated by the death-rates from enteric, which although an infectious, is not a contagious, fever. The prison rate here, 18 per 1,000, as against 22 per 1,000 in the general population, is an index of the diminished prevalency of infectious diseases in English prisons—and incidentally speaks well for the purity of the water supply of these public institutions. Finally, in the list of diseases whose incidence and death-rates are modified by imprisonment, we include intestinal obstruction and peritonitis. The death-rate from these conditions (21 per 1,000 in prison, as against 9 per 1,000 in the general population), is considerably greater amongst prisoners than amongst people at large; and we would attribute this to the influence of prison environment, for the following reasons: that these bodily conditions, including strangulated hernia, involve in every case the performance of a major surgical operation,

than in the general, population ; the rate of death from all these causes combined being 176 per 1,000 for the former, and 242 per 1,000 for the latter, population. The most plausible interpretation of this decline in the death-rate, from senile chronic diseases, amongst prisoners, is that only the robust are able to continue a criminal career into their old age, and that the more infirm drift into hospitals, workhouses, &c. In support of this deduction, we have the death-rate from old age, *i.e.*, the death-rate of old people who end their lives entirely free from any form of mortal disease ; the number of prisoners per 1,000, thus free from disease at death, being 23, whereas the number in the general population is only 17. If the death-rate from old age be taken as an index of the prevalency of good health, we have the conclusion again confirmed that criminals do not differ appreciably in health from the standard in the general population.

(5) *Influenza and Pneumonia.*—These are acute ailments, and are not particularly associated with alcoholism or venereal disease; although the alcoholic, suffering from pneumonia, is more likely to die from it than is the temperate person. The death-rate from these conditions, rather higher amongst criminals (114 per 1,000) than in the general population (104 per 1,000), is thus in accord with our previous conclusions.

(6) *Tubercular disease, Epilepsy, Insanity.*—Upon the evidence of our tabulated death-rates, tubercular disease is not more prevalent inside, than it is outside, the prison walls ; insanity and epilepsy, on the other hand, occur with much greater frequency amongst prisoners. During the past 23 years, 3,968 deaths of criminals in prison have been registered, and ·25 of these have been from some form of tubercular disease ; in the general population the proportion of deaths from all forms of tuberculosis, during the same period, has been ·24 of total deaths. The fractions are almost identical for the two populations ; and, in view of this identity, it is difficult to understand upon what grounds the opinion has prevailed that criminals are peculiarly liable to tubercular disease. A similar opinion as to the association between criminality and epilepsy is better founded ; although even here the contrasted death-rates, 26 per 1,000 for prisoners, and 11 per 1,000 in the general population, are hardly sufficient evidence to support the extravagant theory, first formulated by Lombroso, that criminality itself is a form of epilepsy. The difference of death-rates from insanity, 16 per 1,000 amongst criminals against 11 per 1,000 in the general population, is not so pronounced as the difference between the rates of deaths from epilepsy ; but it must be remembered that criminal lunatics, dying in asylums, are not included in the above estimate of the death-rate from insanity amongst prisoners. In this connection, it is interesting to note how closely Dr. David Heron's estimate of prevailing insanity*—that at least 1 per cent. of English people are certified insane at some time of their lives—is borne out by the present estimate : it being assumed that the prevalency of insanity could hardly be less than the death-rate from insanity, which is 1·10 per cent.

E. *Measures of Association between Morbid Conditions and Criminality.*—The rates we have been comparing provide the possibility of only a rough appreciation of the relation between morbid conditions and imprisonment. If we would trace precisely the general relation of these conditions to the committing of crime, we must consider their incidence not only amongst prisoners, but amongst criminals generally ; and must measure such relation on the correlation scale between − 1 and + 1.

We start from the assumption that, apart from certain conditions such as accidents, suicides, and the like, which are influenced by the prison environment, the death-rates of criminals at large, from all other sources, are the same as the death-rates we have calculated for criminals in prison. But the age-distribution at death of the former class of criminals is not necessarily the same as that of the latter class, (see Appendix Table 235 for ages at death in prison and in the general population) ; consequently, in constructing a four-fold table wherewith to measure the relation of any morbid condition, *e.g.*, tuberculosis, which we will take as a typical example, with the committing of crime, we require some additional information to supplement our death-rate statistics of imprisoned criminals : that is to say, we must ascertain the number of criminals (*i.e.*, prisoners and ex-prisoners) in the general population who die every year, and their age-distribution at death. This has been derived from Table 124, page 296, wherein the total criminal population

* *A First Study of the Statistics of Insanity*, Eugenics Laboratory Memoirs III., Dulau & Co. Proceeding from the asylum evidence of its existence, Dr. Heron calculated the proportion of the general population with the insane diathesis to be 2·5 per cent. in the present generation, and 1·25 per cent. in parents of the last generation. The corresponding proportions in a population of criminal stocks—estimated from statistics of certified insanity within 1,274 family histories of convicts (see schedule records 1,000–2,000 and 2,500–3,000), who were not themselves insane—is 4·1 per cent. insane for the present generation, and 1·9 per cent. for parents of the last generation. The death-rate of criminals from insanity is 1·6 per cent. plus a certain percentage corresponding to criminal lunatics dying in State, and other, asylums.

of England and Wales is estimated at each age, by taking the differences of the totals at successive ages of the entire criminal population, prisoners and ex-prisoners. These differences are deaths per quinquennium ; and deaths per annum, obtained by dividing by five, are shown in Table 82.

TABLE 82.

——	15–	25–	35–	45–	55–	65–	75–	85–	Total.
Deaths per annum in the criminal population generally.	1,540	3,067	5,182	6,988	11,552	12,424	7,693	1,444	49,890

Thus, we know the total number of criminal deaths, from all causes, at successive age-periods ; and we know the rates of death at the same ages, from several causes. It is clear that, by multiplying each of these age-frequencies by its attached rate of death from any disease, a series of numbers will be obtained whose total will be the number of criminals dying from that disease every year, out of 50,000 dying from all causes. The following table—given as an example of the procedure we have described—contains the numerical details necessary for calculating the number of criminals, over the age of fifteen, dying every year from tuberculous diseases, out of 49,890 deaths* from all causes :—

TABLE 83.

——	15–	25–	35–	45–	55–	65–	75–	85–	Total Deaths.
Deaths in prison (23 years).	528	803	867	720	596	346	108	1	—
Deaths in prison from tuberculosis.	221	281	218	130	106	43	2	—	—
Deaths of criminals per annum.	1,540	3,067	5,182	6,988	11,552	12,424	7,693	1,444	—
Deaths of criminals from tuberculosis per annum.	646	1,073	1,303	1,267	2,053	1,544	107	—	7,993

It will be seen that 1,540 criminals die from all causes at ages 15–, 3,067 at ages 25–, and so on ; that at age 15–25, the death-rate from tuberculosis (see Table 81), is 221·1 out of 527·5 total deaths, at age 25– it is 281·0 out of 802·9 total deaths, and so forth : that, consequently, the number of deaths from tuberculous diseases at age 15–25 is 646, at age 25– is 1,073, &c. ; and finally, it will be realised from these numerical facts, that the annual number of deaths of criminals of all ages, from tuberculous disease, out of 49,890 deaths from all causes, is 7,993. Now, the number of deaths from tuberculous disease, every year, in the general population, is $\frac{1}{32}$nd of the number of deaths quoted in Appendix Table 234, viz., 23,721 out of 160,479 deaths from all causes. And, arranging these statistics in a fourfold table, we have :—

TABLE 84.

Causes of death.	Criminals.	Non-criminals.	Totals.
Tuberculous disease	7,993	15,727	23,721
Non-tuberculous disease	41,896	94,862	136,758
Totals	49,890	110,589	160,479

which, reduced by the usual methods, yields the equation :—

$$\cdot 00475 = \cdot 08091r + \cdot 02158r^2 - \cdot 00092r^3 + \cdot 00940r^4 +$$

from the solving of which we find that the correlation coefficient of tuberculosis with crime = ·058.

* 110 deaths, theoretically occurring prior to the age of fifteen, are not included in the count of total criminal deaths.

Statistics of other diseases and morbid conditions, in relation to crime, arranged in fourfold tables, and the correlation coefficients resulting from the reduction of these tabulated statistics, are as follows :—

TABLE 85.

Causes of death.	Criminals.	Non-criminals.	Totals.	Coefficients of correlation with criminality.
Alcoholism	964	375	1,339	·391
	48,926	110,214	159,140	
Syphilis and aneurism	621	339	960	·310
	49,269	110,250	159,519	
Apoplexy, &c.	2,751	9,358	12,109	—·124
	47,139	101,231	148,370	
Diseases of the urinary system	3,610	4,608	8,218	·175
	46,280	105,981	152,261	
Cancer	2,145	7,078	9,223	—·108
	47,745	103,511	151,256	
Bronchitis and emphysema	3,584	11,617	15,201	—·115
	46,306	98,972	145,278	
Other diseases of the heart and blood vessels	6,316	20,036	26,352	—·128
	43,574	90,553	134,127	
Old age	4,387	8,121	12,508	·069
	45,503	102,468	147,971	
Pneumonia and influenza	5,239	9,270	14,509	·009
	44,651	101,319	145,970	
Tuberculous diseases	7,993	15,727	23,721	·058
	41,896	94,862	136,758	
Insanity	546	1,093	1,639	·030
	49,344	109,496	158,840	
Epilepsy	724	522	1,246	·256
	49,166	110,067	159,233	
Total deaths per annum	49,890	110,589	160,479	

F. *General Conclusions.*—The following conclusions, which follow directly from the above coefficients, and from the death-rates and other values tabulated in previous tables, seem appropriate :—

(1) In the main, the present investigation, dealing with three very different kinds of material—(*a*) statistics of good health and delicacy, observed in English convicts ; (*b*) statistics of sickness amongst all prisoners during the last decennium ; and (*c*) statistics of death from old age amongst the inmates of all State prisons during the past 23 years—in the main, this exhaustive inquiry indicates that there is no relation between a healthy or delicate constitution *per se* and the committing of crime ; and that the coefficient of correlation between these conditions is ·07 : a value which shows that, if anything, the criminal is healthier on the whole than is the law-abiding subject.

ditions, has no special relation to criminological problems. It has, however, a considerable incidental importance; because, upon an estimate of the general death-rate, so many statistical inquiries connected with crime and criminals depend. Values of the general death-rates of prisoners, at successive ages, per 1,000 exposed to the risk of death at these ages, were originally obtained by us when investigating the prevalency of criminality in the general population; and, incorporated in that inquiry, they will be found contrasted with the corresponding rates for the general population on page 232, Table 86.

V. *The Enumeration of Criminals in the General Population.*

Let us complete our examination of the vital statistics of the criminal with an inquiry as to *the proportion of individuals in one generation of the general community who are imprisoned for crime at least once in their lives.* We must distinguish the difference between this question and that relatively simple one whose answer can be obtained from any yearly Blue Book of criminal statistics—*i.e.*, the number of persons, proportionately to the population, who are sentenced to imprisonment every year. Our inquiry opens wider issues. We would obtain an estimate of the number of imprisoned individuals, at any moment, relatively to the population at large, and also an estimate of how many in the population at large have already been, and how many will eventually go, to prison. We have shown how the population can be distributed upon a graduated scale, according to its constitutional tendency to commit crime. And we have explained how a population, thus distributed, separates into two sections—a section composed of individuals in whom the tendency to commit anti-social acts is never more than potential; and a section of individuals in whom this constitutional tendency is so intense that it becomes manifest in criminal action, and subsequent imprisonment at least once in a lifetime. The former section represents the law-abiding community; the latter comprises all those who, sooner or later in their lives, become legally designated criminal. We aim at forming an approximate estimate of the relative numerical proportions of these two sections of the community. The solution of the problem is simplified by the fact that the criminal section in our community has been fairly stationary during the last fifty years. In the Report of the Commissioners of Prisons, 1906, Appendix No. 6, a table is given showing the total number of individuals sentenced to various terms of imprisonment in each year, from 1877 to 1906. The table shows that, in 1877, this number was 159,416; in 1880, it was 163,574; in 1890, it was 143,251; in 1900, it was 150,225; in 1906, it was 179,867. Since 1900, the figures show a slight tendency to increase; but, previously to this date, the yearly variations have been insignificant.* Between 1877 and 1900, the total number of imprisonments has never exceeded 167,102 (in 1883), nor fallen below 139,121 (in 1891). These figures refer to imprisonments for all kinds of offences, slight or serious; but attention shows us that, with the graver indictable offences, the numerical stability of the yearly convictions has been more marked still. In the Introduction to "Criminal Statistics," 1906, an interesting analysis of the progress of crime since 1857 is given; and with regard to serious offences, it is here stated that "the number of persons for trial for indictable offences in 1906 (59,079) very closely approximates to the figures for 1857 (54,667), which, in view of the fact that the total of crime depends mainly upon the figures for larcenies and other crimes of dishonesty, is in effect to say that the number of thefts in 1906 was almost the same as in 1857." The Report adds that the total for all serious indictable offences has never exceeded 63,268 (of the year 1882), nor fallen below 48,453 (of the year 1860).

Proceeding upon the assumption gathered from the foregoing figures, *i.e.*, that the criminal section of our community has been fairly stationary during the past years, we can formulate our inquiry thus: In any stationary community, replenished by a given number of new arrivals, and depleted by a similar numerical exodus every year, what is the number of individuals in the whole community? In the general population, the number of new arrivals every year, apart from alien immigration, corresponds to the annual number of births; and leaving emigration out of consideration, the yearly exodus corresponds to the annual number of deaths. As a matter of actual fact, the yearly number of births exceeds the yearly number of deaths: and the population of these islands is, there-

---

* The insignificance of these yearly variations, the proof that they are only the inevitable results of random sampling, and that the number of our criminal population in the long run is remarkably steady, is shown by comparing the number of convictions during two succeeding decennial periods. The number of convictions during the ten years 1882–1891 was 1,540,382, and during the ten years 1892–1901 was 1,554,715. The numbers are almost identical: and are so despite the fact that, during these same periods, the general population steadily increased about 20 per cent.

fore, not stationary. But, allowing for this discrepancy, we may say that the total number of individuals in our population at any moment is the simple product of the annual $\frac{\text{births} + \text{deaths}^{*}}{2}$, multiplied by the number of years each person born may be expected to live. For instance, the Census Returns for 1901 gave 32,527,843 as the total population in England and Wales; and an approximating figure is obtained by multiplying the Registrar General's Returns for the number of $\frac{\text{births} + \text{deaths}}{2}$, in 1902, $\frac{(940{,}509 + 479{,}144)}{2}$ by the expectation of life at birth, which is 44 years (31,232,344). Now, since this is the case in the total population, the same must apply to any section of the population which is fairly stationary in number. Assuming that the numerical strength of our army remains constant, the number of our active forces, *i.e.*, those available for service at any moment, is the product of the yearly number of recruits, multiplied by the number of years each recruit may be expected to serve his country. The total number of soldiers in the community at any moment, *i.e.*, the number of those retired from the service, as well as those on the active list, is the product of the annual number of recruits, multiplied by the number of years each recruit may be expected to live from his age at enlistment. The total number of actual and potential soldiers in the community at any moment *i.e.*, not only those already in, and retired from, the service, but, also those civilians, including infants and children, who eventually will join the service—this total number is the product of the annual number of recruits, multipiied by their average expectation of life at birth. Now since, as we have shown, the number of individuals imprisoned every year is very constant, a similar calculation will give us the strength of our criminal ranks. We may say with considerable accuracy (1) that the number of *imprisoned* individuals at any moment = the yearly number of offenders, multiplied by their average sentence; (2) that the number of prisoners and ex-prisoners at any moment = the annual number of first convictions, × their average expectation of life at the age of conviction; (3) that the total criminal population, including prisoners, ex-prisoners, adult eventual criminals, and those infants and children who only await maturity to fulfil their predestined enlistment into the criminal ranks = the annual number of first convictions, × their average expectation of life at birth. This last, then, is the problem immediately before us; and to solve it, three things must be known. In the first place, we must ascertain the yearly number of first offenders, or criminal recruits: and we can obtain the information from the Annual Report of the Commissioners of Prisons. In the second place, we must know the age-distribution of these first offenders. This was given in Chap. II, page 201. And lastly, we must decide, adducing the probability from his age at first conviction, the average number of years each criminal may be expected to live. In column Ex. of his life table, the Registrar General gives the expectation of life, at different ages, for the general community. We have to consider whether the estimates of the Registrar General will apply in the case of criminals? Now, the expectation of life, or, which is the same thing, the probability of death, is a simple computation from the death-rate. The question to be answered, then, is this: *Is the mortality of criminals numerically identical with the mortality of the community generally?* It is difficult to imagine a substantial reason why there should be any marked difference; at the same time it is impossible to produce incontrovertible evidence that there is no difference. We know the death-rate of criminals who die in prison; but, on leaving prison, criminals pass out of the province of direct observation. We cannot be certain that the death-rate of criminals at large is the same as that of criminals in prison. Moreover, the imminence of death is preceded, in the natural order of things, by physical weakness: which is, conceivably, inconducive to the pursuit of criminal action, and to consequent conviction; and which might therefore be expected to lower the death-rate of criminals in prison. In the absence of direct evidence upon these points, we must assume that the death-rate of criminals, dying in prison, represents the mortality of criminals generally: the expectation being, that if criminals generally (*i.e.*, both those within, and those out of, prison) die at the same rate as the general population, this would be shown by a slight decline in the prison rate. The mortality statistics of prisoners at different ages, compared with those of the general population, are given in the following table, and are illustrated diagrammatically in Figure xxxvi.

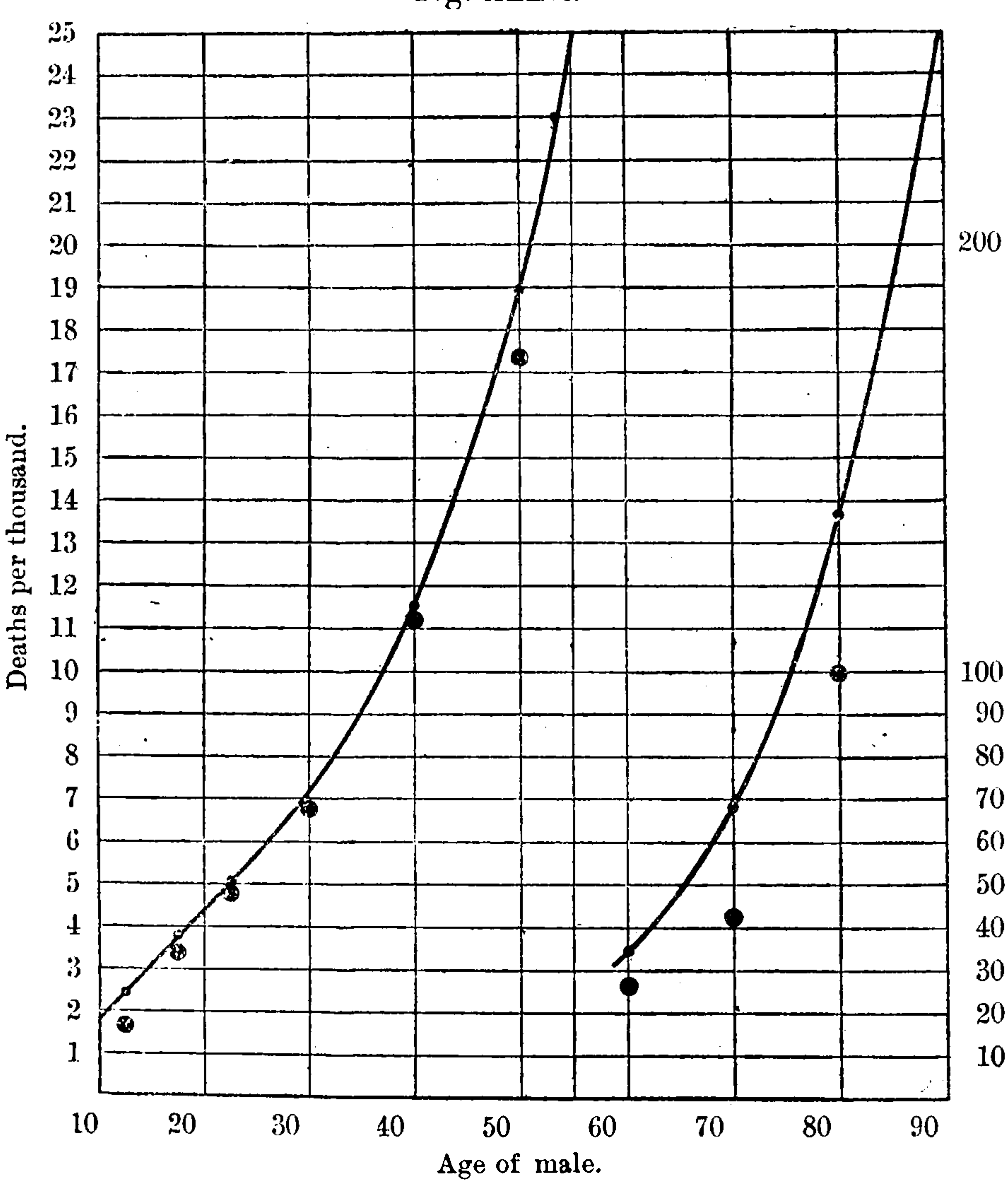
* This is arrived at empirically.

TABLE 86.—MORTALITY IN PRISONS AND IN THE GENERAL POPULATION. (MALES, ENGLAND AND WALES).

Ages.	Mortality in prisons.						Mortality in the general population.				
	Mean daily average of prisoners for 23 years, 1879–1901, and their age-distribution in accordance with the mean of Censuses 1891 and 1901 of males in all prisons.	Actual deaths of prisoners in 23 years.	Add released on medical grounds distributed in age as foregoing.*	Total deaths.	Deaths per annum.	Deaths per annum per 1,000 at ages.	Of 1,000 born, the survivors at ages.	Deaths per annum at ages.	Deaths per annum per 1,000 survivors at ages.	Expected number of deaths in prisons per annum.	Actual number of deaths in prisons per annum.
10–	35	1	1	2	·1	1·64	3,655	8·9	2·42	·1	·1
15–	1,639	96	31	127	5·5	3·38	3,602	13·7	3·79	6·2	5·5
20–	3,275	271	88	359	15·6	4·77	3,524	17·8	5·06	16·6	15·6
25–	5,034	591	192	783	34·1	6·76	6,748	45·7	6·78	34·1	34·1
35–	3,347	649	211	860	37·4	11·17	6,184	71·2	11·51	38·5	37·4
45–	1,750	526	171	697	30·3	17·32	5,344	101·2	18·93	33·1	30·3
55–	1,011	458	149	607	26·4	26·09	4,149	143·5	34·59	35·0	26·4
65–	330	242	79	321	13·9	42·30	2,549	173·7	68·16	22·5	13·9
75–	36	62	20	82	3·6	99·72	930	127·3	136·81	4·9	3·6
85–	4	7	2	9	·4	89·96	124	31·3	253·11	1·1	·4
Totals	16,461	2,903	944	3,847	167·3	—	—	—	—	192·1	167·3

* Imminent death is practically the sole reason for a prisoner's release "on medical grounds."

Fig. xxxvi.



General population, England and Wales ... ——•——
Population in prisons ... ... ●

Assuming the numerical stability of the criminal population, it follows as a corollary that the ratio of criminals to the general community must be equal to the ratio of criminal "débuts" (*i.e.*, first convictions) minus criminal deaths, to the number of births minus the number of deaths every year in the general community. This is to say:

(i) Total criminals (c) $= \lambda \times$ (general population).

and criminal births (B) − criminal deaths $= \lambda \times$ (births − deaths in the general population).

Now, if the death-rate amongst criminals be assumed the same as that amongst other people, which, according to the Registrar General's return, is 25·5 per thousand, or 1 in 65, the annual number of criminals who die will be $\frac{1}{65}$th of all criminals alive at all ages. The estimated Census of 1908 shows the total male population in England and Wales to be then 17 million; and the excess of births over deaths in the population, during the same year 1908, may be taken in round figures from the Registrar General's Report as amounting to 209,000 persons. Accordingly we have:

$$\text{(ii)} \qquad C = \lambda\ 17{,}000{,}000$$

$$B - \frac{C}{65} = \lambda\ 209{,}000$$

$$\text{or (iii)} \quad \frac{B}{C} - \frac{1}{65} = \frac{\lambda\ 209{,}000}{C} = \frac{\lambda\ 209{,}000}{\lambda\ 17{,}000{,}000}$$

$$\therefore \text{(iv)} \quad \frac{B}{C} = \frac{209{,}000}{17{,}000{,}000} + \frac{1}{65} = \frac{1}{36}$$

$$\textit{i.e.,} \qquad C = 36\ B$$

Estimated in this way, the criminal population (*i.e.*, the population of prisoners and ex-prisoners only), is thus thirty-six times the annual number of first convictions. The previous method (see p. 233) gave the figure as 39. The two methods do not give precisely concordant results; but we think they will justify the assumption we are going to make later in this work: the assumption that the results we have obtained for the numerical strength of the total criminal community—eventual prisoners as well as actual prisoners and ex-prisoners—is approximately correct, and sufficiently so for our purpose; and that it may be stated as equivalent to sixty-two times the annual number of first convictions.

TABLE 87 *bis*.—ESTIMATE OF THE TOTAL POPULATION OF OFFENDERS BOTH PRIOR, AND SUBSEQUENT, TO CONVICTION. (MALES, ENGLAND AND WALES).

Ages.	Total influx of newly convicted persons per quinquennium, and their distribution in ages according to the age distribution at 1st conviction of Habituals examined.	Of the foregoing, the numbers alive at the preceding and succeeding quinquennial periods of age, the latter calculated from the life tables, Registrar General's Report, 1907. The total of all the numbers gives the population of offenders at any time, on the assumption of a continued steady influx													Total population of offenders.	Total population prior to conviction (eventual offenders).	Total population subsequent to conviction (manifest offenders).	Total population of males, England and Wales, Mean of Censuses 1891 and 1901. Distribution in life tables.
0-	—	37,865	95,730	48,765	26,405	17,865	8,090	6,630	3,595	2,135	1,685	785	340	110	250,000	250,000	—	1,379,700
5-	—	37,865	95,730	48,765	26,405	17,865	8,090	6,630	3,595	2,135	1,685	785	340	110	250,000	250,000	—	1.237,300
10-	**37,865**	**37,865**	95,730	48,765	26,405	17,865	8,090	6,330	3.595	2,135	1,685	785	340	110	250,000	231,068	18,932	1,218,700
15-	**95,730**	37,316	**95,730**	48,765	26,405	17,865	8,090	6,630	3,595	2,135	1,685	785	340	110	249,451	164,270	85,181	1,201,000
20-	**48,765**	36,515	93,673	**48,765**	26,405	17,865	8,090	6,630	3,595	2,135	1,685	785	340	110	246,593	92,023	154,670	1,175,200
25-	**26,405**	35,527	91,140	47,446	**26,405**	17,865	8,090	6,630	3,595	2,135	1,685	785	340	110	241.753	54,438	187,315	1,143,400
30-	**17,865**	34,382	88,201	45,916	25,554	**17,865**	8,090	6,630	3,595	2,135	1,685	785	340	110	235,288	32,303	202,985	1,106,600
35-	**8 090**	32,941	84,509	43,994	24,484	17,117	**8,090**	6,630	3,595	2,135	1,685	785	340	110	226,416	15,326	211,090	1,060,200
40-	**6,630**	31,125	79,848	41,568	23,133	16,173	7,644	**6,630**	3,595	2,135	1,685	785	340	110	214,771	11,965	202,806	1,001,800
45-	**3,595**	28,971	74,321	38,690	21,532	15,054	7,115	6,171	**3,595**	2,135	1,685	785	340	110	200,504	6,853	193,651	932,400
50-	**2,135**	26,400	67,725	35,256	19,619	13,717	6,483	5,623	3,276	**2,135**	1,685	785	340	110	183,154	3,988	179,166	849,700
55-	**1,685**	23,330	59,850	31,157	17,340	12,122	5,729	4,970	2,895	1,887	**1,685**	785	340	110	165.565	2,078	163,487	750,900
60-	**785**	19,651	50,413	26,244	14,605	10,211	4,826	4,186	2,439	1,589	1,419	**785**	340	110	136,818	843	135,975	632,500
65-	**340**	15,470	39,687	20,660	11,498	8,038	3,799	3,295	1,920	1,251	1,117	618	**340**	110	107,803	280	107,523	497,900
70-	**110**	10,937	28,057	14,606	8,129	5,683	2,686	2,330	1,357	884	790	437	240	**110**	76,246	55	76,191	352,000
75-	—	6,553	16,812	8,752	4,871	3,405	1,609	1,396	813	530	473	262	144	66	45,686	—	45,686	210,900
80-	—	3,086	7,917	4,121	2,294	1,603	758	657	383	250	223	123	68	31	21,514	—	21,514	99,300
85-	—	1,036	2,657	1,383	770	538	254	221	129	84	75	41	23	10	7,221	—	7,221	33,300
90-	—	219	563	293	163	114	54	47	27	18	16	9	5	2	1,530	—	1,530	7,000
95-	—	27	69	36	20	14	7	5	3	2	2	1	1	0	187	—	187	1,200
Totals.	**250,000**	—	—	—	—	—	—	—	—	—	—	—	—	—	3,110,500	1,115,490	1,995,010	14,891,000

A steady influx of 250,000 newly convicted persons per quinquennium, or of 50,000 per annum, at the ages, predicates a population of 3,110,500. Or, for each person newly convicted per annum, a population of 62·21.

Table 87*bis* gives the complete analysis of the figures which would result from a census of the criminal population, *i.e.*, from an enumeration of the total number of prisoners, ex-prisoners, and eventual offenders in England and Wales at any time; and it shows in more detail how we reached our estimate that the total population of offenders in England and Wales, at any moment, is sixty-two times the number of annual first convictions. In the first column of the table, the years of life are divided into a series of quinquennial periods. In the second column, the age-distribution is given of the 250,000 persons, who, assuming a continued steady influx, are convicted of crime for the first time during any quinquennium. This age-distribution is repeated in the line of figures, printed in block type, which runs diagonally through the centre of the table; the figures printed in italics, above the diagonal, show the number of eventual prisoners; and those in Roman type, below the diagonal, show the number of ex-prisoners, at preceding and succeeding quinquennial periods of age respectively. It is a fact, for example, that, as our table shows, during any five years, 8,090 persons, whose ages lie between 35 and 40, are convicted of crime for the first time. This number will be found recorded in its position upon the diagonal row of figures in the table: which further shows that, corresponding to these 8,090 first offenders, there are (1) at each quinquennium *preceding* the age of 35, 8,090 eventual offenders, destined to be imprisoned upon reaching the age-period 35–40; and (2) at each quinquennium *succeeding* the age of 40, there is the same number of ex-prisoners, minus a certain proportion who die every year. The last four columns of the table give the age-distributions of the total population of criminals, contrasted with that of the community at large. From the totals at the foot of the table, it will be seen that 250,000 first offenders quinquennially, or 50,000 annually, yield a population of 3,110,500 total offenders—in other words, that the total criminal population equals the annual number of first convictions, multiplied by 62·21.

The annual number of first convictions is recorded in the yearly official Blue Book issued by the Prison Commissioners. In these books will be found (1) the annual number of total convictions, and of total first convictions, for every kind of offence, venial and serious, indictable and non-indictable, grouped together; (2) the number of convictions (first convictions not separately given) for serious or indictable offences; (3) the number of convictions (first convictions not separated) for each kind of offence; and (4) the respective numbers of first, second, and third convictions, &c. Unfortunately, except in the case of all offences grouped together, the proportion of first convictions to total convictions is not given. We have to assume that the proportion, given for all offences grouped together, holds for each particular kind of offence. In the tables below, these Blue Book statistics are summarized; and in the last column of Table 88, and in Table 89, are presented the final conclusions we seek as to the proportions of criminals in the general population, *i.e.*, the proportion (1) of total offenders, (2) of criminal offenders, (3) of non-criminal offenders, (4) of offenders indicted for particular kinds of crime, (5) of all offenders committing crimes sufficiently serious to be sent for trial at the assizes and quarter sessions, and (6), in Table 89, of offenders graded according to the increasing number of their re-convictions for crime—the proportions of these last being also represented diagrammatically in Fig. xxxvii, whose plan of construction will be found described on p. 268, Chap. V.

TABLE 88.—ESTIMATE OF POPULATION OF OFFENDERS DISTINGUISHED BY NATURE OF OFFENCE (MALES, ENGLAND AND WALES).

Nature of offence.	Persons received into local prisons, for penal servitude or imprisonment, from Assizes or Quarter Sessions. 1906–7 Prison Report.	Summary convictions. 1906–7 Prison Report.	Totals. 1906–7 Prison Report.	First offenders, or year's accession to total population, 46·7 per cent. of total.	The same reduced to a total of 50,000, the estimated annual accession for period 1881–1900.	Population of offenders (prisoners, eventual prisoners and ex-prisoners). Totals. Annual accession × 62·21. Table 3.	Per cent. of total population—14,891,000 males—England and Wales. Mean of censuses, 1891–1901.
Malicious damage to property...	212	2,399	2,611	1,219	970	60,343	·406
Stealing and burglary	5,860	21,059	26,919	12,571	10,007	622,524	4·180
Sexual offences	592	691	1,283	599	477	29,673	·199
Violence against the person ...	687	10,235	10,922	5,101	4,060	252,570	1·696
Forgery, fraud and crimes against the currency.	980	3,671	4,651	2,172	1,729	107,560	·722
*Total criminal offences (excluding those tried summarily).	8,331	—	—	3,891	3,097	192,663	1·294
Total criminal offences (including those tried summarily).	8,331	38,055	46,386	21,662	17,243	1,072,676	7·203
Drunkenness	—	41,990	88,118	41,151	32,757	2,037,792	13·684
†Breach of municipal law and other non-criminal offences.	—	46,128					
Total offenders	8,331	126,173	134,504	62,813	50,000	3,110,500	20·887

TABLE 89.—ESTIMATE OF THE POPULATION OF OFFENDERS DISTINGUISHED BY THE NUMBER OF TIMES IN THEIR LIFE THAT THEY ARE CONVICTED, AND THE DIVISION OF THE TOTALS INTO THREE GROUPS, ACCORDING TO THE CLASS OF THE CRIME, IN THE PROPORTIONS USED IN TABLE 88 (MALES, ENGLAND AND WALES).

—	Numbers in one year. Report 1900–1	Proportional numbers—the annual accession of first offenders being 50,000.	Annual accession of each class of offender × 62·21.	—	Estimate of total population of offenders	Per cent. of total population—14,891,000 males—England and Wales Censuses, 1891–1901.
Convicted for 1st time ...	48,233	50,000	3,110,500	Convicted once only	1,989,476	13·36
" 2nd " ...	17,383	18,020	1,121,024	" twice "	631,618	4·24
" 3rd " ...	7,589	7,867	489,406	" 3 times "	183,271	1·23
" 4th " ...	4,747	4,921	306,135	" 4 " "	80,873	·54
" 5th " ...	3,493	3,621	225,262	" 5 " "	67,622	·45
" 6th " ...	2,444	2,534	157,640	" 6–9 " "	77,640	·52
" 7th–11th " ..	7,667	7,943	494,134	" 10–17 " "	51,000	·34
" 12th–21st " ...	5,760	5,971	371,456	" 18 times & over	29,000	·19
" 22nd– " ...	4,177	4,330	269,369			
				Totals	*3,110,500*	20·89

Criminal offences	1,072,715
Drunkenness	971,054
Breach of municipal law and other non-criminal offences, excepting drunkenness	1,066,727

* Corresponding to the offences committed by the sample of convicts examined.
† Offences dealt with by 'criminal' procedure, but which do not imply "criminal tendency" in the offender.

the critical mind cold and unconvinced until they have been based upon facts, more unquestionably accurate, and more concise in statement, than those general impressions of the truth which have been presented in the past by the leading exponents of criminal anthropology.

For examples of the alleged mental stigmata, we might quote from many pages of *L'homme criminel.* The moral insensibility of the criminal and his lack of foresight, his vanity, vengefulness, and cruelty, his gambling proclivities, his lasciviousness and laziness, and, particularly, the absence of remorse in him, are asserted, not upon statistical evidence. but as general impressions, received by observation of prisoners. These impressions, indeed, are rarely supported by figures, but mainly by the citation of particular cases, and by the descriptive methods of the old psychologists. Thus in Vol. I, p. 346, we read : "the moral insensibility of the criminal is as great as his physical insensibility. In him the voice of sentiment may not be entirely silent, but it is certain that the passions which make the heart of the normal man beat with the greatest force are very feeble in him." Again, on p. 497 : "They talk differently from us because they do not feel in the same way ; they talk like savages because they are veritable savages in the midst of this brilliant European civilisation." * And again Vol. II, p. 165 : "The passions which predominate in criminals are the most ignoble, the most ferocious as vengeance, cupidity, carnal love and the love of wine."

These are typical examples of the alleged mental stigmata of a criminal type ; arrived at from general impressions and experience of the criminal, and evidently unsupported by comparative statistics, how, by the statistical analysis of carefully collected data, is the truth of their existence to be criticised ? The criminal may be vengeful, lazy, cruel, and lascivious : but the mere assertion of these generalisations—whatever credence may be given to the narrative of particular cases, in support thereof—is idle in the absence of random sample statistics of criminals, and of comparative statistics, relating to the law-abiding community. Moreover, many of the stigmata quoted refer to mental and moral qualities that are either inseparable from the committing of crime, or that can hardly be investigated statistically in a law-abiding community : the criminal may be without remorse for, he may be vain-glorious of, his crimes, for instance, but how are these mental states of the criminal to be tested with the corresponding conditions of the law-abiding subject who has not committed crimes for which to be remorseful ? And this is why we stated that our inquiry as to the existence of mental stigmata is of minor importance criminologically, and that it may, in the opinion of many, lead to conclusions of questionable validity. On the other hand, the differentiation of the criminal in general mental capacity is a subject which should lead to fruitful results when investigated statistically, being, as it is, a matter of the greatest practical importance, and one that may prove to be very much at the root of many criminological problems.

II. *The Differentiation of Criminals in Mental Characters.*

A. *Definition of characters investigated.*—The following is a list of the qualities we are going to examine :—

(1) Four characters referred to in the schedule of data, under the heading *Temperament*, viz. :—

(a) *Suspiciousness*, recorded within the three categories of suspicious, trustful and medium : the last category registering degrees of this character, within a range intermediate between the two extremes, and corresponding to the observer's impression of what might be styled an average degree of suspiciousness.

(b) *Sanguine*, as opposed to *phlegmatic*, temperament ; with an average category connecting these two extremes.

(c) *Contented*, opposed to *discontented*, frames of mind : neutral tendencies in these respects being classified within an intermediate category.

(d) *Egotism*, recorded within the three categories of egotistic, sympathetic, and betwixt.

(2) *Temper*: recorded within a category of good or amiable or serene temper, as opposed to a category of bad temper : which latter, on one hand, is denoted by hot and violent forms, and, in another direction, includes sullen and violent forms, of temper.

* See foot-note, Chap. V., page 267.

(3) *Facility*, this, like temperament and temper, is a fundamental form of human personality; and convicts are classified within the three categories of facile, obstinate, and medium, according to their tendency to respond or to be resistant to the influence of other personalities and of circumstances.

The classification of convicts, according to the degree in which they possess the above-mentioned mental attributes, was determined from general impressions received during many months' intimate acquaintanceship with their respective personalities. Their graduation, in respect of the next three attributes, was determined by objective tests corresponding more closely to measurements.

(4) *Conduct*, graduated by the average number of reports for bad behaviour during one year's sojourn in prison.

(5) *Suicidal tendency*, estimated from the recorded facts of attempt to commit suicide.

(6) *Insane diathesis*, measured by the fact that a convict has, or has not, been in an asylum at some time of his life.

B. *The Differentiation of five representative Criminal Groups in respect of the Mental Characters specified above.*

The groups of criminals referred to are determined as before by the nature of the delinquents' crimes. The original observations of the mental characters are given in the schedule records 2,501—3,000, and supplementary records; and the distributed and correlated data will be found in Appendix Tables 236, 237. The statistical constants of the several characters, whose normal distribution was assumed, were calculated by the aid of Sheppard's tables, as already described; the unit of measurement taken in each case being the range of the characters in the betwixt category. The values of the several correlation ratios were obtained by the method described fully on p. 82, Part I.; and the correlation coefficients were obtained by the method of the four fold table: for whose construction the categories we e amalgamated, as shown in the Appendix Tables, wherein the correlated data are presented.

(1) *Four forms of Temperament.*—It is assumed that, both in the general population, and in selected sections of the general population, the four temperaments whose distribution, in a criminal section represented by a sample of convicts, we are about to discuss, are distributed and correlated normally: that is to say, we start from the presumption that, in any random population, (1) extreme degrees of a phlegmatic temperament are relatively rare, and merge insensibly, through more moderate degrees, into an opposite sanguine temperament, whose extreme degrees are also rarely encountered; (2) that extreme degrees of constitutional contentment merge similarly into degrees of a discontented habit of mind; (3) that egotism similarly passes into sympathetic tendencies; (4) that suspiciousness passes into trustfulness: and it is further assumed that, in each form of temperament whose distribution is thus constituted, the average degree for a whole population would approximate to the modal value, or to that degree whose frequency is a maximum. Upon this assumption—which justified our analysing the data by aid of probability integral tables—the means, with their probable errors, of the four forms of temperament within five criminal groups, and five intelligence categories, and the ratios and coefficients of their correlation with crime and intelligence, were found to be as follows:—

TABLE 90.

Characters.	Nature of Crimes. Damage to property. Means. 2 p.e.	Stealing and burglary. Means. 2 p.e.	Sexual offences. Means. 2 p.e.	Violence to the person. Means. 2 p.e.	Forgery and fraud. Means. 2 p.e.	Total Crimes. Means.	Standard deviations.	Correlation ratios η.	Coefficients of Correlation r.
Suspiciousness	·65 ± ·23	− ·22 ± ·10	− ·13 ± ·14	− ·50 ± ·15	− ·50 ± ·15	− ·15	1·05	·26	− ·25
Phlegmatic-sanguine habit.	·37 ± ·27	·16 ± ·11	− ·04 ± ·16	− ·25 ± ·17	− ·25 ± ·17	− ·08	1·37	·13	− ·11
Discontentment	·74 ± ·20	·67 ± ·08	·46 ± ·12	− ·46 ± ·13	− ·46 ± ·13	·60	·88	·11	− ·08
Egotism ...	·57 ± ·19	·36 ± ·08	·73 ± ·11	·67 ± ·12	·86 ± ·12	·57	·86	·23	·34
Intelligence* ...	− ·29 ± ·31	− ·05 ± ·13	− ·60 ± ·28	·36 ± ·19	1·68 ± ·20	·28	1·55	·492	− ·52

* See Appendix Table 187, page 377.

TABLE 91.

Characters.	Intelligence Grades.				Total Crimes.	Standard deviations.	Correlation ratios η.	Coefficients of Correlation r.
	Intelligent.	Fairly Intelligent.	Unintelligent.	Weak-minded and Imbecile.				
	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means.			
Suspiciousness	$-·57 \pm ·16$	$-·27 \pm ·16$	$·00 \pm ·17$	1·61 & 1·56 ± ·21 & ·44	·07	1·38	·57	$-·46$
Phlegmatic-sanguine habit.	$-·52 \pm ·16$	$·14 \pm ·17$	$·36 \pm ·18$	·73 ± ·20	·12	1·45	·31	$-·24$
Discontentment	$·34 \pm ·10$	$·62 \pm ·11$	$·78 \pm ·11$	·74 & 1·31 ± ·14 & 4·29	·62	·92	·24	$-·15$
Egotism ...	$·73 \pm ·08$	$·71 \pm ·08$	$·67 \pm ·08$	·79 ± ·09	·72	·68	·06	·13

The unit of measurement in which the above mean values are expressed is the range of the medium, or betwixt, category, of each character. Thus, when we say that the average degree of suspiciousness within the damage and arson group is ·65, and that within the fraudulent group it is − ·50, we show by these values that, when measured on a scale of diminishing degrees of suspiciousness merging into increasing degrees of trustfulness, incendiaries, on the whole, are more suspicious and less trustful than the fraudulent : or, more exactly, that the average amount of suspiciousness amongst the former is ·65 of a unit *above* the mark on the scale dividing persons we colloquially call "trustful" from those we would style neither "suspicious" nor "trustful"; whereas the average amount of suspiciousness amongst the latter is ·50 of a unit not above, but *below*, the same mark on the scale. Thus, it will be seen that, making allowance for probable errors, as we pass from the incendiaries at one extreme, through thieves, violence and sexual offenders, to the fraudulents at the other extreme, the means of the four characters we are examining tend either to diminish or to increase progressively : the mean amount of phlegmatic tendency of incendiaries is + ·37, − of fraudulents it is − ·25 ; the mean of discontent amongst incendiaries is + ·74, − amongst fraudulents it is − ·46 ; the mean egotism of incendiaries is + ·57, − of fraudulents it is + ·86 ; the mean degree of suspiciousness of incendiaries is + ·65, − of fraudulents it is − ·50 : and in every case the means of the other groups are intermediate in value between the two extreme values we have just quoted. Referring to the next table, it will further be observed that the means of all four characters either diminish or increase progressively, in precisely the same way, as we pass from weak-minded and imbecile, to intelligent, groups of convicts : that is to say, the mean amount of phlegmatic tendency decreases, of discontentedness decreases, of egotism increases, and of suspiciousness decreases, as the general intelligence of the contrasted groups becomes more pronounced. Finally, it will be gathered from the regression of the means that the average intelligence of the criminal groups also progressively increases as we pass from the incendiaries at one extreme, through sexual offenders, thieves, and violence offenders, to the fraudulents at the other extreme. We see then that, according to the nature of their crime, convicts are differentiated in temperament ; and that the measures of this differentiation, or the extent to which the four types of temperament are associated with crime, are given by the values of the correlation ratios quoted in the right-hand columns of the above table—viz., ·26, ·13, ·11, and ·23, respectively. Again, we see that, according to their crimes, convicts are similarly differentiated in intelligence ; and that, according to their intelligence, they are similarly differentiated in temperament (correlation coefficients ·46, ·24, ·15, and ·13 respectively). The problem before us is to determine to what extent the differentiation in temperament, associated with intelligence, sufficiently accounts for the temperamental differentiation of criminals, convicted of different kinds of crime.

The proper method of solving the problem is to trace the amount of direct relation between the four kinds of temperament and crime, through the medium of the partial regression formula : a medium which eliminates disturbing effects due to differences of intelligence tending to mask this relationship.

clearly how the frequencies of every kind of temper amongst criminals approximate to, or deviate from, independent probability :—

TABLE 92.—CONTINGENCY OF NATURE OF CRIME WITH TEMPER.

Characters.	Nature of Crimes.					Totals.
	Damage to property.	Stealing and burglary.	Sexual offences.	Violence to the person.	Forgery and fraud.	
Hot temper ...	8 (11·85)	57 (56·23)	*9* (16·80)	*52* (34·31)	*16* (22·81)	142 —
Sullen temper ...	25 (19·19)	94 (91·08)	32 (27·21)	54 (55·56)	*25* (36·95)	230 —
Good temper ...	29 (29·70)	150 (140·98)	*53* (42·12)	*39* (86·01)	*85* (57·19)	356 —
Violent temper ...	5 (6·26)	*17* (29·70)	*1* (8·87)	*49* (18·12)	*3* (12·05)	75 —
Totals ...	67	318	95	194	129	803

Coefficient of contingency of nature of crime with temper ... ... ·367

TABLE 93—CONTINGENCY OF INTELLIGENCE WITH TEMPER.

Characters.	Intelligence Grades.				Totals.
	I.	F.	U.	W. & Imb.	
Hot temper	37 (38·37)	*53* (43·86)	26 (29·18)	26 (30·59)	142 —
Sullen temper	*38* (62·15)	72 (71·03)	*64* (47·26)	56 (49·55)	230 —
Good temper	*129* (96·20)	*94* (109·95)	*64* (73·15)	*69* (76·70)	356 —
Violent temper	13 (20·29)	29 (23·16)	11 (15·41)	22 (16·15)	75 —
Totals	217	248	165	173	803

Coefficient of contingency of intelligence with temper ... ... ·199

"I" = Intelligent. "F" = Fairly intelligent. "U" = Unintelligent.
"W. & Imb." = Weakminded and Imbecile.

The four temper-categories we have correlated with the five criminal, and four intelligence-classes, in tables 92 and 93 : contain, in the former case, four rows, five columns, and twenty compartments, and, in the latter case, four rows, four columns, and sixteen compartments ; and the unbracketed figures, within these compartments, give the frequency distribution of 803 observations of temper in criminals convicted of several kinds of crime, and possessing different grades of intelligence. In addition to these figures, there are others printed in brackets within each compartment : these are the independent probability frequencies that would theoretically be expected to occur, assuming the distribution of temper in the subjects under review were solely a matter of chance—that is to say, on the assumption that there be no relation between temper and crime, or between temper and intelligence. As described on p. 106, Part I., these independent probability frequencies are calculated by multiplying the chances of occurrence of any kind of temper by the totals for each crime, or intelligence, group. The difference, subject, of course, to probable error, between any independent probability, and observed sub-group, frequency, is a measure of the contingency or correlation of the two attributes represented by the sub-group ; and, in any compartment where the figures are printed in italics, it may be understood that the amount of difference between the frequencies therein, in relation to its probable error, registers a significant degree of correlation. Thus, in the compartment representing the crime of theft, in association with hot temper, the expected frequency is 56·23, the actual frequency is 57: the difference here, ·77 in relation to its probable error, is negligible: whereas, in the compartment correlating crimes of violence with hot temper, the difference of 17·69 is significant of a real existing association between quick temper and conviction for criminal violence. It will be seen that fraudulent offenders, and those convicted of sexual crimes, are specially characterised by serenity of temper; that quick and ungovernable forms of temper are the characteristics of offenders convicted of personal violence; that thieves show a conspicuous absence of persons subject to uncontrolled paroxysms of rage; and that, on the whole, a sullen temper is not significantly associated with conviction for any particular kind of crime. Finally, from a comparison of the respective contingencies of the two tables, it seems likely that the serene temper of fraudulent criminals is unrelated to crime, depending mainly upon the superior intelligence of this class of offenders; and on the other hand, that the excessive degrees of hot temper, associated with offenders committing crimes of violence, has no relation to their intelligence, but depends upon the fact that hot temper conduces to this kind of crime. Accordingly, we would conclude that the degree of correlation given by the coefficient of contingency ($C_2 = ·20$) of temper with intelligence has been exaggerated by the association of this character with crime; and that, on the other hand, the crude measure of association between crime and temper, given by the coefficient of contingency ($C_2 = ·37$), will not be much modified by allowing for effects upon temper due to intelligence. However, a precise measure of the relation between temper and crime, unobscured by intelligence effects, cannot be statistically estimated from the coefficients obtained from the above contingency tables. For the legitimate calculation of this value, we must distribute our statistics of temper on a graduated scale, by combining them, as already suggested, into the two categories of good and bad temper—a procedure more justifiable now we have shown that sullen temper is not closely associated with any particular kind of crime. (See Appendix, Tables 242 to 245.)

The statistical constants of temper, thus distributed, and those of facility and conduct—the former distributed upon a graduated scale of facility merging into obstinacy, and the latter upon a scale which measures conduct by the annual number of reports for misdemeanour—the means, with their probable errors, of these three mental characters, and the ratios and coefficients of their correlation with crime and intelligence, are shown in the following tables:—

TABLE 94.

Characters.	Nature of crimes.					Total crimes.	Standard deviations.	Correlation ratios η.	Coefficients of correlation r.
	Damage to property.	Stealing and burglary.	Sexual offences.	Violence to the person.	Forgery and fraud.				
	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means.			
Bad temper ...	·17±·16	·07±·07	−·15±·14	·84±·10	−·41±·12	·16	1·00	·39	·35
Facility ...	−·07±·21	−·38±·09	−·18±·18	−·77±·13	−·41±·14	−·43	·95	·21	−·08
Bad conduct ...	2·91±·64	3·01±·29	1·85±·43	1·78±·30	1·21±·37	2·27	3·80	·19	−·19
Intelligence grade.*	−·75±·28	1·11±·13	·73±·23	1·81±·16	2·99±·20	1·38	1·68	·65	−·52

* The mean measures of intelligence in the constituents of the "Facility" group are the same as of groups in Table 90 above, (800 criminals). Those of remainder of groups in these tables, (800 criminals), have the values here shown; the origin and unit of the measures having been changed.

TABLE 95.

Characters.	Intelligence grades.				Total crimes.	Standard deviations.	Correlation ratios η.	Coefficients of correlation r.
	Intelligent.	Fairly intelligent.	Unintelligent.	Weak-minded and imbecile.				
	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means.			
Bad temper ...	−·24±·09	·31±·09	·29±·11	·11±·23	·14	1·00	·07	−·14
Facility ...	−·57±·08	−·60±·08	−·20±·11	1·29±·22	−·29	·69	·62	−·57
Bad conduct ...	1·05±·35	1·90±·33	2·12±·44	4·48±·92	2·28	3·80	·33	−·31

The means of temper are expressed here in standard deviation units; those of facility in terms of the middle range between facility and obstinacy, taken as unity; and those of conduct in units of one report for misdemeanour per year. The chief points to be noticed are: (1) that the temper of convicts does not depend to any great extent upon their intelligence, although uncontrolled passion and bad temper generally are more marked amongst the mentally defective section; (2) that the relation of both temper and facility to intelligence is masked to some extent by the fact that a disproportionate number of violence offenders, who are characteristically hot-tempered and obstinate, are included in the "fair intelligence" category; (3) that facility or obstinacy of will depend greatly, and good or bad conduct depend to a pronounced degree, upon the intelligence of convicts: the regular regression of the means of these two characters—a regression shown to be closely linear by the approximating values of the correlation ratios (η) and correlation coefficients (r)—being points of great interest, especially worthy of notice; (4) that, apart from effects due to intelligence, the only important association between these characters and crimes are the uncontrolled temper, and the obstinacy of purpose, particularly associated with offenders convicted for crimes of violence.

The partial correlation coefficient of crime with conduct, for constant intelligence, is given by the following equation:—

Cr*ime with conduct:*—

$$ {}_{i}\rho_{cc} = \frac{\cdot 1890 - \cdot 3062 \times \cdot 6453}{\sqrt{1 - \cdot 3062^2}\ \sqrt{1 - \cdot 6453^2}} = -\cdot 0118 \pm \cdot 039 $$

From the values of this partial correlation coefficient, in conjunction with the other evidence produced, we conclude that criminals convicted of violent crimes are distinguished by hot and uncontrolled tempers, and by obstinacy of purpose, but that other differences of temper, will, and conduct, amongst convicts, depend entirely upon the grade of their general intelligence.

(3) *Suicidal tendency and Insanity.*

TABLE 96.

Characters.	Crimes.					Totals.	Standard deviations.	Correlation ratios η.	Coefficients of correlation r.
	Damage to property.	Stealing and burglary.	Sexual offences.	Violence to the person.	Forgery and fraud.				
	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means.			
Suicidal tendency	$-1{\cdot}09 \pm {\cdot}16$	$-1{\cdot}50 \pm {\cdot}08$	$-1{\cdot}73 \pm {\cdot}14$	$-\ {\cdot}77 \pm {\cdot}10$	$-1{\cdot}73 \pm {\cdot}12$	1·46	1·00	·37	−·29
Insane Diathesis	$-\ {\cdot}64 \pm {\cdot}17$	$-1{\cdot}31 \pm {\cdot}08$	$-1{\cdot}17 \pm {\cdot}14$	$-1{\cdot}10 \pm {\cdot}10$	$-1{\cdot}49 \pm {\cdot}12$	1·25	1·00	·22	−·19

TABLE 97.

Characters.	Intelligence Grades.					Total intelligence.	Standard deviations of intelligence.	Correlation ratios η.	Coefficients of correlation r.
	Intelligent.	Fairly Intelligent.	Unintelligent.	Weak-minded.	Imbecile.				
	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means. 2 p.e.	Means.			
Suicidal tendency	$-1{\cdot}61 \pm {\cdot}09$	$-1{\cdot}38 \pm {\cdot}09$	$-1{\cdot}24 \pm .11$	$-1{\cdot}05 \pm {\cdot}11$	$-1{\cdot}15 \pm {\cdot}23$	1·38	1·00	·20	·20
Insane diathesis	$-1{\cdot}68 \pm {\cdot}09$	$-1{\cdot}32 \pm {\cdot}09$	$-1{\cdot}41 \pm {\cdot}11$	$-\ {\cdot}39 \pm {\cdot}12$	$-\ {\cdot}28 \pm {\cdot}24$	1·40	1·00	·47	·47

A study of the means, recorded in the above table, in relation to their probable errors, and of the contrasted regression of these means with crime and intelligence, respectively,

It will be seen that the more frequently offenders are convicted for crime, the more defective is their general intelligence (correlation coefficient $-\cdot16$); but that, with increasing length of sentences received, the intelligence of convicts tends on the whole to be less defective (correlation coefficient $\cdot10$). Effects due to this varying intelligence are allowed for in the partial correlation coefficients tabulated above: upon the evidence of which, and in so far as the characters enumerated may be considered representative, there is no relationship between the mental attributes of an offender and his degree of criminality, measured either by the length or gravity of his penal record.

III. *The differentiation of Criminals in Mental Capacity.*

A. *General Remarks.*—The important fact emerging from the preceding analysis of several mental characters, as observed in convicts, is this: that there are marked degrees of association between what is called the "general intelligence" of criminals and their mental personality, *i.e.*, their specific forms of temperament, temper, will, conduct, and so forth; but that, apart from one or two specified exceptions, when criminals are compared on a standardized basis of general intelligence, there are no differences in personality associated directly with the nature of the delinquents' crimes: that is to say, any apparent relation between these variable qualities disappears when the contrast is limited to groups of criminals possessing the same degree of general intelligence. If groups of imbeciles be compared only with imbeciles, groups of mentally defective only with the mentally defective, or if average intelligence be compared only with its own degree—it matters not what may be the nature of the crime distinguishing the group: they will be undifferentiated in their specific mental characters. Unfortunately, statistics of mental characters in the general population, legitimately comparable with our criminal data, are not available; but in view of the fact, just recorded, that criminals convicted of such diverse crimes as fraud, rape, murder, petty theft, and arson, although widely differing in general intelligence, are undifferentiated in mental characters, considered apart from intelligence—the deduction is a plausible one that criminals as a class, however differentiated in general mental capacity, are not otherwise distinguished in mental type from the law-abiding public. The number of characters we have been able to examine is admittedly few; but, assuming their representativeness, the results of their analysis all point to one conclusion—that the criminal *per se* is not characterised, as it has been alleged, by the presence in him of any mental anomalies or stigmata: in short, that there is no such thing as a mental "criminal type."

Marked unlikeness of mental characters exists between criminal groups, precisely as it abounds in great variety among different sections of the law-abiding community; but this unlikeness is associated, not with a differentiation in criminal tendency, but with the criminal's differentiation in general intelligence. It will be observed that the position we have reached, enabling us to define this conclusion, is analogous to the standpoint attained when, at the close of Part I. of this work, we were able to assert the absence of physical stigmata in criminals, and the non-existence of a physical "criminal type." From our statistical analysis of 37 physical characters, we had then been able to reduce all apparently existing physical differences to variations of one fundamental character, which we called "general physique," *i.e.*, stature and body-weight; similarly now, from an examination of several mental attributes, we have been able to reduce the mental differentiation of criminals, if such exist, to one fundamental mental character, which we term "general intelligence." Our conclusion now is, not that criminals are a mentally undifferentiated class of the community, but that no mental differentiation exists in criminals beyond an extent accounted for by differences in general intelligence. By a close comparison of the *stature* of criminals with that of the law-abiding public, we were forced to a final conclusion that the criminal differentiation in *physique* is an indisputable anthropological fact: which we explained as resulting from perfectly simple and natural economic, social, and legal, selective processes, by the operation of which society tends to be physically differentiated in an endless variety of ways. The task before us now is to measure precisely the extent to which criminals as a class, and different classes of criminals, are differentiated in *general intelligence and mental capacity* from the non-criminal community; and to trace the actual influences which are at the source of any such existing mental differentiation.

B. *Definition of Mental Capacity.*

(*a*) Before proceeding to this task, which must be based upon a statistical comparison of the general intelligence of criminals with that of the public at large, it is important to define more precisely our notion of what should be understood by the colloquially familiar terms "general intelligence," or "general mental capacity." Broadly defined, we should say that these are related to the human mental constitution in precisely the same way as general physique is related to the human physical constitution. Figuratively speaking, we should say, intelligence is an expression of the stature, weight, and strength of mental substance, just as physique is a resultant of the stature, weight, and strength of corporeal substance. And just as impressions of physique are the resultant of an indefinite number of component impressions of specific physical attributes, so are estimates of general intelligence based upon a number of subsidiary estimates of specific mental characters. The general estimate of physique or intelligence is arrived at, not from consideration of any one character in particular, but from observation of a number of characters, weighed together, and balanced against each other. Thus we may say of a broad shouldered, big-boned, long-limbed person, without prejudicing our judgment of his good physical development, that his hand-grip is that of a child, or that his resistance against fatigue is feeble, or that he possesses no more staying power than that of an old man; and, similarly, we may say of any otherwise intelligent and mentally gifted person, that his extravagance or profligacy is that of a fool, that his worldly judgments are no better than a child's, that, in his blindness to mathematical demonstration, he is stupid, or that, in intelligence, as established by power of self-expression in speech, he borders upon imbecility. It is only when physical weakness is compensated in no direction by strength, that we classify a person as one of feeble physique; and when an indefinite number of mental incapacities and disabilities are unrelieved by mental strength in any one direction, we classify the subject as unintelligent, stupid, defective, or imbecile, according to the unalloyed quality of his psychical attributes. Now, impressions of physique can be directly corroborated by measurements of stature and body-weight; which are characters correlated with, and summarising, an indefinite number of separate physical characters. We cannot corroborate our general impressions of mentality by measurement or observation of any one summarising mental character; but we are compelled to assume that, could any such test be found, it would corroborate the world's verdict upon general intelligence as stature-measurements confirm the reliability of judgment upon physique.*

(*b*) According to estimates of their general intelligence, our criminal subjects have been distributed within the five categories called intelligent, fairly intelligent, unintelligent, weak-minded, and imbecile, respectively. Regarding this classification, we may say that it consists chiefly and originally of a two-fold division of criminals into weak-minded or imbecile, and non-weak-minded—a simple separation, based upon broad estimates of mental capacity, which we may safely state to be entirely free from the personal equation of any one observer. The conditions, in fact, determining the official description of a prisoner as weak-minded, are so manifold and stereotyped, and include the exercise of, and agreement between, the judgments of so many individuals, that the actual relative weak-mindedness of the officially designated "weak-minded" prisoner may be regarded as an established fact, subject to no greater amount of error than attaches to any general concensus of verdict between men whose *métier* it is to express opinions upon technical subjects of the kind we are considering. In regard to the subsequent sub-division of the non-weak-minded class into intelligent and unintelligent, the latter category is also fairly free from the bias of personal equation, consisting mainly, as it does, of individuals concerning whose possible fitness for the weak-minded contingent the verdict of general opinion is doubtful or divided; nevertheless, since the unintelligent category also includes certain other persons who, in the opinion of only one observer, possess mental qualifications not far removed from those of the officially designated "weak-minded," the unintelligent is not, on this account, so clearly defined as the mentally defective category. Finally, the division between the fairly intelligent and unintelligent was determined solely by one individual's opinion: and, consequently, this part of the whole classification might be regarded as possibly biassed by the influence of personal equation.

(c) It is clear, from the above description, that between criminals classified as intelligent, fairly intelligent, and unintelligent respectively, and between those classed as weak-minded and imbecile respectively, there is no definite line of demarcation, but that the several categories merge into each other. The only question is whether the original basis of the whole classification—the separation of mentally-defective criminals

---

* From the intimate relation, however, between intelligence and effective education, a man's position on the scale of education is a good working test of his mental capacity. (See fig. xxxviii, p. 249.)

from the non-defective contingent—can be similarly regarded? Do the weak-minded or mentally defective form a distinct breed of criminals, naturally, as well as conventionally, separated from other offenders, in the same way as criminal lunatics are naturally distinguishable from those who are mentally sound? Or, should the term "weak-minded" be regarded only as conventional nomenclature, describing the notion of a class of offenders whose general intelligence has been found to be below a certain mark on the scale of common intelligence?

We fully admit the existence of pathological imbeciles, or of persons whose natural mental development has been indisputably interfered with by morbid processes; and, while we cannot gainsay that some hidden pathological process may be at the source of the mental defectiveness of the weak-minded class of prisoner, we must, nevertheless, insist upon the fact that, apart from exceptional cases, the inherent defect in mental mechanism, postulated for individuals belonging to this class, if existent, has never yet been demonstrated as fact, and rests only upon the plausibility of an unverified hypothesis. On the other hand, if we turn to the facts, we find these harmonising with the conclusion that the kind of mental defectiveness we are discussing is only a convenient description of the relative degree of general intelligence of persons displaying objectionable and dangerous degrees of mental qualities, which, in some degree, are shared equally by persons of all intelligence grades.

General descriptions of the weak-minded offender are that he is one who is found to possess low degrees of general intelligence, and low standards of morality; or to hold extreme disregard for truth, for opinion, and for authority; or to be unteachable, unemployable, profligate, lazy; or to display marked preferences for undesirable company; or to be very impulsive, excitable, restless, uncertain, passionate, violent, and refractory in conduct; or to be careless in business, neglectful of responsibility, false and malevolent in speech, filthy in habits, and nearly always inebriate. These are rough descriptions of the attributes of the weak-minded prisoner; and no one familiar with their works can fail to be struck with the close resemblance of these qualities to the criminal stigmata of the old descriptive criminologists.* Some typical ones of these mental characters we have statistically examined; and, while showing how little they are related to *criminal tendency*, we have demonstrated their close relation to our categories of *general intelligence*. These are the facts referred to above as displaying the essential unity between the mental constitution of the weak-minded and non-weak-minded classes of criminals; and the force of their significance in this direction will be readily realised from the subjoined tables and diagrams, which represent the regression of the means of several mental characters within our five general intelligence categories.

---

* The following may be taken as typical and moderate examples of the officially designated weak-minded prisoner:—

h. 498, W.S. (Schedule Records 2918) is described as a man of feeble bodily habit, unintelligent in aspect, with very poor memory; as suspicious but not delusional; depressed and tearful; fluent and rational in conversation; of feeble will. He does not know where he was born, and says that he had very little schooling, but thinks he passed the Second Standard. When 13 years old, he went into service as a cow-boy, and after three years became a driver; but eventually he gave up this occupation, as he wanted a change, and could not settle down to anything for long. When aged 20, and working for a builder, he married, and had three children during the three years he lived with his wife, who eventually deserted him. He does not know how many years ago this was; but, since that time, he has been on the tramp. He has lived in workhouses and shelters, and by begging, stealing, and occasional general farm-labouring work. He has been in prison several times previously to his present term, which is for arson.

g. 363, C.P. (Records 2896) is described as a typical specimen of the London criminal. He had very little schooling, and was sent to earn his living, when 13 years old, in an oil shop where he had to take out orders; but he was dismissed after a few weeks. He was engaged at different times in diverse occupations—in retail shops, wire workers, engineers, glass makers, cocoa makers—but never stayed long at any one. He was always found to be incapable, and no occupation seemed to suit him. For the last seven years, he has not done much of any work. He has been in and out of prison all his life, owing, he says, to his home being broken up after the death of his mother, when his father took to drinking. In prison, he was found to be useless for any real work; and was very suspicious and of general feeble intelligence.

h. 309, E.C. (Records 2898) is a more pronounced type of imbecile prisoner. He was convicted for attempting to cut the throat of a girl who teased him, he said. He had attended the National School; but could never learn to read or write beyond a few words. His parents were apparently respectable working-people. He had been employed at various odd jobs. He has twice been imprisoned for the offence of exposing his person to little girls

TABLE 98

Characters	Means in each stature group (mm.).							
	Defective. Under 5′ 3″	Short. 5′ 3″—	Medium. 5′ 5″—	Tall. 5′ 7″—	Very Tall. 5′ 9″—	Means.	St. Devs.	Cfts. of correl. with Stature.
Head lengths	189·96	191·56	192·53	194·23	195·66	192·45	6·40	·264
Face lengths	121·15	122·12	124·00	125·93	127·02	123·73	7·70	·277

Characters	Means in each intelligence group (s. d. units where not stated).							
	Intelligent.	Fairly intelligent.	Unintelligent.	Weak-minded.	Imbecile.	Means.	St. Devs.	Cfts. of correl. with intelligence.
Suspiciousness	− ·53	− ·35	− ·00	·46	·52	− ·20	1·00	·457
Discontent	− ·94	− ·51	− ·32	− ·23	·13	− ·52	1·00	·296
Facility	− 95	− ·71	− ·23	·07	·37	− ·53	1.00	·510
Egotism	− ·38	− ·75	− ·90	− ·51	−1·21	− ·65	1·00	−·130
Bad conduct*	1·05	1·90	2·12	4·59	4·48	2·28	3·80	·306
Suicide	−1·61	−1·37	−1·27	−1·05	−1·15	−1·38	1·00	·200
Insanity	−1·68	−1·33	−1·41	− ·39	− ·28	−1·22	1·00	·472
Standard on leaving school†	6·16	4·61	3·61	3·65	3·08	4·40	2·24	·633
Present degree of education†	13·86	8·84	7·51	7·25	5·81	9·51	5·50	·331

* Number of reports † School standards 0—8 Prison standards 0—21

(*d*) In the above diagrams, the mean values of two head and facial characters are plotted within five stature categories, which we call defective, short, medium, tall and very tall stature ; and these are contrasted with the means of a series of mental characters, plotted within the five categories of general intelligence. The data of the physical characters will be found in Part I. of the present work. The data of the mental characters are recorded in Appendix, Tables 238 to 249 ; and the values of the means and the coefficients of their correlation with intelligence, are given in the accompanying table above.*

The curve at the head of the upper series of diagrams gives the distribution of stature in 2,348 criminals—a distribution we have already shown to be normal in type, *see* page 199, Part II. ; and, in the lower series of diagrams, we have the distribution of intelligence in a sample of the same subjects, assuming the frequencies of this character also to follow a normal curve.†

On this assumption, that mental qualities follow a normal law of distribution, we obtain—from the generalised knowledge of the properties and relations of all normal distributions, which have been studied exhaustively, and tabulated—a graduated scale of intelligence in standardised units, to which we can apply our statistics of intelligence amongst criminals From these statistics, we see that 28·6 per cent. of a sample of 496 individuals, for instance, are within the intelligent category, that 27·8 per cent. have fair intelligence, and that 24 per cent. are unintelligent, 15·9 per cent. are weak-minded, and 3·6 per cent. are imbecile. Consulting Sheppard's tables, we find, from these several percentage

* For description of method of calculating the means, *see* page 83, Part I.

† We have already given grounds for this assumption (*see* page 31, Part I.) ; and a more complete discussion of its legitimate application to the distribution of mental characters will be found on page 342, chap. VII. For the original statement and final substantiation of the assumption referred to, viz., that the distribution of mental and moral characters in random populations is given, with sufficient accuracy for practical purposes, by the Gauss-Laplacian normal curve of deviations from the mean, *see* K. Pearson's Huxley Lecture on *The Inheritance of Mental and Moral Characters in Man*. Biometrika, Vol. III., p. 142.

values, that the point on the scale of intelligence where imbecility merges into weak-mindedness is $-1{\cdot}80$ standard deviation units from the mean intelligence of the whole population (marked 0 on the scale); that the division between the weak-minded and the unintelligent categories is $-{\cdot}86$ units from the mean; and that the other categoric divisions are $-{\cdot}16$ and $+{\cdot}56$ units from the mean, respectively; and we also learn from Shepherd's tables that the mean degree of intelligence of the several categories fall at the several points on the scale indicated in the diagram.*

Having obtained, then, by the means described, an exact measure of the ranges of our intelligence categories, and constructing, upon the assumption of their normal distribution, similar quantitative scales for the mental characters, temper, temperament, &c., we have been enabled to measure the intensity of, and to represent diagrammatically, the relation between these mental characters and intelligence in the same way as the relation between the physical characters, cephalic and facial length, &c., and stature, has been measured and diagrammatically represented: that is to say, we have been enabled to plot the means of the mental characters, corresponding to the several intelligence categories, in the accompanying lower diagram, so that these may be legitimately comparable with the upper diagrams, wherein are plotted the means of the physical characters corresponding to the several stature classes. For instance, assuming, as we did for intelligence, the normal distribution of the mental character, facility, we plotted, at the mean of the intelligent group, a length on the scale of facility equal to the average degree of facility within the intelligent group; and, at the mean of the weak-minded group, we plotted the average degree of facility corresponding to this group, and so forth. In this way, the series of points were obtained which are exhibited in the diagrams, and which illustrate the regression of facility with intelligence. And by plotting in a precisely similar way the average values of all the mental characters—each measured in standard deviation units upon its own quantitative scale—by plotting these values at their right positions upon the intelligence scale, and by plotting all the means of the physical characters in their right position upon the scale of stature, the several series of regression points were obtained which are exhibited in the accompanying diagram.

From the study of these diagrams, it will be seen at once how closely the form of regression of mental characters with general intelligence corresponds to that of the physical characters with stature. It will be seen how, in the case of every physical and mental character examined, the series of points, whose relative positions indicate the relative values of mean for certain stated grades of stature and intelligenee, tend to lie upon straight or slightly curved lines. It should be remarked especially how the analogy of regression holds for such mental characters as conduct, suicidal tendency, and insanity,†

---

* The value of the mean of the fair group, for instance, is $\dfrac{Z'-Z}{\frac{1}{2}(1+\alpha)-\frac{1}{2}(1+\alpha')}$; where Z, & $\frac{1}{2}(1+\alpha)$, have the values, assigned in Sheppard's tables, of the point dividing intelligent from fairly intelligent, and where Z' & $\frac{1}{2}(1+\alpha')$, have the values of the point dividing fairly intelligent from unintelligent. This formula follows at once from the property noted above.

† It should be noticed that the slope of the regression line of insanity with intelligence becomes much steeper as it passes from the unintelligent, to the weak-minded and imbecile, groups. This indicates the fact that certified insanity is disproportionately associated with prisoners who are officially classified weak-minded. The meaning of this is that, just as the possession of extreme degrees of certain anti-social physiological qualities results in a want of mental balance—which is often the only ground for a prisoner's official designation of mentally defective—so, when possessed in more marked degrees still, they ultimately lead to the prisoner's certification as insane. Extreme degrees of such qualities as impulsiveness, obstinacy, indolence, lack of attention or control, and liability to outbursts of violence, render their possessors a danger to themselves and a menace to society; and they have to be certified insane. But theirs is a *psychological* lack of mental balance, and not the *pathological* loss of balance which characterises real insanity. It is a well-recognised fact that the convict who is certified insane is readily distinguishable from other lunatics; and the essential difference between pathological and physiological insanity is probably at the basis of the differentiation. The following concrete examples will demonstrate the justness of this contention :—

W. H., an habitual criminal, considered his sentence an unjust one; and, on this account, refused to work, or to take any food. He was artificially fed for eighteen months; and the only real grounds for his final certification was his extraordinary manifestation of extreme obstinacy of purpose.

Another prisoner in our series was eventually certified for refusing to work, for refusing to do anything—even to clothe himself. He would remain placidly lying on his back, in an unfurnished cell, for days; but, although conversing freely and rationally, and showing no sign of delusion, he obstinately refused to perform any exercise required of him while in prison. When asked why he *i.e.*, for characters whose observation has been evidently independent of bias due to the observer's personal equation. The plotted means of any character do not, of course, lie exactly on a line, and the slope of the line varies for different characters; but, within the limits of observation and of random sampling, we may categorically assert that the points do tend to lie on straight or slightly curved lines.

Now, in the case of the physical characters described in the diagrams, if, instead of plotting these means within five stature categories, our data were large enough to plot them for inch differences of stature, what would be the result? The result would be that the more numerous plotted points, being closer together, would appear to lie on a continuous line with greater definiteness than before: from which the imagination infers that if the stature divisions were made at extremely small intervals, the succession of plotted means would absolutely define a continuous line. Consequently, we say that the relation of the physical characters examined with stature is one which obeys the law of linear or curvelinear regression; and an implication of this statement is that nowhere, on the scale of stature, is there any solution of continuity: extremely diminutive stature, or what might be colloquially termed defective degrees of stature, merge into opposite extremes by insensible gradations. And, as with stature, so with intelligence. Since the means of temper, temperament, facility, conduct, &c., for certain stated grades of intelligence, lie upon the trail of a continuous line, we say in technical language that the relation of these mental characters with intelligence, like that of physical characters with stature, follows the law of regression; and we conclude, from this statement, that there is no solution of continuity in the quantitative scale of intelligence—that extremely low degrees of general intelligence, or what may for convenience be called mental defectiveness, merge into the opposite extreme of mental integrity by insensible gradations.

Assuming the representativeness of the mental characters examined, and their approximately linear regression with general intelligence, two conclusions may be stated without reserve. The one is that our mentally defective convicts are not a special qualitative breed of men, but that they form a conventional class only, consisting of individuals drawn from the lower end of the scale of intelligence, and whose mean intelligence is, consequently, lower than that of criminals who are not designated "mentally defective." The other conclusion is that, in our criminal population, the frequency distribution of general intelligence follows, with sufficient accuracy for practical purposes, the Gauss-Laplacian normal curve of deviations from the mean. With these conclusions in hand, the way is prepared for an examination, upon a legitimate statistical basis, of the vital question connected with the mental constitution of the criminal. This question is not whether criminals are, or are not, stigmatised by special mental characters. It is whether or not the criminal is differentiated in general intelligence or mental capacity

---

would not work, he replied: "Work? No, I didn't come to prison to work! There is quite enough of that outside."

d. 496 G.S., already quoted, was finally certified insane on account of his extremely filthy behaviour, and outbursts of violence, when he would break windows, and assault officers. He would smear himself with excrement and drink his own urine, for the single purpose of defying authority; at any rate, there was no evidence of pathological dementia or delusion to be elicited by conversation with him, and his conduct was invariably reactionary to some explicit cause, and directed to some definite purpose.

Y 276, J. MacC. (See Records 2858) was indicted for the wilful murder of his child, committed at H. when the prisoner, his brother, and his wife, accompanied by the child, three years old, and a baby, were on the tramp. The prisoner was a collier; and, at the time he was on the road, was professedly in search of work. His conduct towards the child was noticed by several persons A miner saw him dragging the child up the hill, by a strip of cotton which was round the neck. The child was then screaming, and seemed unable to walk. Later, in a public-house, being remonstrated with, he said: "What would you do with a child, four years old, that is too lazy to walk? Wouldn't you drag it?" To another miner, who expostulated with him for the way he was treating the child, he said: "I've carried the child until I am sick; and I'll kill him if he won't walk." Later, the prisoner was seen to kick the child in the back; and finally to take him up by the frock, to lift him in the air, and to throw him down on the flags, saying: "I'll have an end to this." The child died on the way to the Infirmary. The Judge who tried the prisoner said he had never had to deal with a case in which there had been more evidence of cruelty and want of parental feeling.

The prisoner was certified insane. He showed a moroseness and sullenness of disposition which were unremitting. He walked to and fro, and looked out at one from his cell, like a caged beast; but his ferocious disposition seemed to be a physiological one, and natural to himself; and, apart from the evidence of his crime, it would have been difficult to have given a certificate presenting definite evidence of a pathological mental state.

published in the Midsummer of 1908. It will be found stated in this Report that, at the outset of their inquiry, the Commissioners were confronted with the difficult fact that no trustworthy estimate was existent, and that no statistics were available, upon which to base an estimate of the proportion of mentally defective persons in the population of Great Britain. Accordingly, one of the first acts of the Commissioners was to make an enumeration of defectives in sixteen representative districts of the British Islands ; and their estimate, from the returns of the inquiry, was that ·46 per cent. of the whole population of England and Wales are mentally defective.

Apart from this estimate which, on account of the thoroughness and representativeness of the inquiry from which it emerged, must, for the present, be accepted as if it were final, the only other existing estimates of English adult defectives has been indirectly derived from data of the mental capacity of school children. In Biometrika, Vol. V., p. 3, Professor Pearson quotes 1·88 as the percentage of very dull and imbecile children ; and in a recent memoir,* the same investigator, working (1) on statistics provided by Dr. James Kerr "which include mentally defective children in the special schools as well as children certified as such in the ordinary schools" of London, and (2) on data provided by Dr. E. W. Hope, Medical Officer of Health for Liverpool—Professor Pearson finds that the mentally defective boys in the London schools are 1·59 per cent., and of the Liverpool schools are ·827 per cent. In his memoir referred to, p. 13, the author draws attention to the fact that these estimates are for the *child* population, and would probably have to be reduced for the adult population ; and he writes: "This follows because (1) there is accumulating evidence to show that mental defect is hereditary and not acquired, (2) the death-rate amongst these children is admittedly higher than among normal children, (3) the slighter cases of mental defect among children, owing to the influence of training, may not be reckoned as cases of mental defect in adult life." In consideration of these facts, we can hardly err widely by taking the Commissioners' estimate, quoted above, as a good working approximation to the facts ; and, accordingly, we will accept ·46 per cent. as the correct estimate of adult feeble-mindedness in the general population of England and Wales.

(3) *The Mental Capacity of Criminals.*—In addition to the Inquiry in the general population already referred to, the directors of the Commission on Feeble-Mindedness also appointed medical investigators to make an enumeration of mentally defective persons in local prisons, casual wards, shelters, &c.; and the report of the investigators was to the effect that 242 such persons were found out of 2,353 examined, or 10·28 per cent.

Sir Bryan Donkin, one of the Directors of Convict Prisons, speaking at a conference in Birmingham,† said: "The bald statement may be accepted that the weak-minded amount to between 10 and 15 per cent. of the total number of persons committed to prison ; the true maximum is probably higher than this." And, later on, he again stated: "Owing to their inherited incapacities and to certain surroundings, a large number of mental defectives tend to become criminals, and the considerable proportion, even 20 per cent., of so-called criminals or law-breakers are demonstrably mentally defective." This 20 per cent. of course does not include offenders under the Inebriates Act, amongst whom, according to Dr. Branthwaite, the Inspector of Inebriate Reformatories, the proportion of mentally defective is over 60 per cent.‡

We see then that Sir Bryan Donkin's minimum estimate of mental defectiveness amongst prisoners generally is identical with that reached by the Feeble-Mindedness Commissioners, viz., 10 per cent. ; and, moreover, that it very interestingly accords with a minimum estimate of mentally defective convicts, obtained from records embodied in the yearly reports of Directors of Convict Prisons. Since 1904, the station at Parkhurst has been utilised for the segregation of officially designated weak-minded convicts ; and referring to the Blue Books specified, we find that, in the year 1904–5, 85 weak-minded were received at Parkhurst out of 888 total convicts received at all stations ; that in the year 1905–6, 92 out of a total of 977, in 1906-7, 84 out of 985, and in 1907–8, 94 out of 1,132, were received. It will be seen that the proportion of weak-minded to total convicts remains very constant from year to year, and on the average for four years equals 9 per cent. We may take it then, that all authorities seem agreed upon an approximation

* *A Preliminary Study of Extreme Alcoholism in Adults.*
† *The Feeble-minded Criminal*, H. B. Donkin, M.D., Birmingham Education Committee.
‡ *Mentally defective Drunkards*, R. W. Branthwaite, M.D.

of 10 per cent. as a minimum estimate of the proportion of mentally defective persons in English prisons generally.

We quote 10 per cent. as a *minimum* estimate, because it is based upon the number of prisoners officially designated weak-minded only. Now a prisoner is often not thus officially classified until, in addition to, or rather as a result of, mental deficiency, he is found to be unmanageable by ordinary penal discipline, and to require special treatment under the regulations for the feeble-minded.* The number requiring such treatment is evidently only a fraction of the total number of defectives; and that is why we say that 10 per cent. is the very lowest estimate of mentally defective prisoners.

According to Sir Bryan Donkin, a maximum estimate would be 20 per cent. defective; and this figure is corroborated by our own data of intelligence amongst convicts. These statistics consist of observations of 948 convicts at Parkhurst (see Records 2,501 to 3,000 and Supplementary Records), classified within the five categories of intelligent, fairly intelligent, unintelligent, weak-minded, and imbecile; and the number of convicts recorded within these categories are 43, 170, 205, 268, and 262, respectively. But since the weak-minded and imbecile are segregated at Parkhurst, their proportion here—22·47 per cent. of total convicts—is evidently over-stated. The right proportion of classified defectives is, as we have seen, 10 per cent. of total convicts. If, then, we reduce our weak-minded contingent to this 10 per cent., the proportion of our unintelligent becomes 25 per cent., and, of our fairly intelligent and intelligent combined, becomes 65 per cent. Now, as we have explained, many convicts, virtually weak-minded, are, for official reasons, not so classified; and if we assume one-third of the unintelligent group consists of the unclassified weak-minded, the proportion of defectives becomes 20 per cent. ap.; which is the figure we shall take as a maximum estimate of mental defectives in convict prisons.

Accordingly, against the ·45 per cent. of defectives in the general population, the proportion of mentally defective criminals cannot be less than 10 per cent., and is probably not greater than 20 per cent. It is clear that criminals, as a class, are highly differentiated mentally from the law-abiding classes. Before proceeding, however, to measure the intensity of the relationship exactly, we will present some tabulated figures showing (1) how conviction for particular kinds of crime is related to the intelligence of the perpetrators, and (2) how criminals convicted of several kinds of crime vary in their degree of mental differentiation from the law-abiding public.

(b) *The Relation of Intelligence to the Perpetration of Crime.*—It is needless to remark that the annual number of convictions for crime does not correspond to the number of persons convicted every year for committing crime; and that the total number of convictions during a community's period of generation does not correspond to the number of criminals in the community. The sub-joined tables are based upon statistics of a random sample of 8,290 offences, committed by 948 criminal persons, who, at some time of their career, have been sentenced to a convict prison. Table 99 shows the percentage frequencies of 33 different kinds of offences, as committed by persons of three stated grades of intelligence; Table 100 shows the proportional frequencies of 33 different kinds of offences out of every thousand resulting in a conviction, and the percentage of each of the 33 types of offences committed by persons who are officially designated mentally defective.

---

* The following (see Schedule Records 2,850) is a typical case of the kind of prisoner who, being unmanageable by ordinary penal discipline, is eventually classed weak-minded.

d 496 G.S., previous to his conviction for arson, was supposed to have been a respectable umbrella-maker. He had been in the Salvation Army, where he was looked upon as unaccountable for his actions; and he had had frequent experience of several workhouses. When first under control, he was described as a man of degenerate type and somewhat weak intellect; as noisy, impulsive and negligent in his habits; without regard for his personal tidiness and cleanliness. He is said to converse freely and lucidly on the above and other matters—explaining, for instance, his personal negligence by the fact that he could never be attended to at the time required. The man at this time was reported to be fully cognisant of his surroundings, and of the offence for which he was awaiting trial, and of all the details connected therewith; and it is stated that, although possessing general weakness of intellect, he is fully aware of the nature of his peculiar behaviour. He is later described as untidy, noisy, obscene in his speech, and as frequently simulating epileptic fits. Another report describes his behaviour as grotesque, and remarks his habit of imitating the mewing and barking of cats and dogs. His memory is reported to be good. The reasons for his final classifaction as weak-minded are his troublesomeness, dirty habits, noisy, impulsive, and frequently violent behaviour; and his indifference to penalties inflicted for breaches of prison discipline.

TABLE 99.—OFFENCES (PRESENT AND PAST) OF 948 CONVICTS, REDUCED TO ONE THOUSAND IN EACH GRADE OF INTELLIGENCE OF THE OFFENDERS.

Nature of crimes.	Mental grades.		
	Intelligent and fairly intelligent.	Intermediate or unintelligent.	Mentally defective.
Murder and murderous intent	17·0	8·0	9·6
Manslaughter	11·5	1·8	3·8
Wounding and intent to wound	20·7	11·7	7·0
Striking superior officer	2·2	0·0	0·0
Assault	22·9	49·8	41·6
Robbery with violence	17·8	15·4	9·0
Burglary with violence	1·5	0·0	1·9
Stealing	473·6	614·2	541·9
Burglary	166·5	139·1	144·8
Receiving	25·2	12·9	7·0
Poaching	8·1	9·2	7·7
Coining	36·3	3·7	3·8
Arson	2·6	1·2	5·8
Firing of stack	2·6	10·5	49·3
Maiming (animals)	·7	·6	1·9
Wilful damage	4·4	12·9	31·4
Rape (child)	8·1	13·5	17·9
Rape (adult)	6·7	6·8	2·6
Indecent assault	1·5	10·5	21·8
Unnatural (sexual) offences	1·9	3·1	3·8
Fraud	95·5	28·9	10·9
Embezzlement	4·4	0·0	1·3
Forgery	13·7	2·5	·6
Fraudulence as trustee	2·2	0·0	0·0
Bigamy	2·2	0·0	0·0
Performing illegal operation	2·2	0·0	0·0
Blackmail	3·7	1·2	3·8
Cruelty to children	1·5	2·5	5·1
Living on prostitution	4·1	4·3	·6
Obscenity	·4	3·1	7·7
Begging	14·8	20·3	31·4
Offences under "prevention of crimes" act ...	23·7	12·3	25·6
Totals	1000	1000	1000
Summary convictions	228·2	281·0	382·5
Convictions at assizes and quarter sessions ...	771·8	719·0	617·5
Totals	1000	1000	1000

TABLE 100.—OFFENCES (PRESENT AND PAST) OF 948 CONVICTS, ARRANGED IN THREE GRADES OF INTELLIGENCE WITH ADJUSTED TOTALS OF EACH GRADE. THE PERCENTAGE FREQUENCIES OF THE VARIOUS TYPES OF CRIME. THE PERCENTAGE OF MENTALLY DEFECTIVE IN THE NUMBERS COMMITTING A CRIME.

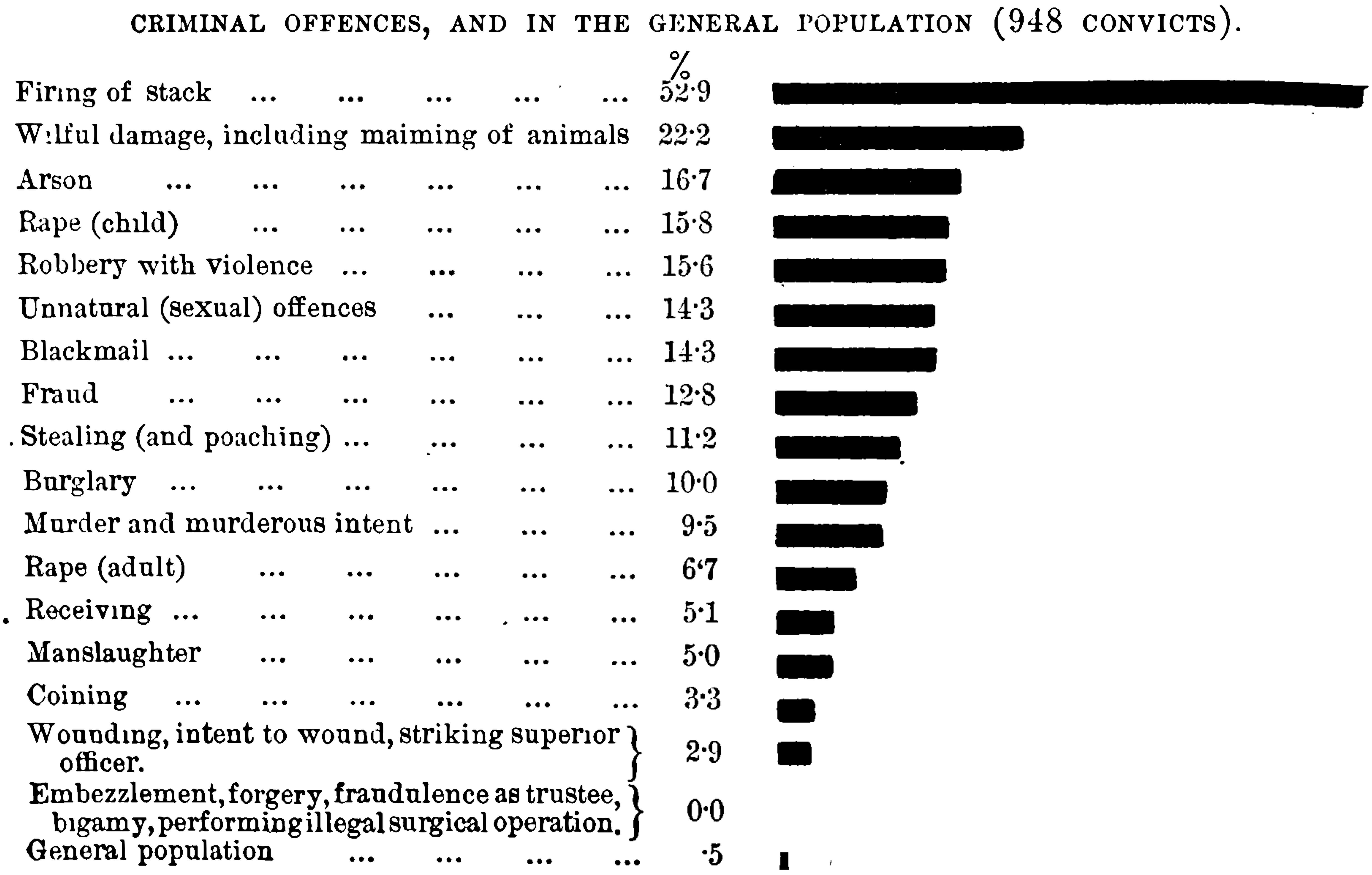
Nature of crimes.	Mental grades.			Totals.	Percentage frequencies of crimes.	Percentage of crimes committed by mentally defective persons.
	Intelligent and fairly intelligent.	Intermediate or unintelligent.	Mentally defective.			
Murder and murderous intent...	57	16	7	80	·9	8·8
Manslaughter	38	4	3	45	·5	6·7
Wounding and intent to wound	69	24	5	98	1·2	5·1
Striking superior officer ...	8	0	0	8	·1	0·0
Assault	77	99	31	207	2·5	15·0
Robbery with violence	59	30	7	96	1·2	7·3
Burglary with violence... ...	5	0	1	6	·1	16·7
Stealing	1,575	1,229	399	3,203	38·6	12·5
Burglary	553	278	107	938	11·3	11·4
Receiving	84	25	6	115	1·4	5·2
Poaching	27	19	6	52	·6	11·5
Coining	121	8	3	132	1·6	2·3
Arson	9	3	4	16	·2	25·0

gravity or of the frequency of their offences are sentenced to convict prisons (and it must be borne in mind that convicts, and offenders who eventually become convicts, from a very small proportion of total offenders) that even amongst convicts, the large proportion of convictions is for petty theft and other relatively trivial offences ; and (2) that apart from certain offences associated with class—fraud, embezzlement, forgery, &c.—amounting to only ·7 per cent. of total offences resulting in conviction, every kind of crime is largely associated with mental defectiveness. The justice of this last fact will be appreciated if, when studying the figures recorded in the right-hand column of the lower table given above, it be kept in mind that, in the general population, only ·46 of every 100 persons has the grade of intelligence we are describing as weak-mindedness or imbecility. The figures in these columns, however, give the proportion of various kinds of crime committed by mentally defective persons : which is a different thing to the proportions of defective persons in the community who commit various types of crime ; proportions which are figured in appendix table 257.

(c) *Differences in Mental Capacity between Five Convict Types.*—The original data will be found in the appendix table already referred to, where the crimes they commit, and the intelligence of 948 convicts, are recorded. These data, although they represent the right proportion of crimes committed by convicts of stated mental grade, are not justly representative of the relative mental capacities of a random sample of convicts. Of the 948 convicts whose intelligence was observed (see Records 2,501 to 3,000 and supplementary), 213, or 22·47 per cent. belong to the weak-minded class, which, in a random sample of convicts, would consist only of 10 per cent. In the table referred to, the total number of individuals within each intelligence category has been proportionately weighted so that 10 per cent. of the 948 individuals belong to the weak-minded group. In the right-hand column of the table, the percentage of weak-minded persons is given.

Bearing in mind that only ·46 per cent of the general population are mentally defective, it will be realised how consistently all kinds of criminals are differentiated from the general population in intelligence ; but also how much more highly are some classes differentiated to others. It is particularly interesting to note that the percentage of mentally defective murderers is nearly twice as great as the percentage of persons convicted of other forms of personal violence ; that receivers of stolen goods and coiners are on the average much more intelligent than thieves ; that stack-firing, which is a crime of passion, associated more highly than any other with imbecility, must be distinguished from other forms of arson, which are crimes perpetrated by persons of much higher grade of intelligence, and for motives of personal gain ; that indecent assaults upon children, and unnatural sexual offences, are related to weak-mindedness much more than are crimes of rape upon adults ; and that embezzlement, forgery, and all kinds of fraud are peculiarly intelligent crimes, absent in a marked manner from the records of mentally defective persons. The percentages of the mentally defective in criminals, as a class, and in criminals convicted of different crimes, contrasted with the percentage in the general population, can be seen at a glance in the accompanying diagram.

FIG. xxxix.—PERCENTAGE OF MENTAL DEFECTIVES AMONG PERSONS COMMITTING CRIMINAL OFFENCES, AND IN THE GENERAL POPULATION (948 CONVICTS).



It will be seen, by referring to this diagram, that mental defectiveness is associated the most intimately with stack-firing, but also to a very large extent with all crimes of malicious damage to property, and with unnatural sexual offences; that it characterises, in less degree, crimes of violence not associated with robbery; and that it is entirely dissociated, within the limits of our sample, from such crimes as embezzlement, forgery, &c., classed by us under "fraud": in fact, it will be realised from a glance at the diagram, that, with the exception of those technically convicted of fraudulence, all criminals are pronouncedly more mentally defective than are law-abiding persons in the general population.

Condensing the many sub-divisions we have lately been considering into the five broad groups of criminals of our original plan, we have the following table:—

TABLE 101.

Nature of Crimes.	Totals.	Mental Grades.			Percentage of mental defectives committing each crime.	Per cent. of general population committing the several offences. Table 88.
		Intelligent and fairly intelligent.	Intermediate or Unintelligent.	Mentally defective.		
Malicious damage to property ...	55	21	12	22	40·00	·406
Stealing and burglary	442	256	141	45	10·18	4·180
Sexual offences	101	49	39	13	12·87	·199
Violence to the person	183	140	32	11	6·01	1·696
Forgery, coining and fraud ...	167	149	14	4	2·40	·722
Totals	948	615	238	95	10·00	7·203

(Per cent. of general population committing the above offences, excluding those tried summarily, 1·294.)

—which contains all the information we require for constructing representative four-fold tables correlating intelligence with crime.

(d) *Measures of Association between Defective Intelligence and Criminal Proclivity.*—Confining attention to the relation of intelligence to criminality generally, and taking our minimum estimate of 10 per cent. as representing the prevalency of mental defectiveness amongst criminals, and 7·2 as the percentage of criminals in the general population—the data presented in the last table can be rearranged as follows:

——	Defectives.	Non-defectives.	Totals.
Criminals	95	853	948
Non-Criminals	56	12,157	12,213
Totals	151	13,010	13,161

This table represents the respective frequencies of a random sample of 13,161 persons in the general population, classified into the four groups of (1) mentally defective criminals; (2) criminals not mentally defective; (3) mentally defective non-criminal subjects; (4) subjects who are neither criminal nor mentally defective. Thus, out of a total of 948 criminals, we have 95 who are, and 853 who are not, defective; and since the persons who are sentenced to imprisonment at some time of their lives constitute 7·2 per cent. of the general population, the total number of individuals represented in the table $= \frac{948 \times 100}{7 \cdot 2} = 13{,}161$; and the total number who are not, and never will be, so convicted, equals 12 213. Next, of these 12,213 non-criminal persons, ·46 per cent. or 56 are, and 12157 are not, mentally defective. Finally, the table is completed by adding the criminal to the non-criminal frequencies; when it leads to the following equation:—

$$\cdot 00639 = \cdot 00452r + \cdot 00686r^2 + \cdot 00326r^3 + \cdot 00107r^4 \quad . \; . \; . \quad \&c.;$$

and $$r = \cdot 6553.$$

Turning next to the consideration of criminals convicted of the five types of crime—incendiarism, theft, sexual offences, violence and fraud—we construct, from the data in Table 101, the following representative fourfold tables :—

TABLE 102.

—	Intelligence.		
	Defective.	Not defective.	Totals.
Fraudulent criminals	4	163	167
Not " "	147	12,847	12,994
Violence offenders	11	172	183
Not " "	140	12,838	12,978
Sexual offenders	13	88	101
Not " "	138	12,922	13,060
Thieves, &c.	45	397	442
Not "	106	12,613	12,719
Incendiaries, &c.	22	33	55
Not "	129	12,977	13,106
Totals of each	151	13,010	13,161

These tables lead to the following equations :—

Fraudulent criminals :

$$\cdot 000158 = \cdot 000984r + \cdot 002481r^2 + \cdot 002734r^3 + \cdot 000912r^4 + \cdot 000022r^5 + \cdot 000693r^6$$

Violence offenders :

$$\cdot 000677 = \cdot 001065r + \cdot 002644r^2 + \cdot 002847r^3 + \cdot 000894r^4 + \cdot 000031r^5 + \cdot 000737r^6$$

Sexual offenders :

$$\cdot 000900 = \cdot 000633r + \cdot 001734r^2 + \cdot 002156r^3 + \cdot 000915r^4 - \cdot 000015r^5 + \cdot 000447r^6$$

Thieves, &c. :

$$\cdot 003034 = \cdot 002241r + \cdot 004632r^2 + \cdot 000367r^3 + \cdot 000299r^4 + \cdot 000144r^5 + \cdot 000942r^6$$

Incendiaries, &c. :

$$\cdot 001624 = \cdot 000372r + \cdot 001102r^2 + \cdot 001536r^3 + \cdot 000802r^4 - \cdot 000039r^5 + \cdot 000175r^6$$

whose solution provide the following coefficients :

Fraudulence	$r = \cdot 1201$
Violence	$r = \cdot 3102$
Sexual crime	$r = \cdot 4630$
Theft and burglary	$r = \cdot 5859$
Arson	$r = \cdot 7600$
All crimes	$r = \cdot 6553$

It should be particularly noticed that the coefficients, tabulated above, are *minimum* measures of the relationship between mental defect and conviction for crime. The estimate we have taken of 10 per cent. of criminals, mentally defective, is a *minimum* value ; had we taken our *maximum* estimate of 20 per cent., the values of the several coefficients would have been considerably increased, and, for all kinds of crime, instead of ·65, would have been ·79. And the percentage we have employed of criminals in the general population relates to all kinds of offenders—to those whose cases were tried summarily, as well as to those who were dealt with at assizes and quarter sessions. Any more restricted notion of the criminal we might have adopted would have had only slight influence upon the values of the coefficient. For instance, had we considered that our statistics of mental defectiveness applied only to the convict criminal from whom they were obtained, and had we, accordingly, adopted a percentage of 1·29, which is the proportion of convicted felons in the general population, the correlation coefficient for convicts generally would have been ·63, instead of ·65—an insignificant difference. It is clear that the relationship between mental defectiveness and the committing of all types of crime, with the exception of some kinds of fraud, is an extremely intimate one. The strength of this bond transcends that of any we have hitherto been able to discover : and it is evident that defective intelligence is one of the primal sources of crime in this country.

to suppose that in the long run, of those liable to be convicted, the abler would more skilfully evade, and the mentally defective would more inevitably become entangled in the meshes of the police net. In the next place, their greater economic instability when at large would appear almost to compel many mental defectives to drift into prison. Unteachable, unemployable, a nuisance to themselves and everyone else, without a place in the economic régime of a law-abiding community, the position of unsupervised mental defectives is extremely forlorn, and can hardly fail, in the long run, to compel them to swell disproportionately the criminal ranks. But probably the chief source of the high degree of relationship between weak-mindedness and crime resides in the fact that the criminal thing which we call criminality, and which leads to the perpetration of many, if not of most, anti-social offences to-day, is not inherent wickedness, but natural stupidity. At any rate, we need only study the penal record of habitual criminals to realise fully that the one characteristic of the offences of 90 per cent. of the 150,000 persons convicted to prison every year—the one characteristic, apart from their intolerableness in a well-ordered society, is the incredible stupidity of these offences.*

V. *Relation of Mental Defectiveness to other Constitutional Determinants of Crime.*

To resume: defective physique, extreme forms of alcoholism, epilepsy, insanity, sexual profligacy, and weak-mindedness—these are the constitutional conditions, and the only ones, which so far have emerged as significantly associated with the committing of crime in this country. An interesting question that arises is to what extent are these conditions several manifestations of one and the same thing? The correlation coefficient with criminality of alcoholism is ·39, of epilepsy is ·26, of sexual profligacy is ·31, and of mental deficiency is ·64. From the high value of the last coefficient we would presume that, if reducible to one condition, it is mental defectiveness which would most likely prove to be the common antecedent of the alcoholism, epilepsy, insanity and sexual profligacy. The coefficients quoted above measure the relation of these several conditions with *criminality in the general population;* and to decide whether they are traceable to defective intelligence, we require to know the values of their coefficients of correlation with *intelligence in the general population.*

The relation of mental defectiveness to extreme forms of alcoholism has been investigated by Pearson; and in his memoir, already referred to, he states ·69 to be its measure on the correlation scale.

Assuming that, so far as epilepsy is concerned, our sample of criminals may be regarded as a random sample of the general population, the correlation coefficient of epilepsy with defective intelligence is found by the data in the following table to be ·22.

—	Mentally Defective.	Non-Mentally Defective.	Totals.
Epileptic	71	19	90
Non-Epileptic	877	529	1,406
Totals	948	548	1,496

$$\cdot 00934 = \cdot 04481r + \cdot 01193r^2 - \cdot 00934r^3 + \cdot 00167r^4$$

The relation of sexual profligacy and of insanity to feeble-mindedness in the general population we have no means of ascertaining; but we have shown that, amongst criminals, feeble-mindedness and insanity are to some extent related (see p. 251).

* The following are cases in point:—

h. 498 W.S. (*see* Records 298) said he fired a haystack because he wanted to give himself up. Since his wife and children, whom he had dearly loved, had left him, many years ago, he had been on the tramp, and could not rest. He had wandered about everywhere, as if it "had been ordained that he shouldn't stop." When he got work, he could not keep to it, as it was "like someone behind him pulling him away": and he had to go on the tramp again. He did not know how otherwise he could get to prison: so he set fire to a haystack.

h. 134 W.M. (Records 2976) is a capable watchmaker and repairer; but, excluding one conviction for burglary, he has been sentenced six times to penal servitude, and nine times to short terms of imprisonment, for the same offence, viz., for pawning watches entrusted to his charge for repair.

h. 2 S. S. (Records 2644) has the following penal record: twice convicted in '91 for stealing a barrow and a glass; four times in '92 for stealing a barrow, a bird, fishes and a coat; three times in '93 for stealing a barrow and tools, and for fraud; five times in '94 for stealing a trolley, a rabbit, fowls, a rabbit, and a barrow; once in '95 for stealing boots; once in '96 for stealing a knife; once in '01 for stealing a picture; four times in '02 for stealing tools, coat, tools, and for failing to report; once in '03 for stealing fowls; three times in '04 for stealing fowls, a rabbit and for burglary; and once in '05 for frequenting.

Accordingly, the partial correlation coefficient with crime, for constant intelligence, of alcoholism,

$$ {}_i\rho_{ca} = \frac{\cdot 3905 - \cdot 6880 \times \cdot 6388}{\sqrt{1-\cdot 6880^2}\sqrt{1-\cdot 6388^2}} = \cdot 0877 \pm \cdot 039 $$

and of epilepsy,

$$ {}_i\rho_{ce} = \frac{\cdot 2600 - \cdot 2217 \times \cdot 6388}{\sqrt{1-\cdot 2217^2}\sqrt{1-\cdot 6388^2}} = \cdot 1578 \pm \cdot 04 $$

The former coefficient, in relation to its probable error, is barely significant; the latter, although significant, is small, and, would probably be reduced if a measure of the relation between epilepsy and feeble-mindedness could be obtained through a more legitimate sample of the general population.

Our conclusion is that alcoholism, epilepsy, and, probably, sexual profligacy and insanity also, in their relation to crime are accidental associations, depending upon a primary high degree of relationship between defective intelligence and crime. Is the inferior physique of the criminal dependent similarly upon his defective intelligence? Statistical evidence shows clearly that this is not the case. The relation of intelligence to stature has been investigated in the general population; and the measure of their correlation has been found to be zero. Allowing for class differences of stature by confining attention to general labourers and artisans only, the correlation of this physical and mental condition amongst criminals equals ·02 ± ·03.

VI. *Conclusion.*

Our final conclusion is that English criminals are selected by a physical condition, and a mental constitution which are independent of each other—that the one significant physical association with criminality is a generally defective physique; and that the one vital mental constitutional factor in the etiology of crime is defective intelligence.

CHAPTER V.

The Influence of the "Force of Circumstances" on the Genesis of Crime.

I. *General Remarks.*

So far, we have been analysing, contrasting, and tracing the associations of the physical and mental qualities of the criminal; and we have measured the relative weights attaching to several of these—alcoholism, epilepsy, weak-mindedness, &c.—as *constitutional* influences on the genesis of crime. In the present chapter, we turn to an examination of an entirely different series of influences related to the social, economic, and other *environmental* conditions of offenders: in other words, we shall here be dealing with the relation, to the genesis of crime and the production of criminals, of what has been frequently described as "the force of circumstances."

Concurrently with the study, by Lombroso and his followers, of the criminal man as an anthropological phenomenon, the so-called "causes" of crime as a social phenomenon have been the subject of inquiry by another set of investigators, and notably by Enrico Ferri and Lacassagne. No difference of opinion, however, held by these opposite camps of investigators with regard to the etiology of crime and the origin of the criminal, implies a corresponding division on the truth of the fundamental facts upon which their respective creeds are based. The sociologist does not appear to discredit the existence of the physical and mental stigmata of a criminal type; nor, apparently, does the anthropologist deny that adverse environmental conditions are necessary for the consummation of crime. The difference of opinion between these investigators resides, rather, in the relative importance attached to what are described by each as the subjective, and objective, causes of crime. The extreme criminal anthropologist considers that the essential cause of crime is a subjective one. The root idea of his doctrine is that the criminal is born to his estate: he is constitutionally an outcast; and becomes a law-breaker despite of his circumstances, despite, even, of himself. In support of this view, he points to the physical, mental, and moral abnormalities of the criminal. These stigmatise him as a product of anomalous biological conditions, as born to do evil—as a veritable criminal *né*. As Lombroso said of the Palermo poisoner, her physical characteristics prove that "the woman was born to do evil, and that if one occasion to commit it had failed, she would have found others." The creed of the criminal sociologist, on the other hand, is that the law-breaker is not born, but is made, criminal: his physical, mental and moral characteristics have not a biological origin, but are products, rather, of the force of circumstances. And in support of this contention, the sociologist points to the adverse social, economic, and other environmental conditions of the criminal, as self-evident external causes of his physical and mental constitution, and of the crimes he commits.

Now, while we are prepared to accept this colloquial misuse of the term "cause" as expressing the mere *coexistence* of associated phenomena, we must admit our inability to understand how any contemplative study, or how any "study of causes," apart from the analysis of association by statistical methods, can enlighten, or in any way extend, our knowledge of the etiology of social phenomena. The matter is not clarified by reference to the works of criminal sociologists, who, while deprecating statistical methods of inquiry, consider the enumeration of conditions *associated* with crime as sufficient evidence of the *causes* of this phenomenon. For instance, in a recent criminological work,* Dr. F. H. Wines devotes a chapter to what he calls "The Causes of Crime." The writer begins by inquiring "To what cause or causes must the occurrence of crime be attributed?" And replies: "(1) The answer may be confined to a statement of the conditions which precede the perpetration of a criminal act. This is the answer given by the statistician. (2) The causes of crime may be sought in the criminal himself. This may be called the subjective answer. (3) It may be sought outside the criminal, in all the external circumstances and influences by which he is surrounded. This is the objective answer." But, "only the two last named are, in truth, answers," the writer adds, after dismissing the idea of appeal to the statistician as entirely vain.

Starting, thus, with the statement of *where* the causes are to be sought, the author does not proceed next to explain *how* these causes are to be ascertained; but goes on, rather, to the enumeration of every kind of chance condition associated with the criminal's, or with anyone's, existence, and to the dogmatic assertion that any of these may be the causes of crime. Thus, he writes: "Orphanage is an acknowledged cause of crime." "Bachelorhood and spinsterhood have their own peculiar and recognised perils." "There is a no more prolific cause of crime than the want of a true home life in childhood and early youth." "We must include among the causes of crime ignorance, or the want of a suitable education; idleness; vicious companions; bad habits; and the dissipation of moral earnestness occasioned by worthless, misleading or immoral books." "War is a cause of crime." "Much crime has grown, and will continue to grow, out of the bitter conflicts between Capital and Labour"; whereas "constant employment and adequate remuneration strongly tend to subdue the impulse to theft and violence." "The toleration of vice is a cause of crime; and so is the fanatical effort to suppress it"; and so are "unsanitary conditions as well as civilization, religious superstition as well as the absence of religious conviction, &c., &c.," all of them causes of crime. In fact, "every thing is, or may be, a cause of crime in those upon whom it reacts unfavourably: poverty and wealth; density of population and sparsity of population; employment and unemployment; good times and bad times; city life and country life; health and disease; civilization and barbarism; there is no conceivable end to the antitheses which might here be enumerated." The author next modifies these generalities by admiting that "certain social causes of crime are more specially active than others"; and that "the causes of crime are not of the same order or potency." But, without developing this thesis, he remarks that it is a sign of narrow vision and immature thought to single out any one cause, and attribute the prevalency of crime to that; and he concludes by enunciating a belief that "to doubt that in the end truth will prevail over error, and righteousness over unrighteousness, is to believe in the Devil rather than in God."

We have quoted rather fully from this author, because his exposition of the idea of causation, as applied to social and economic phenomena—the idea that there is a veritable quality in the last straw, not possessed by the bulk of the truss, which enables it to break the camel's back—is typical of the intuitive, introspective, and descriptive method of inquiry pursued generally by criminal sociologists. Poverty, lack of education, parental neglect, are often prominently associated with the committing of particular crimes: it is reasonable that these conditions should conduce to crime; therefore, parental neglect, illiteracy, and poverty are the causes of these particular crimes. This is the form of argument adopted by the descriptive sociologist; and it exemplifies how inexplicably confused the notion of *causation* has become with the kindred idea of *association.* If all the social and economic conditions associated with criminal phenomena were thus related by the absolute, inherent, and inseparable bond which might satisfy the physicists' idea of causation, we could, perhaps, admit the justice of describing these associations as causes

* *Punishment and Reformation* by Frederick Howard Wines, LL.D.

already frequently shown, is to the partial correlation coefficient. To quote an instance: we found, in a previous chapter, that the correlation of alcoholism with crime is ·09: Are we to interpret this value as the extent to which the alcoholist tends to become criminal, or as the extent to which the criminal tends to be alcoholic? Or is the relation of alcoholism to crime due to the fact that both alcoholism and criminality have a common antecedent in defective intelligence? The value of the partial correlation coefficient of alcoholism with crime, for constant intelligence (·08±·04), tells us that undoubtedly the last of these three possible explanations is the right one. And similarly, employing appropriate partial correlation methods, Pearson has been able to settle finally the previously vexed question of the relation between alcoholism and defective intelligence, by demonstrating that, of these two conditions, it is the latter which is antecedent, and the former which is consequent.

The third and last objection of Mr. Wines is rather a definition of the limitations of scientific inquiry generally, than a condemnation of the statistical method in particular. The author writes:—"Furthermore, admitting the accuracy of the observations and calculations, and that no mistake has been made as to the actual order of sequence of the phenomena in dispute, the fact of sequence, even if it is invariable, is rather a hint than an explanation; it suggests the existence of a causal relation, but does not reveal the methods by which the supposed cause operates to produce crime." With parity of reasoning, an objection to the experimental method of physical science might be raised, on the grounds that the law of gravitation, revealed by this method of inquiry, contains no explanation of the inner mechanism through which Nature operates to produce the phenomenon of gravitation. Statistical science makes no claim to explain the operation of supposed causes; the distinctive merit of the science is that it reveals the fact of causal relationship.

The environmental conditions, possibly related to crime, are so manifold and complicated, and may come into association in so great a variety of ways and degrees, that to disentangle satisfactorily the contributory effectiveness of each from, and in relation to, all the others, would lead to a long and complicated inquiry.* Such a complete and final investigation of the matter is not possible within the limitation of the present records; whose analysis will hardly enable us to make more than a superficial survey of the subject. It is perfectly clear that the solution of etiological problems of crime must ultimately rest upon a statistical determination of the relative likeness, or unlikeness, between the environmental conditions of persons who do, and who do not, eventually become convicted criminals: consequently, to decide these questions, it is not only essential to know the family and personal histories of individuals convicted of crime, but also those of

* The complexity of environmental conditions, possibly associated with any individual criminal's career, is illustrated by the following autobiographical sketch of b. 196 W.R. (Schedule Records 617). He writes: "Sir, You called me up to ask me the history of my life. I did not answer you in a proper maner. But I would have done so If an officer had not been in the room. I am now takeing the trouble to write it for you. I have been in and out of prison since I was fourteen years of age. I have been rared in an imoral atmosphere in one of our london slums I was always knocking about the streets I have had no schooling only what I have received in prison. My father was a hard-working man. But a great drunkard. My mother seldom drank at all. I have been a drunkard from the age of sixteen. I have been in a lunitic asylam once. Powic Asylam Worcester in the year 1900. I was there ten months. One of my aunts on my mother's side had been in an asylam in london. I have had sunstroke in this country it was in 1896. I lost my leg in covent garden market sleeping out one night on the side of the pavement a cart came by and crushed my leg aside of the curb. Mortyfication set in a few days after and the leg had to be amputated. It was taken off by Dr. B. in charing cross hospital in the year 1886. I was twelve years of age at the time. There were twelve children in the familey ten are living and two are dead. I am the onley one that as ever been in prison. We lived in london sometimes in one room sometimes in two. I have got this term of imprisonment for stabing. It is the first time that I have ever used a weapon to anybody in my life. I have done a bit of exerbition boxing for a living at race meetings and london clubs and when I was not doing this I was knocking about getting a crust of bread the best way I could. This is my longest term of imprisonment. My longest term before this was six months. I have got about thirty convictions against me. Onley one of them for theft. All my brothers and sisters are married and got children. Except the youngest two. They all work for a living and they all drink more or less except my youngest brother who is the youngest in the familey. There are two older than me and seven younger. My mother died with her last child at the age of forty-two. My father died from the effects of an accident. He was knocked down by a horse and cart three years ago in London. my mother as been dead sixteen years. I have had very little ilness in my life. I have had vernilary ilness twice about twelve years ago. I have had my head knocked about a great deal and I always suffer from the same. I perfer a country life to a town. When I leave here I intend to try and lead a good life I shall join the Salvation Armey and there I will be able to work at the trade I have learnt here and in a few years time I live in hopes of becoming a respectable member of society. If there is any other question you would like to ask me I am willing to answer it and healp you in your siamtific research providing there is not an officer there to hear all ones canare. I remain yours to oblige, W.R."

unconvicted persons of the same age, class and intelligence, in the general population.* This, at the outset of his inquiries, is the difficulty that confronts the criminal statistician: the inability to obtain statistics of the general population to compare with his own data. And it is the lack of these general data which has been the chief obstacle to anything like finality of conclusion in the investigation of the present chapter. Another difficulty, moreover, restricting the scope of our inquiry, lies in the circumscribed character of our own criminal records. These data relate, not to criminals generally, but to convicts indicted for serious offences, and to the extreme tail, or worst kind, of habitual criminals only, *i.e.*, to those who have been so frequently convicted as to receive eventually a penal servitude sentence. For these reasons, the values of any correlations we may reach from these limited data are likely to be often considerably lower than would be corresponding values obtained from more representative criminal data, or from statistics of the general population, that could be divided legitimately into representative criminal and non-criminal sections. We emphasise these points here because, in most of our previous inquiries, we have been able to supplement our data: so that conclusions we have reached with regard to *constitutional* determinants of crime have a more general application and validity than attaches to some of the *environmental* relations we have been able to measure. The utmost we hope from this chapter's contribution towards the solution of etiological problems of crime is that the general trend of information we have obtained from our data of convicts may serve as a rough measure of the relative importance of environmental and constitutional influences.

II. *Definition of Conditions examined.*

The environmental conditions whose relation to criminal conviction we have examined are the following:—

I. *Nationality.*—Our data are too few for the making of a serviceable examination of all the different scheduled nationalities which, for the purpose of this examination, we have condensed to four broad groups, viz.: (*a*) English, Welsh, and Scotch; (*b*) Irish; (*c*) Foreign; and (*d*) Jewish.

II. *Education.*—With regard to this important condition—ignorance due to lack of education being placed by criminologists high on the list of "causes of crime"—our data supplies information in two directions. One set of data is related to the kind of education received; the other records the result achieved by the particular form of education provided. The importance of differentiating clearly between these two meanings colloquially associated with the term "education" has been emphasised by Pearson, whose terminology, describing the former condition as *formal*, and the latter as *effective* education, it will be convenient to adopt.

(a) *Formal education.*—The classification relates (1) to the *kind of school teaching* received—whether at an elementary or secondary school: or whether industrial or reformatory school teaching has formed part of the curriculum; or whether no education has been provided by any orthodox school; and relates (2) to the *age of the subjects at leaving school.*

(b) *Effective education.*—Here, also, we have a two-fold classification, viz.: (1) according to the standard reached by subjects on leaving elementary schools and, for those who have received secondary education, according to whether the results achieved were good, fair, or indifferent (Records 1 to 1,000), or by the form reached on leaving school (Records 2,500 to 3,000 and supplementary records); and (2) according to the educational grade, decided by the schoolmaster, of each subject, on his reception into prison. This official classification should form an unbiassed estimate of the profit derived by prisoners from the particular schooling they have received; and it should be particularly valuable as a graduated measure of general intelligence.

III. *Employment.*—Subjects are grouped within four categories describing whether, prior to conviction or during intervals of imprisonment, they have been in regular work, have only worked occasionally, have been voluntarily unemployed, or have been unemployable.

IV. *Alcoholism.*—Subjects are recorded within three categories according to their repeated intemperance, temperance, and total abstinence.

* Many dogmatic assertions that poverty, illiteracy, irreligion, parental neglect, &c., &c., are causes of crime, have resulted from the fact that the general prevalency of these conditions, in what Lombroso described as our "brilliant European civilization," has been realised for the first time when studying criminals; and has accordingly been regarded as peculiar to the personal histories of these individuals only. What of the illiteracy, and parental neglect, &c., of the "thirty-thousand needle-women," of the occupants of "dingy, poor, and dirty dwellings where the unfortunate not-yet-enlisted-into-that-Force are struggling manifoldly," of the "dim millions that toil and moil continually under the sun?"

V. *The influence of family life.*—The relations of home and family life to criminal conviction are examined under four separate headings :

(a) *The standard of living of parents.*—This represents the economic position and social status of the home environment within which the criminal subjects were brought up. Four broad grades are recognised, designating the parents as belonging to the well-to-do, the prosperous poor, the poor, and the very poor and destitute classes.

(b) *The age of the subjects at the death of their mothers.*— Under this heading, the restraining influence of maternal authority on the genesis of crime is examined.

(c) *The order of the subject in his family.*

(d) *The number in the family of the subject.*—It has been maintained that a disproportionate number of "only sons" become convicts ; and that this is the result of the undue indulgence and spoiling of the first son, or only child, born in the family ; and is also connected with the absence of training in self-effacement and sacrifice necessitated by the presence in the home of brothers and sisters. An analysis of our records under the above headings should throw light upon these interesting matters.

VI. *The relation of the first to subsequent conviction of convicts.*

(a) *The age of the subject at first conviction, and* (b) *the nature of the subject's first sentence*, cannot be appropriately described as environmental factors connected with the criminal career. It will be convenient, however, to discuss in the present chapter these relations, whose statistical analysis should lead to interesting conclusions.

III. *Nature of, and Method of dealing with, the Inquiry.*

In dealing with the above reputed environmental influences upon the genesis of crime, undoubtedly the most satisfactory procedure would be to examine the relations of each in a sample of the general population that could be divided into representative criminal, and non-criminal, sections respectively. The next best course would be to investigate these matters in a sample of criminals, representative in constitution of prisoners generally. Unfortunately, neither of these investigations are possible with the statistical material available for analysis. As we have pointed out, the only data we possess, save for one or two exceptions which will be considered later, are our scheduled records of convicts ; and, consequently, our inquiry must be limited in the main to an examination of the influence exerted upon the convict criminal's career by the several environmental factors specified. Although thus limited in the scope of their application, the conclusions we reach should nevertheless have great practical importance within this restricted sphere of inquiry ; and moreover, if they do not furnish exact information, these conclusions should, at any rate provide indication of the probable relations of the conditions examined to criminals generally. For the present, however, confining attention to convicts only, we would inquire : is the career of a convict, as measured by the gravity of his penal record, influenced by the environmental conditions enumerated above ? And if so, what, in each case, is the exact numerical estimate of its intensity ? To answer this question, the first task before us is to graduate our sample of convicts according to the gravity of their penal records.

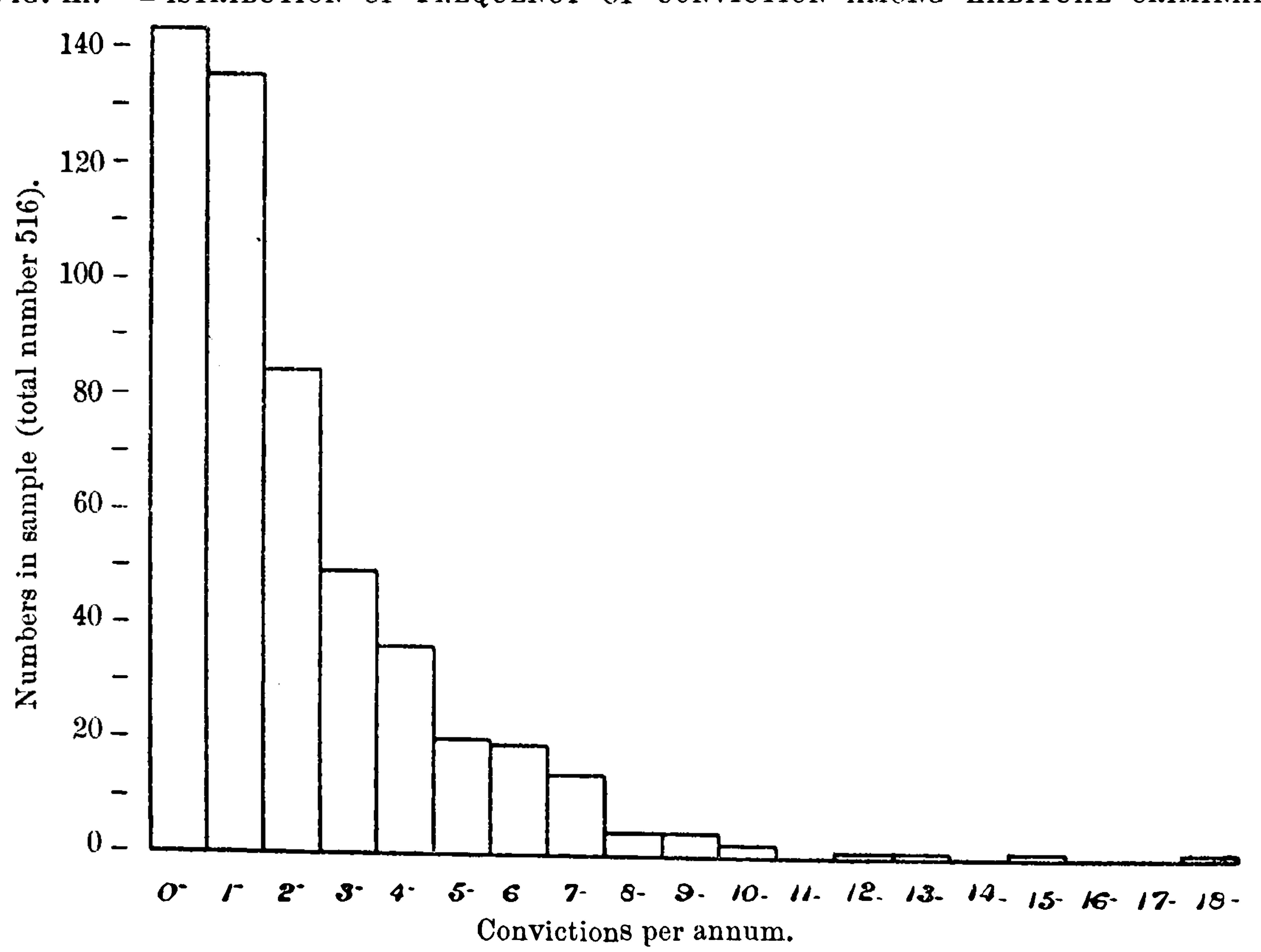
IV. *The Graduation of Convicts.*

Throughout this work, we have been regarding the criminal as "criminal" merely in the legal sense of the term : that is to say, we have defined our subjects as individuals who commit breaches of the law sufficiently serious to be dealt with by imprisonment. Similarly, without any presumption as to his mental and moral status, a man's criminality, so far as it concerns the State, is defined by the extent of his tendency to be imprisoned : degrees of tendency being measured in the first instance by his age at first conviction, and, subsequently, by the number of his convictions, and the length of his sentences, to incarceration. It would seem to follow, then, according to this notion of criminality, (see p. 26, Introduction) that the essential difference between criminal and non-criminal persons is one of degree only, and not of kind—that all persons, however non-criminal they may be, possess some degree of criminal tendency ; just as, all persons, however intelligent they may be, possess some degree of mental defectiveness : and that, on this hypothesis, the criminal tendency, like all other human characters, should have, in a random population, an approximately normal distribution of frequency (see p. 342, Chap. VII.). On this assumption, that criminality is a measurable quantity, distributed in the general population according to the normal law of frequency, we have represented in Fig. xxxvii., p. 237, Chap. III., the distribution of this character in the community by a normal curve. Referring to this diagram, it will be seen that the curve is divided into two main sections by a dividing line, whose position is such that the amount of area on the left side of the line bears the same proportion to the whole area as the number of

years of his criminal career, give the fraction of each year spent in prison. To take an example: it was found, upon consulting the official records, that the total period of a certain convict's life, between his first and last conviction, was fifteen years; and that during this period (1) he was altogether under confinement 3·58 years, (2) he was living in freedom 11·42 years, and (3) he was convicted altogether seven times. Clearly, his average number of convictions during every year of freedom was $\frac{7}{11{\cdot}42} = {\cdot}61$, and the fraction of every year, on the average, passed in prison, was $\frac{3{\cdot}58}{15} = {\cdot}24$ of a year.

Estimated in this way, it appears that the frequency of conviction of habitual criminals who become convicts ranges from fractional numbers, less than 1 per annum (26 per cent. of all cases), and between one and two (also 26 per cent. of all cases)—the commonest experience—to the very exceptional number of eighteen conviction per year of freedom—which is the record of one outlying individual amongst 514 examined. This extraordinary penal record means that the person it refers to was consistently reconvicted within three weeks of his discharge from prison. Against this exceptional case, however, we have the fact that, in 52 per cent. of instances, habitual criminals enjoy on the average a year of freedom before they are again incarcerated; and that, for all convicts, the average amount of freedom between periods of imprisonment is 4½ months (*i.e.*, the mean frequency of conviction per year of freedom is 2·7, *see* Table 116, page 284). With regard to the fraction of every year, measured by the average number of tenths, spent in prison per annum since first conviction, the official records show that the range extends from under one-tenth to over nine-tenths of the year, and that the proportional frequencies attaching to each successive interval are distributed fairly equally throughout the range, the mean time of imprisonment for all convicts being ·472 of a year. (*See* Table 116). The graduation of convicts on the scale measuring the average number of convictions per year of freedom is shown diagrammatically in Fig. XL.: the interesting feature of which is that this frequency distribution corresponds, as we premised it should do, to the tail-end of a normal curve of frequency.

FIG. XL.—DISTRIBUTION OF FREQUENCY OF CONVICTION AMONG HABITUAL CRIMINALS.



V. *The influence of environmental conditions on criminal tendency or recidivism, measured by the gravity of the penal records of convicts.*

We present now the results obtained by measuring the relations of convicts, graduated, as described above, on scales of increasing criminality, to the several environmental conditions already enumerated. The original statistics upon which the inquiry is based are published in the scheduled records 2,501 to 3,000, and supplementary records; and for every relation examined, the correlated data, and other particulars not accompanying the text, will be found in Appendix, Tables 258 to 276.

A. *The Relation of Recidivism to Intelligence.*

A feature to be borne in mind is that, with increasing degrees of recidivism, there is a small, but nevertheless regular regression, in the meau intelligence of convicts. With increasing frequency of conviction, the proportion of convicts who are mentally defective progressively increases from 19 per cent. to 36 per cent., and their mean intelligence decreases from + ·39 to − ·27 ; on the other hand, with increasing periods of imprisonment, the average intelligence of convicts increases from − ·08 to + ·32—the proportion of the mentally defective correspondingly diminishing from 33·6 per cent. to 23·6 per cent. Evidently, the characteristic of the penal records of relatively weak-minded offenders is frequency of conviction to short periods of imprisonment, for trivial offences ; and the distinguishing features of the penal records of the more intelligent recidivists are fewer convictions, but longer sentences, for serious offences. The correlated data, and other particulars exhibiting these interesting relations between intelligence and recidivism, are shown in the following table :—

TABLE 104.—INTELLIGENCE AND RECIDIVISM.

Frequencies and means : intelligence being measured upon a scale giving a normal distribution, the class Fair *having a range from* 0 *to* 1.

Intelligence.	Totals.	Convictions per year.																Mean convictions. Devs. ±2 p.e.
		0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-	
Intelligent	100	44	12	16	6	9	4	4	3	1	—	—	—	—	—	—	—	−·44±·32
Fairly intelligent	152	43	48	21	17	6	3	8	2	—	2	—	1	—	—	—	1	−·19±·27
Unintelligent	115	26	27	23	12	12	6	1	3	2	—	1	—	1	—	1	—	+·23±·31
Weak-minded	138	27	40	24	13	9	7	6	6	1	2	1	—	—	2	—	—	+·36±·28
Totals	514	140	127	84	48	36	20	19	14	4	4	2	1	1	2	1	1	General mean 2·60
					84		69											
Mean intelligence and deviations of means.	1·08	+·39	+·08	−·21	−·15		−·27											(s.d. of conv'ns 2·45)
Twice probable error... ...	±	·14	·14	·16	·18		·20											
Standard deviations	1·34	1·26	·98	1·28	1·23		1·36											

Intelligence.	Fractions of year imprisoned.										Mean imprisonment. Devs. ±2 p.e.
	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	
Intelligent	12	6	9	5	12	8	12	16	19	8	+·77±·38
Fairly intelligent	21	13	17	21	11	19	14	14	16	7	−·16±·32
Unintelligent	12	9	16	14	14	12	11	12	11	4	−·11±·37
Weak-minded	22	15	16	15	9	18	14	11	12	8	−·32±·33
Totals	67	43	58	55	46	57	51	53	58	27	General mean 4·73
	110		113		103		104		85		
Mean intelligence and deviations of means.	−·08		−·04		−·04		+·14		+·32		(s.d. of imprisonment 2·79)
Twice probable error	·16		·16		·16		·16		·18		
Standard deviations	1·10		·96		1·21		1·40		1·43		

Correlation of intelligence with frequency of conviction—
- Coefficient r (grouping I. F. & U. W. ... ... − ·16 ± ·03
- Ratio η (intelligence upon convictions) ... ... ·20

Correlation of intelligence with time of imprisonment—
- Coefficient r (grouping I. F. & U. W.) ... ... ·10 ± ·03
- Ratio η (intelligence upon imprisonment) ... ... ·12

It will be seen that the correlation coefficient of intelligence with convictions is − ·16, which measures the extent to which defective intelligence is associated with frequency of conviction ; and that the coefficient of imprisonment with intelligence is + ·10, which measures the strength of bond uniting length of imprisonment, or sentence, with good intelligence. It is clear that when estimating the influence of environment upon criminal tendency, measured by frequency of conviction or length of imprisonment, due allowance must be made for effects upon these relations which are attributable to differences of intelligence.

B. *The Influence of Nationality on Recidivism.*

We find from the data that the proportions of our particular sample of convicts who are British, Irish, alien, or Jewish in nationality, are 82·1 per cent., 10·3 per cent., 6 per cent., and 1·6 per cent., respectively. These figures, of course, do not necessarily give the proportional representation of aliens, in convict or other State prisons ; and, consequently, we cannot, from the analysis of our own data, provide any information as to the nationality differentiation of recidivists in England. All we can positively state is that the mean number of convictions, and the average length of imprisonment, recorded against recidivists grouped, by their nationality, within four broad classes, are as follows :—

TABLE 105.—NATIONALITY AND RECIDIVISM.

Nationality of Recidivists.	Convictions per year.			Fractions of year imprisoned.		
	Means.	Exc.	2 p.e.	Means.	Exc.	2 p.e.
British	2·63	·03	± ·16	4·73	·02	± ·18
Irish	2·71	·11	± ·45	4·58	−·14	± ·52
Alien	2·02	− ·58	± ·59	4·59	−·12	± ·66
Jewish	2·50	− ·10	±1·17	5·25	·53	±1·33
Totals	2·60			4·72		

Within the limits of probable error, there is no significant difference between any of the mean values quoted above. We conclude that the degree of his recidivism bears no relation to a convict's nationality : that Englishmen, Irishmen, foreigners, and Jews, convicted in English courts, are, on the average, re-convicted with equal frequency, and, in the long run, receive sentences of the same severity.

C. *The Influence of Employment on Recidivism.*

The frequencies, means, and other statistical information connected with this relation, derived from the correlated data in Appendix Tables 259, 260, are presented in the next table.

TABLE 106.—EMPLOYMENT AND RECIDIVISM.

Employment groups	Convictions per year.			Fractions of year imprisoned.			Intelligence.			Coefficient of correlation r of irregularity of employment with		
	Means.	Exc.	2 p.e.	Means.	Exc.	2 p.e.	Means.	Exc.	2 p.e.	Convictions.	Imprisonment.	Intelligence.
Employed regularly ...	1·48	−1·12	± ·35	3·01	−1·71	±·39	1·17	+1·14	±·17	·15	·27	−·20
Employed occasionally ..	2·79	+ ·19	± ·28	4·73	+ ·01	± ·31	− ·14	− ·17	±·14			
Voluntarily unemployed	2·74	+ ·14	± ·27	5·59	+ ·87	±·30	·70	+ ·67	±·13	Correlation ratio η of irregularity of employment with		
										Convictions.	Imprisonment.	
Unemployable	3·02	+ ·42	±·29	4·89	+ ·17	± ·34	−1·41	−1·45	± ·15	·31	·24	
Totals	2·60			4·72			·04					

It will be observed that convicts regularly employed prior to, or during, intervals of imprisonment, are, on the whole, convicted less frequently, and spend a smaller fraction of their time in prison, than do those whose work is not regular : and, of these latter, it should be noticed that it is the unemployables, or those who *cannot* work, who show the greatest liability to be re-convicted for crime ; and that it is the voluntarily unemployed, or those who *will not* work, who receive the longest terms of imprisonment. A probable source of this differentiation, however, will become apparent on referring to the several means of intelligence in the above table. For, it will be remarked, firstly, that the differences of mean intelligence of the arrays are much more pronounced, relatively to their probable errors, than are the mean differences of either convictions or imprisonment ; and, secondly, that it is the most intelligent convicts who either work regularly, or who, voluntarily, do not work at all, whereas, inability to work is the associated characteristic of defective intelligence ; and, also, it will be remembered that with increasing convictions the intelligence of convicts becomes more, and that with greater length of imprisonment it becomes less, defective. Now, in view of the conclusion reached in the last Chapter, we

who will not work appear to be convicted a trifle more frequently than others, and those who cannot, as well as those who will not, work, appear to spend rather larger fractions of their time in confinement. But the differences of penal record associated with regularity or irregularity of employment, with inability or unwillingness to work, are all of them trifling; and within the limits of probable error most of them are insignificant. In view of all the facts, our conclusion is that long terms of imprisonment militate against the regularity of a convict's employment when he is free from prison; but, regarded as an antecedent, the nature and amount of his work have very little, if any, influence, upon the extent of the convict's recidivism.

D. *The Influence of Education on Recidivism.*

(a) *Formal Education.*—The current contention that ignorance, due to lack of education, is a fruitful source of crime, refers, of course, to a lack of that condition which we have described, after Pearson, as "formal education." The practical question before us is whether there is statistical evidence for the belief that recidivism, measured by frequency of conviction and length of imprisonment, would be reduced in this country if the opportunity for receiving scholastic instruction was the same for all persons? If all children were taught at the same kind of school, and remained at school till the same age, would the incidence and gravity of crime be thereby affected? For a first attempt to answer this question, we turn to a statistical examination and comparison of the penal records of convicts (1) whose early education has been derived from such widely different sources as elementary, secondary, industrial, and reformatory schools, or from no orthodox school at all; and (2) whose school-education ceased at ages varying from eight to 19 years. If lack of formal school-education influences the genesis of crime, criminals who have not received any school-education should be the most frequently convicted; and one would anticipate that those who have passed through secondary schools, and who had received scholastic guidance until 18 years of age, would be less frequently convicted than others less fortunately trained. The statistical facts of the case, derived from the distributed data in Appendix, Tables 261, 262, 263, are as follows:—

TABLE 108.—FORMAL EDUCATION AND RECIDIVISM.

School education received.	Convictions per year.			Fractions of year imprisoned.			Intelligence.			Correlation ratio η with school of		
	Means.	exc.	2 p.e.	Means.	exc.	2 p.e.	Means.	exc.	2 p.e.	Convictions.	Imprisonment.	Intelligence.
Elementary ...	2·69	+·09	±·18	4·74	+·01	±·21	+ ·09	− ·16	±·01			
Secondary ...	1·97	−·63	±·50	4·91	+·18	±·51	+4·71	+3·46	±·35			
Industrial ...	2·54	−·06	±·67	5·59	+·86	±·77	+ ·32	− ·93	±·48	·11	·15	·52
Reformatory ...	3·10	+·50	±·47	5·34	+·61	±·54	+ ·73	− ·52	±·34			
Nil	2·28	−·32	±·38	3·93	−·80	±·43	+ ·50	− ·75	±·27			
Totals ...	2·60	—	—	4·73	—	—	+1·25	—	—			

	Convictions per year.					Fractions of year imprisoned.					Intelligence.					Coefficient of correlation with age at leaving school of		
	0-	1-	2-	3-	5-	0-	2-	4-	6-	8-	I.	F.	U.	W.	Imb.	Convictions.	Imprisonment.	Intelligence.
Mean age at leaving school.	14·40	14·20	14·58	14·33	14·33	14·03	14·52	14·35	14·53	14·30	14·58	13·79	13·43	13·51	13·23	−·01	·04	·21

As the relative values of the correlation ratios and correlation coefficients show, the formal education received by convicts is very much more closely related to their intelligence than it is to the length or gravity of their penal records. The differences between the mean intelligence of the several arrays are all of them unquestionably significant; and the correlation ratio (·52) of school with intelligence measures a high degree of relationship between these conditions. Moreover, the mean ages at leaving school show a regular regression with intelligence grade—the correlation coefficient measuring its degree being ·21. It must not be assumed, however, from these figures, that defective intelligence is necessarily a consequence of inferior school-education. Convicts who have passed through secondary schools have certainly the highest degrees of intelligence, and those who have not had any schooling are the most defective in this respect; but these differences are mainly an expression of the class-differentiation in intelligence demonstrated in the last chapter: that is to say, convicts who have had secondary education are superior in intelligence because they are drawn from a superior social class. And, similarly, the regression of intelligence with age at leaving school is dependent mainly upon the fact that the more intelligent convicts were brought up in a social class where the school-training of the young is continued to a later age. Statistical evidence on these matters will be given later (see pp. 286, 288); but, in the meantime, the chief task in hand is to measure, not the relation of education to intelligence, but its influence upon the penal records of convicts, after eliminating the effects due to differences of intelligence.

The correlation coefficient (r_{xy}) of intelligence (x) with convictions (y) is $-\cdot 16$, and with imprisonment (y) is $\cdot 10$: hence, the regression coefficient $\frac{\sigma_y}{\sigma_x} r_{xy}$ of the former is $\frac{2\cdot 45}{1\cdot 74} \times -\cdot 16 = -\cdot 22$, and of the latter $= \frac{2\cdot 78}{1\cdot 74} \times \cdot 10 = \cdot 16$. Thus, for every unit depreciation in the mean intelligence of a sub-group, ·22 must be added to the average number of convictions to be expected for the group, and ·16 units must be subtracted from its predicted average degree of imprisonment. Applying these corrections to the means quoted in the last table, we have:—

TABLE 109.—FORMAL EDUCATION AND RECIDIVISM II.

School education received.	Convictions per year.			Fractions of year imprisoned.		
	Predicted Means.	Actual Means.	Excess of Actual.	Predicted Means.	Actual Means.	Excess of Actual.
Elementary	2·60+·04	2·60+·09	·05±·18	4·73−·03	4·73+·01	+ ·04±·21
Secondary	2·60−·77	2·60−·63	−·14±·50	4·73+·56	4·73+·18	− ·38±·57
Industrial	2·60+·21	2·60−·06	−·27±·67	4·73−·15	4·73+·86	+1·01±·77
Reformatory	2·60+·12	2·60+·50	+·38±·47	4·73−·08	4·73+·61	+ ·69±·54
Nil	2·60+·17	2·60−·32	−·49±·38	4·73−·12	4·73−·80	− ·69±·43

From the above differences of mean in relation to their probable errors, it would appear, firstly, that there is no significant relation between a convict's formal education, when a child, and the frequency of his subsequent convictions for crime, or that, if any relation there be, it is those who have received no school education who are the least frequently convicted; and, secondly, that convicts receiving the longest terms of imprisonment are those who have been industrial and reformatory school-boys, and that those receiving the shortest terms are those who have not been educated at any orthodox school. Our conclusion is that the kind of school-education they may have received has no traceable influence upon the subsequent careers of convicts; but that, since industrial and reformatory school-boys must be the pick of those with the greatest law-breaking proclivities, this accounts for the fact that convicts with the worst penal records consist of those who have passed through industrial and reformatory schools.

With regard to age at leaving school, our conclusion is similar, and is based upon the partial correlation coefficients of age with penal record for constant intelligence (${}_{i}\rho_{pa}$) viz.:—

Age with convictions:

$${}_{i}\rho_{pa} = \frac{\cdot 0057 - \cdot 2073 \times \cdot 1573}{\sqrt{1 - \cdot 2073^2}\ \sqrt{1 - \cdot 1573^2}} = -\cdot 0278 \pm \cdot 0297$$

Age with imprisonment:

$${}_{i}\rho_{pa} = \frac{\cdot 0384 - \cdot 2073 \times \cdot 1011}{\sqrt{1 - \cdot 2073^2}\ \sqrt{1 - \cdot 1011^2}} = \cdot 0179 \pm \cdot 0297$$

This conclusion is that their age, on leaving school, has no appreciable influence upon the subsequent penal career of convicts.

(b) *Effective Education.*—Leaving out of consideration now the type of schooling received, we next proceed to measure the relation between the penal records of convicts and their "effective education." How are these records influenced by the apparent profit derived from whatever formal education has been received? Measuring profit derived from education by (1) the standard or form reached by the subjects on leaving school, and (2) the grade of education apportioned to each convict on his reception into prison by the school-master, we enquire: do the penal records of convicts, in the long run, increase or diminish in gravity as their education has been more effective? or are these records unaffected by the standard of education attained? Statistical information bearing upon this question, derived from the distributed and correlated data in Appendix Tables 264 and 265, is presented in the next table.

TABLE 110.—EFFECTIVE EDUCATION AND RECIDIVISM.

Effective education.	Convictions per year.					Fractions of year imprisoned.					Intelligence.					Coefficient of correlation of effective education with		
	0-	1-	2-	3-	5-	0-	1-	2-	3-	5-	I	F	U	W	Imb.	Convictions.	Imprisonment.	Intelligence.
Mean standard on leaving school.	5·13	5·29	4·79	4·97	5·08	4·90	4·88	5·12	5·23	5·30	5·79	4·72	3·84	4·03	3·27	—·03	·10	·48
Mean standard on reception into prison.	7·63	7·84	7·21	8·38	7·96	7·00	7·08	8·09	8·51	8·51	11·20	8·16	6·25	6·85	4·74	·06	·15	·42

A study of the relative values of the means in this table, within the limits of their probable errors, shews that (1), with increasing number of convictions recorded against convicts, there is no significant change in the mean standard attained by them on leaving school, and there is no change in the mean grade of education of these convicts on reception into prison ; that (2), with increasing lengths of a convict's imprisonment, his standard of education on both scales, does on the whole, although only to a small degree, tend to improve ; but that (3), as the intelligence of convicts becomes more defective, the degree of education they have attained falls off progressively and pronouncedly—the sixth is the average standard of intelligent convicts on leaving school ; the average standard of those whose intelligence is defective is the third. On admission to prison, the schoolmaster apportions 11, 8, 6, and 4 as the respective average educational grades of four groups of convicts who subsequently are independently classified as intelligent, fairly intelligent, unintelligent, and mentally defective, respectively. We would emphasise the importance of this regression of education with mental capacity as substantiating the soundness of our classification of prisoners according to their intelligence grade They illustrate, moreover, the importance of making due allowance for any differentiation in mental capacity, when measuring the relations of their effective education to the penal records of convicts.

The correlation coefficient of education with convictions and imprisonment are quoted in the above table. The coefficients of intelligence with convictions and imprisonment are —·16 and ·10, respectively (see p. 271). Consequently, the partial correlation coefficients for constant intelligence of :—

School education with convictions ${}_{i}\rho_{sc}=$

$$\frac{-\cdot 0263-(\cdot 4790\times -\cdot 1573)}{\sqrt{1-\cdot 4790^2}\ \sqrt{1-\cdot 1573^2}}=\cdot 0565\pm\cdot 0297.$$

School education with imprisonment ${}_{i}\rho_{sp}=$

$$\frac{\cdot 1036-(\cdot 4790\times\cdot 1011)}{\sqrt{1-\cdot 4790^2}\ \sqrt{1-\cdot 1011^2}}=\cdot 0632\pm\cdot 0297$$

Present education with convictions ${}_{i}\rho_{pc}=$

$$\frac{\cdot 0590-(\cdot 4178-\cdot 1573)}{\sqrt{1-\cdot 4178^2}\ \sqrt{1-\cdot 1573^2}}=\cdot 1389\pm\cdot 0297$$

Present education with imprisonment ${}_{i}\rho_{pp}=$

$$\frac{\cdot 1516-(\cdot 4178\times\cdot 1011)}{\sqrt{1-\cdot 4178^2}\ \sqrt{1-\cdot 1011^2}}=\cdot 1210\pm\cdot 0297$$

All these correlation coefficients are small ; and, in relation, to their probable errors, it is only the last two which are significant in value. We accordingly conclude, firstly, that the profit derived from school education exerts no influence upon the subsequent penal records of convicts ; and, secondly, that, with regard to the ultimate profit derived from scholastic education, the influence of this condition upon the convictions and imprisonment of convicts is measured by the fractions ·14 and ·12, respectively : which is to say that, on the correlation scale between 0 and 1, the small values of these fractions measure the trifling extent to which, not bad, but good, education, considered apart from its relation to intelligence, conduces in the long run to the committing of crime.*

* These correlation coefficients probably measure the increase of prison scholastic education associated with longer terms of imprisonment.

thoroughly, we examined the records of these 1,434 individuals apart from the remaining records of 1,318 convicts, whose size of family was not recorded.

Now, if his position in the family be entirely unrelated to a criminal's conviction; if the first-born, the last-born, and persons placed in any other intermediate position, are all equally liable to be criminally convicted—the expected distribution of all degrees of elder and younger family members who should become criminal would depend solely on the size of the families from which criminals are drawn; and could, accordingly, be theoretically calculated. For instance, our records show that the families of 131 convicts consisted of seven individuals; if, as far as their position in the family is concerned, these 131 individuals had been selected at random, it is clear that the same proportion of them, viz., $\frac{131}{7}$ or 19 ap., within limits of random sampling, should be first-born, second-born, &c., &c., and seventh-born, respectively.

In the following table are presented (1) the distributed frequencies of the order in and size of, the families of 1,434 convicts; (2) the distribution of birth-position actually given by the records of these 1,434 convicts, in contrast with their expected distribution of birth-position, calculated from the size of the families; and (3) the distribution of birth-position of another series of 1,318 convicts, whose size of family was not recorded.

TABLE 111.—NUMBER IN FAMILIES OF CRIMINALS, AND POSITION ORDER OF CRIMINALS IN THEIR FAMILIES.

Frequencies of total number of members in criminals' families, and the position-order of the criminals among those members. 1,434 *criminals.*

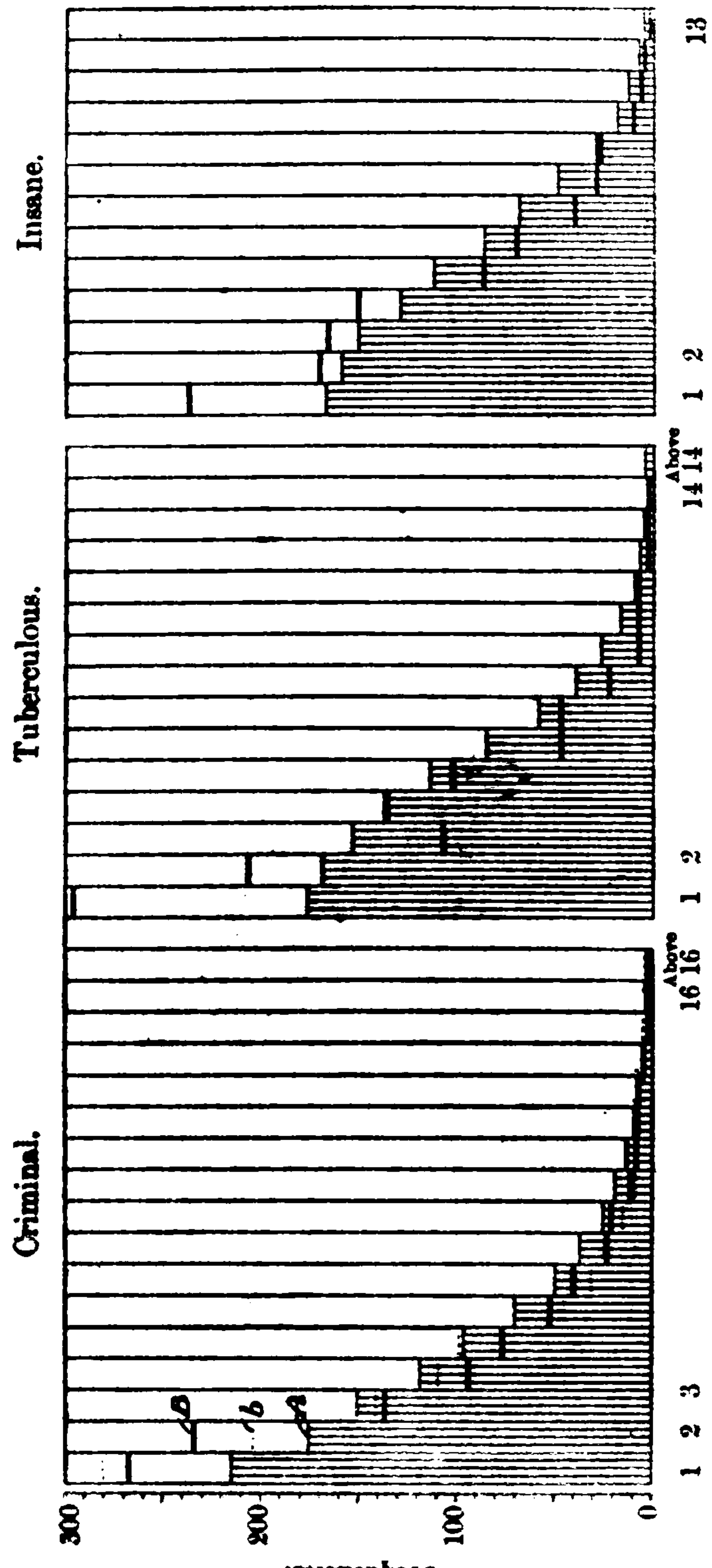
Order in family.	Number in Family.																							Totals.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	29	
1	57	38	57	39	53	42	16	17	18	11	15	4	6	4	2	5	1	—	—	—	—	—	—	—	385
2	—	35	47	47	50	37	33	33	15	7	16	5	7	4	3	2	2	1	1	—	—	—	—	—	337
3	—	—	32	17	29	27	23	14	11	9			4	7	1	2	1	—	—	—	—	—	—	—	197
4	—	—	—	27	17	19	21	10	7	6			5	4	3	4	—	—	—	—	—	1	1	—	135
5	—	—	—	—	37	12	8	13	6	11			7	3	1	1	1	—	1	—	1	—	—	1	111
6	—	—	—	—	—	38	12	8	1	3			2	2	—	—	—	—	1	—	—	—	—	—	75
7	—	—	—	—	—	—	18	19	3	8	—		1	2	1	1	—	—	—	—	—	—	—	—	58
8	—	—	—	—	—	—	—	15	10	3	1	[illegible]	2	—	1	1	—	—	1	—	—	—	—	—	34
9	—	—	—	—	—	—	—	—	12	13	1		—	2	—	—	—	—	—	—	1	—	—	—	31
10	—	—	—	—	—	—	—	—	—	7	4		1	—	1	—	—	—	—	—	—	—	—	—	17
11	—	—	—	—	—	—	—	—	—	—	9		—	1	—	—	—	—	—	—	—	—	—	—	12
12	—	—	—	—	—	—	—	—	—	—	—		4	2	—	1	—	—	—	—	—	—	—	—	13
13	—	—	—	—	—	—	—	—	—	—	—		7	3	1	—	—	—	—	—	—	—	—	—	11
14	—	—	—	—	—	—	—	—	—	—	—	—	—	5	1	—	—	—	—	—	—	—	—	—	6
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	—	—	—	—	—	3
16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	1	—	—	—	—	—	—	4
17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	2
19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
Totals ...	57	73	136	130	186	175	131	129	83	78	62	50	46	39	16	20	6	5	4	—	4	2	1	1	1,434

TABLE 112.

Position-order in Family.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Over 16.
Expected frequencies order in 1,434 criminals calculated solely from the sizes of their families ...	309·2	252·2	215·7	170·4	137·9	100·7	71·5	52·8	36·7	27·4	19·6	14·0	9·8	6·3	3·5	2·5	3·8
Actual frequencies of order recorded ...	385	337	197	135	111	75	58	34	31	17	12	13	11	6	3	4	5
Expected frequencies of order in 1,000 criminals	215·6	175·9	150·4	118·8	96·2	70·2	49·9	36·8	25·6	19·1	13·7	9·8	6·9	4·4	2·4	1·7	2·6
Actual frequencies reduced to 1,000	265·8	235·0	137·4	94·1	77·4	52·3	40·5	23·7	21·6	11·8	8·4	9·1	7·7	4·2	2·1	2·8	3·5
Actual frequencies of order of balance of 1,318 criminals whose size of family was not recorded	370	269	186	144	130	59	41	32	20	12	17	9	9	7	6	2	5
The same reduced to 1,000	280·7	204·1	141·1	109·3	98·6	44·8	31·1	24·3	15·2	9·1	12·9	6·8	6·8	5·3	4·6	1·5	3·8

Fig. xli.—Distribution of order of birth in 1,000 individuals.

A. Expected frequencies. B, b. Observed frequencies.



It will be realised by comparing the expected, with the observed, frequencies, in the above table, and it will be seen at a glance from the accompanying graph, diagrammatically representing the contrasted frequencies, that the first and second-born members of a family are unquestionably more likely to be criminally convicted than are those who are later born. It should be noted, moreover, that the unexpected predominance of first and second members, and complementary defect of younger family members, convicted of crime, is shown by both samples of convicts we have examined. Since large families obviously contain more criminal members than small families, it is true that these samples have inevitably been weighted to some extent by size of family; consequently, if the earlier born, in larger families, are more likely to become criminal than the earlier born in smaller families, the frequencies we have found do not necessarily correspond precisely to the frequencies that would be obtained from records of a random sample of families in the general population: in short, in the circumstances stated, the preponderance of first and second-born, shown by our records, may be unduly emphasised. However, any such error in our frequencies, although it may admittedly have led to an over-statement of the fact, would not contradict the only conclusion to be drawn: which is that elder members of a family, especially the first and second, are liable to become criminal at a greater rate than are the younger members.

What is the explanation of this selection of the first and second-born for criminal conviction? Is it due to an intensified constitutional proclivity, in older members of a family, to become criminal? or does it result from the fact that environmental conditions, peculiar to families of one or two offspring only, foster the development of criminal tendencies, which, in the conditions of a wider family circle, remain latent, or develop to a lesser degree?

The fact that the selection referred to is most probably connected in some way with constitutional proclivity is shown by the closely similar weighting of first and second-born children which occurs for the pathological conditions of tuberculosis and insanity; on the other hand, evidence that the relation does not originate from any modification in family environment is found in the correlations of family conditions with the frequency of conviction and length of imprisonment, of convicts.

In the accompanying figures contrasted with the criminal graph, diagrams are given representing the birth order or tubercular members in 381 families,* and the insane members in 468 families.† These diagrams are taken directly from the Memoirs of Pearson and Heron, cited below; and they show that the special liability of the earlier born to be subsequently convicted of crime has a striking parallel in their increased liability to suffer also from tuberculosis and insanity. It is difficult to see how environmental conditions, peculiar to a limited family circle, could play any part of importance in the incidence of these heritable pathological states; the special incidence of these states in the earlier born can only be due to the fact that the taints of tuberculosis and insanity are inherited in greater intensity by older than by younger members of a family. We would, accordingly, be inclined to attribute the increased tendency of elder members to be criminally convicted to their possessing, in some way, an increased intensity of constitutional criminal taint.

(b) *The Influence of Order in, and Size of, Family, on Recidivism.*—The distributed data are given in Appendix, Tables 268, 269, and from the figures correlated therein we find that the coefficient of size of family with frequency of conviction is $-\cdot05 \pm \cdot03$, and with length of imprisonment is $-\cdot04 \pm \cdot03$;‡ and that the correlation of order in family with frequency of conviction is $-\cdot008 \pm \cdot03$, and with length of imprisonment is $-\cdot03 \pm \cdot03$. From the values of these coefficients, in relation to their probable errors, we can only conclude that convicts who are "only sons" do not tend to be convicted more frequently, nor for longer periods, than others; and that the presence of brothers and sisters, or other conditions peculiar to large families, have no apparent mitigating influence upon recidivism.

(c) *The Influence of Family Prosperity on Recidivism.*—The correlated data in Appendix, Tables 270, 271, yield the following statistical results:—

TABLE 113.—FAMILY PROSPERITY AND RECIDIVISM.

Economic grade of subjects' parents.	Convictions per year.			Fractions of year imprisoned.			Intelligence.			Coefficients of correlation (r) of standard of living with		
	Means.	Exc.	2 p.e.	Means.	Exc.	2 p.e.	Means.	Exc.	2 p.e.	Convictions.	Imprisonment.	Intelligence.
Very poor and destitute	3·12	+ ·52	±·81	5·44	+ 70	± 94	− ·00	−1 79	±·56	− 05	+·12	+·52
Poor	2·69	+ ·09	±·26	4·27	−·47	± 30	+ ·40	−1 39	±·18			
Prosperous poor	2·70	+ ·10	±·20	4·92	+·18	± 23	+1 43	− 36	±.14	Correlation ratios (η) of standard of living		
Well-to-do	1·58	−1·02	±·47	5·03	+·29	±·54	+8 78	+6 99	±·32	·15	·13	·52
Totals	2·60			4·74			1·79					

* K. Pearson, *First Study of the Statistics of Pulmonary Tuberculosis*, Drapers' Companies Research Memoirs, II., p. 22.

† D. Heron, *First Study of the Statistics of Insanity*, Eugenics Laboratory Memoirs, II., p. 30.

‡ The values of these coefficients show that the increased incidence of criminal conviction, shown above in the first- and second-born of families, remains constant within every grade of criminality. The selection of the earlier-born, however it occurs, leads only to a change of the position, but not of the slope, of the regression line of order in family with criminality in the general population. From this, we would feel inclined to deduce that the selection of first- and second-born for criminal conviction is only an appearance, due possibly to the fact that the infant mortality of the later born in families is greater than that of the earlier born. We have no statistical evidence to show in support of this suggestion.

orderly fashion; and that, only in three instances out of the fourteen, are the differences between the expected and actual means greater than twice the probable errors of the differences. In fact, the variation in the means, quoted in the above table, are precisely of the degree and kind we would expect from random samples. We conclude that the ages of our convicts at the death of their mothers, whether they were infants at the time, or had reached maturity, was an environmental accident without any significant relation to their subsequent degree of recidivism.

G. *The Influence of First Conviction for Crime on Subsequent Recidivism.*

(a) *Age at First Conviction.*—From the distributed data in Appendix, Table 274, we see that the correlation coefficient of convicts' age at first conviction with the frequency of their subsequent conviction is $-\cdot 11$; with the length of their subsequent imprisonment it is $-\cdot 08$, and with their mental grade it is $\cdot 34$. Hence, the partial correlation coefficient, for constant intelligence, of age at first conviction with subsequent convictions per year of freedom:

$$_{i}\rho_{ac} = \frac{-\cdot 1103 - (\cdot 3381 \times -\cdot 1573)}{\sqrt{1 - \cdot 3381^2}\ \sqrt{1 - \cdot 1573^2}} = -\cdot 061 \pm \cdot 030\ ;$$

and with the fraction of each year subsequently spent in prison:

$$_{i}\rho_{ap} = \frac{-\cdot 0799 - (\cdot 3381 \times \cdot 1011)}{\sqrt{1 - \cdot 3381^2}\ \sqrt{1 - \cdot 1011^2}} = -\cdot 122 \pm \cdot 030$$

We see, then, that apart from effects due to a relatively high degree of association between defective intelligence and first conviction at an early age—that when examined on a standardised basis of intelligence, the earlier in life our convicts were first convicted, the more frequently have they been subsequently convicted; and, on the whole, the longer have been their periods of imprisonment. But, from the figures of Appendix, Table 276, we find that frequency of conviction and length of imprisonment are both, to a small extent, related to the present age of convict. It is true that when we graduated our subjects according to their frequency of conviction per year of freedom, and to the average fraction of a year they have been imprisoned, the legitimacy of these operations depended upon the assumption that, in the long run, the future career of convicts would be identical to their previous criminal history, *see* p. 269. Yet, although for most practical investigations the differences in the similarity of convicts' penal records in this respect are negligible, the likeness between their future and past careers is not absolute: according to precise fact, with their increasing age the average frequency of our subjects' convictions per year of freedom has tended to diminish (correlation coefficient $-\cdot 11$), and their fraction of every year passed in confinement has tended to increase (correlation coefficient $\cdot 24$). This relation of age to the penal records of convicts was negligible when measuring the associations of environmental conditions with penal record, because the correlation of age with these several conditions is insignificant in value. But the correlation coefficient of age, at last conviction, with age, at first conviction, has obviously a high value (precisely, it is $\cdot 60$); and consequently, the influence of the present age of our subjects must be allowed for when measuring the relation between their ages at first conviction and the gravity of their subsequent penal records. Now, the correlation coefficient of age with intelligence is zero; and, accordingly, we can say that, for constant present age and constant intelligence, the correlation of age at first conviction (1) with subsequent frequency of conviction per year of freedom:

$$_{ai}\rho_{ac} = \frac{-\cdot 0614 - (\cdot 6046 \times \cdot 1049)}{\sqrt{1 - \cdot 6046^2}\ \sqrt{1 - \cdot 1049^2}} = \cdot 004 \pm \cdot 03\ ;$$

and (2) with the fraction of each year subsequently spent in prison:

$$_{ai}\rho_{ap} = \frac{-\cdot 1219 - (\cdot 6046 \times \cdot 2367)}{\sqrt{1 - \cdot 6046^2}\ \sqrt{1 - \cdot 2367^2}} = -\cdot 240 \pm \cdot 03$$

Of these values, in relation to their probable errors, the first is insignificant, and the significance of the latter is unquestionable. We conclude that undoubtedly the principal factor conducing to the early first conviction of convicts is defective intelligence; but, apart from intelligence, we may also conclude (1) that, measuring criminality by frequency of conviction, there is no relation between a convict's criminal tendencies and the age at which he is first convicted; and (2) that, measuring strength of criminality by length of imprisonment or length of sentence, the later in life habitual criminals are first convicted of crime, the less pronounced do their criminal tendencies appear to be.

(b) *The Nature of the First Sentence.*—The distributed data will be found in Appendix, Table 275; and, calculated from the figures therein tabulated, the mean frequency of conviction, the mean length of imprisonment, and the average intelligence of convicts, grouped according to the severity or nature of their first sentence, and the means of conviction and imprisonment, corrected for the differences of intelligence, between the several sub-groups, are as follows :—

TABLE 115.

Nature of first sentence.	Convictions per year.			Fractions of year imprisoned.			Intelligence.		
	Predicted Means.	Actual Means.	Excess of Actual.	Predicted Means.	Actual Means.	Excess of Actual.	Means.	Exc.	2 p.e.
Less than 3 months.	2·53+·05	2·53+ ·15	+ ·10±·25	4·72−·08	4·72− ·70	− ·62± ·29	·59	− ·80	±·17
3 months ...	2·53−·06	2·53+ ·54	+ ·60±·43	4·72+·09	4·72+ ·32	+ ·23± ·50	1·47	+ ·08	±·31
6 months ...	2·53−·17	2·53− ·13	+ ·04±·37	4·72+·27	4·72+1·05	+ ·78± ·43	2·35	+ ·97	±·26
1 year	2·53−·30	2·53− ·28	+ ·02±·43	4·72+·46	4·72+1·05	+ ·59± ·51	3·63	+2·25	±·25
5 years and over	2·53−·42	2·53− ·06	+ ·36±·67	4·72+·64	4·72+1·96	+1·32± ·80			
Birched ...	2·53+·05	2·53− ·62	− ·67±·89	4·72−·08	4·72− ·60	− ·52±1·40	·58	− ·80	±·64
Reformatory school.	2·53+·05	2·53+ ·12	+ ·07±·45	4·72−·07	4·72+ ·67	+ ·74± ·52	·64	− ·74	±·38
Birched and school.	2·53+·09	2·53+ ·60	+ ·51±·93	4·72−·14	4·72+ ·09	+ ·23±1·04	·30	−1·08	±·46
Fined	2·53+·12	2·53−1·09	−1·21±·59	4·72−·18	4·72−2·35	−2·17± ·67	·10	−1·29	±·42
Nil	2·53+·10	2·53− ·01	− ·11±.63	4·72−·15	4·72−1·33	−1·18± ·74	·25	−1·14	±·52
Totals ...	2·53	2·53		4·72	4·72		1·38		

The nature and extent of the relationship between the mental defectiveness of convicts and the crimes they commit are most interestingly brought out by the means of intelligence in the above table. It will be observed that the mean intelligence of convicts increases progressively as the sentence, resulting from their first conviction for crime, becomes progressively more and more severe. Now, in the case of first offenders, a slight sentence presupposes a trivial offence: from which it follows that the more mentally defective a convict may be, the more trivial will his first offence have been. But, as reference to current Blue Books will show, 90 per cent. of the punishments annually inflicted upon criminals are fines and short periods of imprisonment for presumably trifling offences; and, as we have already statistically demonstrated, the more defective a convict's intelligence, the more frequently is he convicted. It is evident that the condition most closely related to petty crime, the most fruitful source of nearly all that is meant by the term crime in this country, must be mental defectiveness.

But, apart from effects due to intelligence, what is the relation between the severity of a first sentence, or the gravity of a first offence, and the subsequent career of habitual criminals? The differences, relatively to their probable errors, between the several means in the above table, corrected for intelligence, show that the relation is not a very pronounced one. It would seem that recidivism, measured by frequency of conviction, is least marked in convicts who were fined only for their first offence; and that, measured by length of imprisonment, the recidivism of convicts becomes rather more pronounced with increasing severity of first sentence. This is all that can be definitely stated upon the evidence of the figures in the above table.

VI. *The Relation of Frequent Conviction to Length of Imprisonment.*

In Appendix, Table 276, the frequencies of convicts, distributed according to the average number of their convictions per year of freedom, will be found correlated with their frequency distribution in regard to the fraction of every year passed by them in confinement. The correlation coefficient between the criminality of convicts measured in these two ways is ·47. From the value of this coefficient—relatively to zero, which would be the measure of a complete dissociation between the two criminality scales—we see that there is a strong likeness between the recidivism of convicts, measured on the one hand by frequency of conviction, and, on the other hand, by length of imprisonment. It is clear that, in the long run, increasing frequency of conviction goes hand in hand with increasing length of imprisonment; that, to a great extent, the more frequently habitual criminals are convicted, the greater becomes their fraction of time spent in prison. Nevertheless, from the value of the coefficient quoted above—relatively to unity, which would be the measure of a perfect likeness—we also see that, coexisting with similarity, there is a considerable degree of difference between the two estimates we have been considering of the gravity of the penal records of convicts. It would appear that, in these respective estimates, we have two functions of criminality, representing presumably two types of habitual criminals. The one is a mentally defective type, characterised by first conviction at an early age, by frequency of subsequent convictions, and by short sentences for relatively trivial offences. The other would appear to be a type of habitual criminal, less markedly defective mentally, and one whose actions are more deliberately and consciously anti-social —the "professional type," described by authors. Offenders of this order are convicted for the first time later in life, and are subsequently convicted less frequently; but the crimes they commit are more serious in character, and the sentences they receive involve them in longer periods of imprisonment.

VII. *Types of Crime associated with Recidivism.*

In the following table are given the average number of previous convictions per year of freedom, and the mean length of annual imprisonment of five groups of recidivists, distinguished by the nature of the last crime committed by each delinquent :—

TABLE 116.—FREQUENCY OF CONVICTION AND TIME OF IMPRISONMENT FOR EACH TYPE OF CRIME.

Frequencies and means.

Crimes.	Totals.	Convictions per year.																Mean convictions.	± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	14–	15–	18–		
Damage to property ...	65	19	21	8	4	4	1	—	1	3	1	—	1	—	1	—	1	2·87	·42
Stealing and burglary ...	383	70	105	67	41	33	20	18	12	2	6	3	2	1	1	2	—	3·02	·18
Sexual offences	30	16	10	1	—	—	2	—	—	—	1	—	—	—	—	—	—	1·53	·63
Violence to the person ...	82	26	19	17	7	6	3	2	1	—	—	1	—	—	—	—	—	1·23	·38
Forgery and Fraud ...	87	38	17	11	9	5	2	2	2	1	—	—	—	—	—	—	—	1·99	·37
Totals	647	169	172	104	61	48	28	22	16	6	8	4	3	1	2	2	1	—	—

Mean frequency of conviction measured by average number of convictions per year of freedom since first conviction... ... ... 2·70
Standard deviation of frequency of conviction ... ... 2·55
Correlation ratio of frequency of conviction with nature of crime ... ... ·186

Crimes.	Totals.	Fractions of year imprisoned.										Mean imprisonment.	± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–		
Damage to property ...	65	20	5	8	8	6	7	—	2	5	4	3·48	·46
Stealing and burglary ...	383	16	25	42	40	45	53	52	45	43	22	5·31	·19
Sexual offences	30	14	8	2	1	1	—	—	2	2	—	2·13	·68
Violence to the person ...	82	29	10	4	11	5	7	6	6	3	1	3·15	·41
Forgery and fraud ...	87	5	4	13	8	11	7	6	11	14	8	5·44	·40
Totals	647	84	52	69	68	68	74	64	66	67	35	—	—

Mean time of imprisonment measured by average number of tenths of a year spent in prison per annum since first conviction ... ... 4·72
Standard deviation of time of imprisonment ... ... 2·76
Correlation ratio of time of imprisonment with nature of crime ... ... ·370

The most important facts connected with the above table are that over 50 per cent. of recidivists are sentenced to penal servitude for theft and burglary; that petty thieves are the men who are convicted most frequently; whereas burglars and fraudulent offenders are convicted for the longest periods. Other statistical facts of interest are set forth at the foot of the table.

VIII. *Environmental Associations of different kinds of Crime.*

Hitherto we have been measuring the influence of several environmental conditions upon the career of recidivists. We turn now to an entirely different kind of criminal, viz., star class convicts or prisoners, not previously convicted, who are sentenced to penal servitude for committing serious crimes. The question to be answered is whether prisoners of this kind, convicted of such widely different crimes as arson, stealing, violence, rape and fraud, are differentiated by the circumstances of their environment: and if so what, in each case, is the exact measure of the differentiation?

allotted to each of the five sub-groups of criminals by the former, are the same as those apportioned by the latter investigators. In regard to alcoholic intemperance, the results of both inquiries give us the same order for the criminal groups: offenders convicted of personal violence being unanimously placed at the head of the list as the most alcoholic, fraudulent offenders, with equal unanimity, being placed at the bottom as the least intemperate, and sexual offenders, incendiaries, and thieves, in order, occupying an intermediate position between these two extremes; and the correlation ratio measuring the degree of this regression of alcoholism with crime is ·20 in the one case, and ·19 in the other: or, practically, it is the same in both cases. We emphasise this interesting agreement between the results obtained from data collected by several observers, because it illustrates the particular reliability of conclusions derived from statistical methods of inquiry, and the unsoundness of criticism which would disparage these methods, on the grounds that statistics of such conditions as alcoholism are valueless because of the personal equation of the observers collecting them. No two observers have the same idea as to where the line should be drawn between temperance and alcoholism. This, possibly, is the fact. But the statistician does not ask for unanimity of idea with regard to an absolute definition of alcoholism, or of any other matter of personal opinion. The genius of the statistician's science lies in comparison: his results do not represent the absolute truth; they express, always and only, the relative truth. The statistical fact of importance derived from the above table is not that fraudulent and violence offenders fall below or above any absolute standard of alcoholism: it is that, relatively to other kinds of criminal, the fraudulent are the least, and those convicted of violence are the most, alcoholic, &c.; that the correlation between alcoholism and crime is measured by the fraction ·20· Despite of differences in the standard of alcoholism adopted, it is not surprising that different investigators should be unanimous with regard to this relative truth. For the only condition necessary for ensuring consistency in the statistical results of any observer is not that his standard of observation should be the same as that of other investigators, but that he should remain consistent to his own particular standard.

The correlation coefficient of alcoholism with intelligence is $-·23$ (see Appendix Table 283); and consequently—the standard deviation of alcoholism being unity, and of intelligence being 1·26—the regression coefficient $\left(\frac{\sigma_y}{\sigma_x} r_{xy}\right)$ of alcoholism with intelligence $= \frac{1}{1·35} \times -·23 = -·17$: which is to say, that for every unit depreciation in the mean intelligence of a sub-group, ·17 of a unit must be added to the group's expected mean degree of alcoholism. Correcting, in this way, the crude mean degree of alcoholism of all the criminal sub-groups, according to their differences of mean intelligence, we have:

TABLE 118.—ALCOHOLISM AND CRIME (II).

Nature of Crimes.	Predicted Means of Alcoholism.	Actual Means of Alcoholism.	Excess of Actual.
Damage to property	·07+·24	·07+·07	$-·17\pm·14$
Stealing and burglary	·07+·04	·07+·06	$+·02\pm·06$
Sexual Offences	·07+·06	·07+·09	$+·02\pm·11$
Violence to the person	·07−·03	·07+·12	$+·15\pm·08$
Forgery and fraud	·07−·20	·07−·42	$-·22\pm·09$
Totals	+·07	+·07	

It is clear that, apart from degrees of alcoholism resulting from mental defectiveness, those convicted of personal violence are the only offenders whose crimes are directly associated with inebriety. It is in regard to this type of criminal only that the assertion can be justly made that alcoholism is a cause of crime. On the other hand, it would appear from the figures in the above table that incendiaries are, on the whole, more temperate than their extreme mental defectiveness would lead us to expect; and, allowing for the diminution in alcoholic indulgence, which would be expected from their superior intelligence, it would seem that intemperance is a quality conspicuously absent amongst offenders convicted of forgery and other kinds of fraudulence.

E. *The Relation of Crime to the Social Class of Offenders.*

From the means and other data in Table 60, page 176, Table 120, page 288, and in Appendix Table 214, it will be seen that the characteristic crimes of the upper and middle social class are forgery, embezzlement, and every kind of fraudulent pretence; and that stealing and burglary are crimes limited to the lower classes. This is a fact which hardly calls for explanation; but it is interesting to note that if, as we shall do later, fraud, stealing and burglary be grouped together and called "acquisitive crime," this differentiation of class in relation to crime almost entirely disappears. For the rest, crimes of violence to the person—amongst which wife-beating and drunken assaults figure prominently—are committed mainly by the lower classes; and sexual offences, consisting mainly of indecent assaults upon children, and incendiarism, which is to say stack-firing, are crimes peculiar to mentally defective persons of the very poor and destitute classes.

IX. *Recapitulation and Conclusions.*

The following series then of correlation coefficients and ratios, measure, as we have said, (1) the relative potency of several adverse environmental conditions, as influences upon the recidivism of convicts and the kind of crimes they commit; and (2) the relative associations of these same conditions with the mental defectiveness of convicts. In every case, a negative sign attached to a coefficient registers the fact that the influence of the adverse condition is not conducive, but is inimical, to crime, and is related not to defective, but to good, intelligence.

TABLE 119.

Conditions.	Convictions per annum.			Fractions of year imprisoned.			Nature of crimes.	Defective Intelligence.
	r	η	Intelligence constant. ρ	r	η	Intelligence constant. ρ		
School	—	·11	—	—	·15	—	—	·52 (η)
Early age at leaving school ...	·01	—	−·03	−·04	—	−·02	—	·21 (r)
Low standard on leaving school	·03	—	−·06	−·10	—	−·06	—	·48 (r)
Defective education	−·06	—	−·14	−·15	—	−·12	—	·42 (r)
Irregularity of employment...	·15	·31	—	·27	·24	—	·05 (c_2)	·20 (r)
Alcoholism	·05	·09	·03	−·04	·15	−·02	·20 (η)	·14 (r)
Low standard of living of parents.	·05	·15	−·04	−·12	·13	−·08	—	·52 (r)
Early age at death of mother...	—	·15	—	—	·22	—	—	·27 (η)
Order of criminal in family ...	−·01	—	—	−·03	—	—	·05 (η)	—
Size of family of criminal ...	−·05	—	—	−·04	—	—	·10 (η)	—
Early age at first conviction...	·11	—	−·01	·08	—	·24	—	·34 (r)

The relative values of these contrasted coefficients demonstrate effectively and conclusively one truth: that an adverse environment is related much more intimately to the intelligence of convicts than it is to the degree of their recidivism, or to the nature of the crimes they commit. Moreover, since mental defectiveness is closely related to crime, an easily imagined corollary to this truth is that the mental defectiveness of the convict is antecedent to his environmental misfortunes, rather than that his unfortunate circumstances have been responsible for the mental defectiveness of the convict, and his lapse into crime.

Admittedly, many of the coefficients quoted above are not so great as they would have been if the relations they refer to, measured in our sample of convicts, had been estimated from more representative criminal data, or from statistics of the general population. It does not follow, because the influence of environment upon the recidivism of *convicts* is small, that the intensity of this influence upon the criminal tendencies of *all offenders* would not be greater, nor that, upon the production of *criminals in the general population*, adverse social and economic conditions are of unimportant effect. The *non sequitur* is conceded: nevertheless, while admitting the danger of drawing wider conclusions from the results of our analysis than the circumscribed nature of the data giving these results can warrant, we would draw attention to what appears to be a legitimate breadth of interpretation to be placed upon the statistical facts we have reached.

In the first place, from the coefficients in the above table, we may dogmatically assert that recidivism, in its most pronounced form, is certainly not a product of any of the social and economic inequalities we have been examining. Secondly, it is equally indisputable that the particular nature of crime committed in this country has very little, if any, relation, apart from the relation of class, to any of these same environmental conditions. If lack of employment, for instance, has an influence upon crime, it must be equally related to the committing of all kinds of offences: the unemployed person, if, because of his inability to find work, he becomes a criminal, is as equally likely to commit serious crime as trivial offences; we cannot assert that, because he is unemployed or unemployable he is more likely to become a petty thief than a forger, incendiary, or murderer. Finally, some facts to be noticed, when interpreting the coefficients in the above table, are these: (1) that some of the coefficients have a negative value—which means that the adverse conditions thus qualified are influences, not for, but against, the genesis of crime, and no increase in the value of these coefficients is likely to alter the nature of the relation it measures; (2) that the values of many of the coefficients are practically zero—which means that, even if magnified three- or four-fold, the relation measured by the coefficients will still be little removed from zero in intensity; (3) that only one of the coefficients has a value greater than twice its probable error—in view of which fact we cannot be certain that an examination of these relations from more representative data would necessarily yield coefficients more significant in value.

From the general trend of the results tabulated above, our interim conclusion is that, relatively to its origin in the constitution of the malefactor, and especially in his mentally defective constitution, crime in this country is only to a trifling extent (if to any) the product of social inequality, of adverse environment, or of other manifestations of what may be comprehensively termed "the force of circumstances."

X. *The Relation of Occupation to Criminality.*

Their occupation, prior to conviction, is the only condition whose distribution amongst criminals we have been able to compare directly with corresponding statistics obtained from the general population. The salient facts of the comparison, obtained from our total records 1–3,000, are incorporated in the accompanying table:—

TABLE 120.—CRIME AND OCCUPATION.

—	Professional classes.	Commercial classes: clerks and shop-keepers.	Selected classes: soldiers, policemen, messengers, servants.	Labourers: agricultural, roads, quarries, railways.	Sailors, fishermen.	Miners: coal, minerals.	Artisans.	Factory operatives.	Floating traders.	Totals.
Actual frequencies of occupations in sample under each crime:—										
Damage to property ...	—	8	5	73	8	10	26	1	6	137
Stealing and burglary ...	20	225	67	492	47	45	534	6	162	1,598
Sexual offences	7	16	18	91	9	32	69	1	10	253
Violence to the person ...	8	49	59	182	47	35	139	4	46	569
Forgery and fraud ...	122	124	16	41	6	9	82	1	26	427
Inferred occupations and crimes of 1,000 persons convicted:—									Frequency of each kind of crime.*	
Damage to property ...	—	·4	·2	3·4	·4	·5		1·5		6·3
Sexual offences	·5	1·2	1·3	6·6	·7	2·3		5·7		18·4
Violence to the person ...	·4	2·3	2·7	8·4	2·2	1·6		8·7		26·4
Acquisitive crimes ...	27·6	142·2	29·5	280·0	27·0	26·3		406·3		948·9
Total	28·5	146·1	43·7	298·4	30·3	30·7		422·3		1,000
Occupations per 1,000 committing each type of crime:—										
Damage to property ...	—	58	36	533	58	73		241		1,000
Sexual offences	28	63	71	360	36	126		317		1,000
Violence to the person ...	14	86	104	320	83	61		332		1,000
Acquisitive crimes ...	30	150	42	295	28	28		428		1,000
Frequencies of occupation of adult males in the non-criminal population.†	44·6	103·6	59·7	324·1	31·6	59·2		377·2		1,000

In the upper third of this table, the actual frequencies of occupation given by the data are presented for 2,984 convicts, classified into five groups, according to the nature of the crime for which they have been convicted. In the middle third of the table, the total number of offenders is reduced to 1,000; subjects convicted of fraudulence, stealing, and burglary, are combined in one group of offenders, convicted for what we have called

* *See* Table 60, page 176.

† *See* Table 60, page 176.

conditions must be fulfilled in order that our comparison may be legitimate? We are to compare the respective rates at which two classes of individuals actually reproduce their kind. We are to measure the extent of the difference between the absolute reproductiveness of the criminal and of the law-abiding classes. Our estimate, clearly, will not refer to *potential* generative power. The question before us has no immediate relation to physiological fecundity or sterility. The physiological question is interesting and important, and will be considered later; but it does not affect our immediate task, which is to find, upon statistical evidence alone, a measure of the difference in extent to which generations of the two classes under comparison are replaced by offspring in the succeeding generation. In other words: if a hundred individuals of a generation of the criminal class are eventually replaced by x offspring, and a hundred individuals of the same generation of the non-criminal class are eventually replaced by y offspring, what will be the ratio of x to y?

Now, the fertility, or expectation of children, for any community, depends, firstly, upon the proportion of individuals who marry, and, secondly, upon the average size of family of those who become parents. And these two factors are themselves dependent upon other subsidiary conditions. The relative proportion of married to unmated, in any population, must always be associated with the age-distribution of the individuals who compose it. And the average size of family begotten by these individuals is not only controlled by the age distribution of the parents, but by the duration of the parents' marriages at the time their families are counted; and also (since the degree of fecundity varies with age), by the ages of the mothers at the time of their marriage. Now, unless all these conditions are allowed for when dealing with fertility statistics of different communities, the results obtained will obviously not be suitable for purposes of exact comparison. For instance, the age-distribution of criminals *as found in prison* is an artificial condition not necessarily representative of the age-distribution of *ex-criminals at large*. And, certainly, it is widely different from the age-distribution of the general population. It follows, then, that any comparison between the marriage and fertility rate in the general population with that obtained for criminals, by calculation without regard to age, and from statistics of a random sample of imprisoned individuals, would inevitably be misleading. And even when the conditions enumerated have been allowed for, a comparison of the results obtained will still be inadequate to yield, of themselves, the particular information we are seeking. We may have found for criminals and non-criminals the marriage and fertility rates, age for age; we may have measured the average fecundity of the two communities when duration of marriage has been equalised, and the ages of wives at time of marriage have been reduced to a common measure: but the final results will not yet be comparable for our purpose. Our inquiry must discover, not only the extent of difference between the average number of offspring, begotten, respectively, by criminals and non-criminals, *at any or all periods of life*, but also the extent of difference between the average number of offspring bequeathed by criminals and non-criminals *at time of death.**

B. We will give a brief summary of the statistical evidence we have collected in the effort to solve our problem, *i.e*, to demonstrate *the extent of difference in absolute fertility between the criminal and non-criminal classes*. We shall present side by side, for a criminal and a non-criminal population, (1) statistics, for each quinquennial period of age, of *marriage rates:* that is to say, of the proportion of individuals who do, and who do not, marry;† (2) statistics *to show the natality rates* (*i.e.*, the probable number of offspring of those individuals who become parents) at (*a*) quinquennial periods of age, (*b*) for quinquennial periods of marriage duration, with which will be considered the various ages of the wives at time of marriage; (3) frequency statistics for the distribution of ages at death, which, (*a*) in conjunction with the marriage rates already found, will yield one figure for the proportion of individuals in each population (criminal and non-criminal) who are married at the time of death, and (*b*) in conjunction with the preceding natality rates, will give the total number of offspring begotten by married individuals in each population before they die.

---

* If at time of death x per cent. of the general population are married and bequeath on the average y offspring, and x^1 per cent. of criminals at time of death are married and bequeath on the average y^1 offspring, then the relation we seek between the absolute fertility of criminals and the general population will be the ratio $\frac{x^1\, y^1}{x\, y}$.

† We do not insist that criminals described as "married" are necessarily legally married to the women they refer to as their wives, and with whom they have lived.

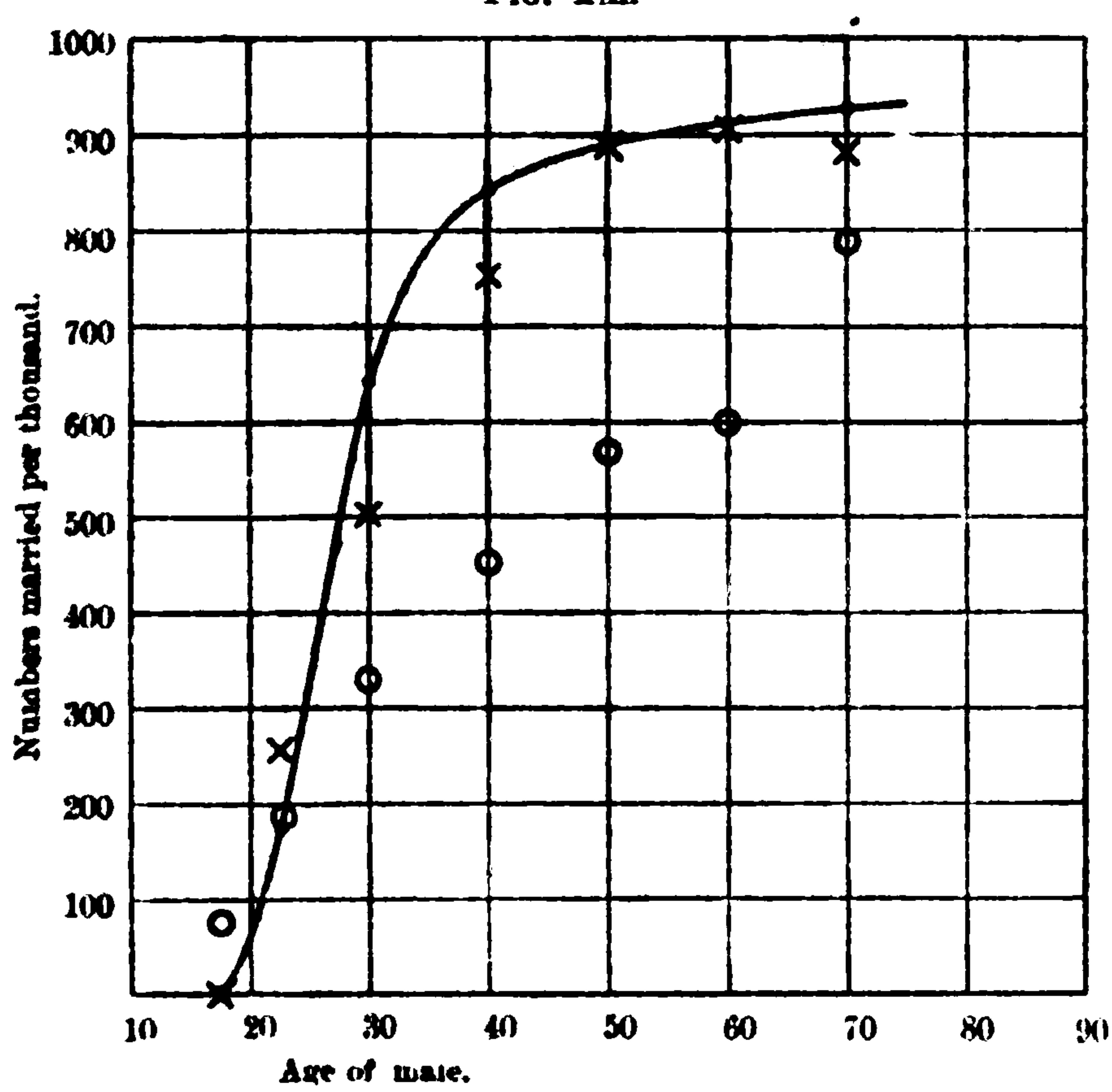
C. *The Marriage Rates of Habitual Criminals and of Non-criminals at successive Ages.* The statistics and rates are shown in the following table 121, and figure (xlii).

TABLE 121.

Numbers married (including widowed and deserted) in habitual offenders found in convict prisons, and in the general population of England and Wales. (Reg. Gen. Rep., 1906.)

Ages.	Numbers in sample of criminals.	Married per thousand criminals.	In general population, married per thousand.	Actual numbers married criminals.	In general population of like numbers, the number married.
15–	40	75	3	3	—
20–	399	188	174	75	69
25–	849	330	641	280	544
35–	477	453	842	216	402
45–	236	569	890	134	210
55–	157	599	911	94	143
65–	94	787	926	74	87
All ages ...	2,252	389	646	876	1,455

FIG. xlii.



General population, England and Wales ... ... ——•——
First offenders in convict prisons X
Habitual offenders do. do. ... ... O

The statistics for the general population were taken from the Registrar General's report for 1906, and those for habitual offenders from a sample of 2,252 convicts. In dealing with such large data, the probable error of the computation is small enough to be neglected. It will be remarked that, at every quinquennial age period, there is a marked difference in the proportion of criminals who marry, relatively to the proportion of those who marry in the non-criminal population. The variation in the differences at each quinquennial period, and the apparent reversal of the general trend of difference at the first and second periods (ages under 20 and ages 20-25), will be examined later. For the moment, we must limit ourselves to a simple statement of the two conclusions that while, upon the average of all ages, 64·6 out of every 100 in the general population are married, the number of married persons out of the 100 imprisoned criminals is only 38·9; and that, reduced to a common standard of age, the ratio of the actual number married in the two populations is $\frac{876}{1455}$. The ratio $\frac{876}{1455}$ expresses only the relative rates at which criminals and non-criminals tend to marry. It tells us that, upon an equalized average of all ages, only one criminal marries to nearly two individuals in the general population. But it does not follow that this ratio of the rates at which two classes of *living* individuals tend to marry is necessarily a correct expression for the relative numerical proportion of the individuals in these two classes who are married at the time of *death*. For instance, the rates of marriage in two contrasted populations might be identical at every age of life, yet, if in one population, old people preponderated, and in the other, infants and young adults were mainly present, the proportion of individuals married at the time of death would obviously be widely different in the two cases. This ratio, then, $\frac{876}{1455}$, need not concern us further at the present juncture. The essential value, for the present purposes, of Table 121, lies in the series of marriage rates it supplies for criminals and non-criminals respectively, at each quinquennial period of age. It should be noted, moreover, that these rates are unique, and are independent of age-distribution. The age-distribution—admittedly an arbitrary one—adopted in Table 121 and in succeeding tables, is that of our sample of criminals; and the age-frequencies in the general population are reduced to this standard. A reverse process—the age-distribution of criminals reduced to that of the general population, taken as a standard—would have equally well served our purpose: which is to legitimatise comparison of the general marriage rate of criminals and non-criminals, on an average of all ages. But, as we have said, the marriage rates, at each quinquennial period of age,—the only figures in Table 121 of immediate concern—are absolute and final for each particular age, and quite independent of the relative frequencies of individuals at different ages. We must point out, however, one implication. We have assumed that the marriage statistics in Table 121, obtained from our particular sample of criminals, are representative of the marriage condition of criminals generally. This is not strictly accurate. We shall see later that the marriage-rate of criminals decreases progressively with frequency of imprisonment. Now, our sample population above referred to is composed entirely of *convict* criminals, most of whom have become convicts solely on the ground of their previous penal records. These men have been in and out of prison so often that finally, on this score alone, and independently of the nature of their last offence, they have received a penal servitude sentence. Measured, therefore, by the penal record, the sample of convicts we have had under observation is not a typical sample of all criminals: it is a sample of an extreme kind of criminal. The relation of our subjects to criminals generally will be discussed later. In the meantime, it must be borne in mind that the facts of fertility we are eliciting from our statistics apply only to habitual offenders of a certain type: to those of a definite average grade of diathesis.

D. *Natality Rates of Habitual Criminals and of Non-criminals at successive Ages.*

Our statistics of criminal offspring were obtained from 203 married habitual offenders. The number is a small one; and consequently one would not lay much stress upon the finality of the actual frequencies and averages within every quinquennial period of age—especially within the first period (20–), and within the last three periods (70–), (75–), (80–). The sample, however, will serve to show the general trend of the frequencies, age for age, and will provide approximately correct figures for the frequencies and mean families within the quinquennial periods between the ages of 25 to 65, and for the frequency and mean family on an equalized average of all ages. Unfortunately, we almost entirely lack natality statistics for the non-criminal classes. Of English statistics, there are none of any value. The Census Returns for England and Wales give the number of children for all married couples: but since they omit the ages of parents, and do not record dead offspring, nor even those absent from home on census day, they are singularly useless for purposes of scientific comparison. We have been compelled to fall back upon the vital statistics 1900–1902 for New South Wales, for the required comparative information. These analysed statistics were published by Powys in Biometrika, Vol. IV., and were accompanied by some admirable natality tables relating the ages of parents at death with the number of children born to them. The only objection to our comparing these records with our own is that our information was obtained direct from the *living* married criminals, whereas the New South Wales statistics refer to the offspring of married individuals at the time of the latter's death. The objection is a real one, because the period of sickness prior to death, during the earlier decades of life, must necessarily be inimical to

most fecund individuals are those who die between the ages of 70 and 75, and families are not completed until the male parent has reached the age of 57, amongst criminals, fecundity reaches its maximum, and family histories are prematurely completed, when the male parent is only 40 years old. On the average for all ages, the mean size of non-criminal families is 3·88, and that of habitual offenders, represented by our sample of convicts, is 2·97. Reduced to a common standard of age, the ratio of the actual number of offspring, begotten by the two populations, is $\frac{602}{788}$.

E. *Natality Rates of Habitual Criminals and of Non-criminals for Constant Duration of Marriage.*

The difference we have found between the fertility of the criminal and law-abiding classes, from the age of 40 onwards, might be due to the fact that criminals, over this age, are selected from individuals who marry relatively late in life; or again, the difference might result from a reformation in character, during middle life, of criminal parents who married early: when it is clear that any diminution of criminal fertility would be more apparent than real. So that it is important to discover how the average criminal family compares with the mean value of families in the non-criminal population, when the duration of marriage, and age of wife at time of marriage, are the same in both cases. We have, therefore, investigated the distribution of the offspring of criminals, for successive periods of marriage duration, in our above-mentioned sample population; and, following the plan of Powys, whose New South Wales natality statistics, published in Biometrika, Vol. IV., we have again taken for comparison, as representative of the non-criminal population—we have sorted our criminal families into groups, according to the age of the mother at marriage, and with regard to the duration of the marriage at the time of observation. The distribution of the offspring of criminals in these conditions is given in Table 123. At the foot of the table are appended the average families of criminals, compared with the averages obtained by Powys for New South Wales families. We must conclude that, unquestionably, the diminution in fertility amongst criminals, as exemplified by the particular sample of criminals under observation, is not a simple consequence of lessened duration of marriage. As duration of marriage increases, the disparity between the reproductiveness of the criminal and the non-criminal classes becomes progressively greater. When duration of marriage has been equalised, the falling-off in numbers of criminal, compared with non-criminal, offspring, is more marked than we found

TABLE 123.

Frequencies of number of offspring of married habitual offenders found in convict prisons, distinguished by the duration of their marriage, and the age of their wife at marriage; and offspring of similarly circumstanced individuals in the general population, New South Wales experience, 1901–1902.

Number of Offspring	Duration of Marriage.																								All durations of marriage and ages of wives at marriage found in criminal sample.
	Under 5 years. Age of wife at marriage.				5 to 10 years. Age of wife at marriage.				10 to 15 years. Age of wife at marriage.				15 to 20 years. Age of wife at marriage.				20 to 25 years. Age of wife at marriage.				Over 25 years. Age of wife at marriage.				
	15 yrs.—	25 yrs.—	35–45 yrs.	All ages.	15 yrs.—	25 yrs.—	35–45 yrs.	All ages.	15 yrs.—	25 yrs.—	35–45 yrs.	All ages.	15 yrs.—	25 yrs.—	35–45 yrs.	All ages.	15 yrs.—	25 yrs.—	35–45 yrs.	All ages.	15 yrs.—	25 yrs.—	35–45 yrs.	All ages.	
0	1	2	—	3	4	2	1	7	3	—	2	5	1	1	—	2	4	1	—	5	2	9	—	11	33
1	10	6	—	16	6	1	—	7	4	1	—	5	3	1	—	4	1	1	—	2	3	6	2	11	45
2	3	—	—	3	9	1	—	10	8	1	—	9	5	2	—	7	2	—	—	2	8	2	—	10	41
3	—	—	—	—	6	2	—	8	5	1	1	7	3	—	—	3	—	1	—	1	8	1	—	9	28
4	—	—	—	—	3	1	—	4	1	—	—	1	—	—	—	—	1	—	—	1	1	1	—	2	8
5	1	—	—	1	—	—	—	—	4	—	—	4	—	—	—	—	3	—	—	3	5	1	—	6	14
6	—	—	—	—	—	—	1	1	2	—	—	2	2	—	—	2	1	—	—	1	4	—	—	4	10
7	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	2	1	—	3	4
8	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	2	—	—	—	—	1	1	—	2	4
9	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	2	—	—	2	6	—	—	6	9
10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	1	—	—	1	2
11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	1
12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	1	—	—	1	2
13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	1
14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	1
20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total married criminals.	15	8	—	23	28	7	2	37	27	3	3	33	17	5	—	22	16	3	—	19	45	22	2	69	203
Offspring per marriage.	1·40	·75	—	1·17	1·93	1·86	3·00	1·97	2·63	2·00	1·00 *	2·42	3·47	2·40	—	3·23	4·37	1·33	—	3·89	5·18 *	1·68 *	1·00 *	3·94	2·94
Offspring per marriage, New South Wales experience.	·94	·97	—	·95	2·64	2·39	·77	2·49	1·12	3·42	·77	3·75	5·64	4·20	—	5·31	7·17	4·20	—	6·70	7·17	4·20	·77	6·04	4·43

* Assumed to be the same as for duration of marriage 20–25 years.

it to be when duration of marriage was left out of account. Allowing only for differences in the age-distribution of the parties, we found that, on the average, imprisoned criminals, as represented in our sample, have one child less than have law-abiding parents. Secondly, disregarding the paternal age-distribution, but reducing all marriages to a standard duration, and limiting the ages of wives at marriage to definite decennial periods, we find the difference between the average family of the contrasted classes is 1·5 offspring, instead of 1. Unfortunately, from lack of comparative material, and from our limited data, we cannot find by direct observation what the difference in fertility would be were the conditions, thus enumerated, *simultaneously* equalised. We would, however, assume that if the estimates of fertility were based upon populations of criminals and non-criminals, both reduced to a common standard with regard to (1) age-distribution of fathers at time of observation, (2) age-distribution of mothers at time of marriage, and (3) duration of marriage—we would assume that, if these three fundamental determinants of fecundity could be reduced at the same time to a common measure, the difference of fertility between the criminal and non-criminal classes should be somewhere between the two values that we have obtained, rather greater than 1 and rather less than 1·5.

F. *Marriage and Natality Rates of Habitual Criminals and of Non-criminals at time of Death.*

In section (C), we have given a table of the comparative marriage-rates, and in section (D) a table of the comparative natality rates, for criminal and non-criminal populations at every quinquennial period of age. These rates, as we have pointed out, are unique, and are independent of the actual frequencies of individuals within each age period. Directly, however, we want to find a general marriage rate, and a general rate of natality for the total population, upon an average of all ages taken together—which is the aim of our present inquiry—the relative frequencies of individuals at each age period become of significant importance. We seek a general marriage and natality rate, for criminals and non-criminals respectively, on an average of all ages at time of death: let us then first obtain :—*the age-distribution of criminals and that of non-criminals, and also the age-distribution of married criminals and that of non-criminals who are married, in each case at the time of death.*

We have been able to show, upon substantial evidence (see page 232), that the death-rate of criminals does not markedly differ from the death-rate in the general population—that, in any case, it does not so differ up to the age of 55, when the reproductive period of life is at an end. Upon this assumption of a close agreement, if not of an actual identity, in the respective death-rates of criminals and non-criminals, we were enabled to determine, as explained on pp. 226, 233, 234, and presented in Table 87 bis, a frequency distribution of all criminals alive at consecutive ages. This age distribution of surviving criminals is presented again in the first column of the following Table 124, which table is divided into two similar parts contrasting this and other distributions of criminals with corresponding frequencies in the general population. Comparing the first columns in the two sections of this table, it will be seen that the frequencies of criminals, and of the general po ula io , surviving at consecutive ages, are widely different. This difference is due to the fact that an individual cannot be imprisoned, *i.e.*, is never legally designated a criminal—until he has attained a certain age. In this work, as already defined, the criminal is regarded as "criminal" only in the legal sense of the term. We have defined the criminal as an individual who actually commits a breach of the law, and is dealt with by imprisonment. Many persons, we believe, break the law, but are neither detected nor imprisoned ; many, we conjecture, without breaking the law, merit imprisonment, and with a slight adjustment of the law, or of circumstances, would probably be dealt with according to their merit ; and, finally, many potential offenders (including infants and children) we know there must be who only escape legal recognition as criminals by premature death. All these are relegated to the category of non-criminals in the present work, which deals only with the legal statistics of convictions for crime. Consequently, although, in the general population, a certain proportion of all individuals begin to die directly they are born, in the criminal population, as illustrated in Table 87 bis, and as shown again in column 2, Table 124, no death occurred until the age of 15–. Comparing, therefore, the second column in the two sections of Table 124, it will be seen that although the death-rate at consecutive ages is taken as the same both for criminals and for the general population, the relative frequencies of persons dying, like the relative frequencies of persons surviving, are widely different in the two contrasted populations. Similarly, it will be remarked that although the marriage rates of criminals are at every age less than those of the general population (ages 15 to 20 excepted), the total numbers married at time of death, as recorded at the foot of column 3, are approximately the same in the two populations. The significance of allowing for age distribution is illustrated by this apparently paradoxical result. The last columns of the table give the offspring bequeathed at death by criminals and non-criminals at different ages, and from the values of the totals of the various columns, *i.e.*, from the total numbers of married persons and the offspring they bequeath at death, at all ages, the final conclusion can be formulated :—

Of 250,000 males born in the general population, 621 per thousand, or 155,220 males, marry, and have an average number of 5·66 offspring, or 877,852 offspring (male and female) in all.

Of 250,000 male criminals born, 629 per thousand, or 157,243, marry, and have an average number of 3·50 offspring, or 550,653 offspring (male and female) in all.

TABLE 124.

Fertility in the general population, and fertility in the population of habitual offenders found in convict prisons. Experience of England and Wales, 1891–1901, as to deaths, and as to married and widowed. Experience of New South Wales, 1901–02, as to offspring at death of married males. Experience of present sample as to habitual offenders.

Ages		Of 250,000 males born in the general population.						Of 250,000 male habitual offenders born.					
		Survivors at initial age.	Deaths at ages.	Married or widowed.		Offspring, male and female.		Survivors at initial age.	Deaths at ages.	Married or widowed.		Offspring, male and female.	
				Per 1,000 at ages, Table 121.	Of those dying at ages.*	Average at ages, Table 122.	Of those dying married or widowed at ages.			Per 1,000 at ages, Table 121.	Of those dying at ages.	Average at ages, Table 122.	Of those dying married or widowed at ages.†
0—		250,000	62,430					250,000					
5—		187,570	3,995					250,000					
10—	10—	183,575	2,232					250,000	549				
15—	15—	181,343	3,415	3	10			249,451	2,858	75	214		
20—	20—	177,928	4,455	174	775	·91	703	246,593	4,840	188	910	1·29	1,170
25—	25—	173,473	11,431	641	7,327	1·92	14,104	241,753	15,337	330	5,061	1·76	8,902
30—		168,300						235,288					
35—	35—	162,042	17,790	842	14,979	3 60	53,909	226,416	25,912	453	11,738	3·49	40,966
40—		153,991						214,771					
45—	45—	144,252	25,290	890	22,508	5·08	114,341	200,504	34,939	569	19,880	3·58	71,091
50—		132,722						183,154					
55—	55—	118,962	35,876	911	32,683	6·09	199,007	165,565	57,762	599	34,599	3·73	128,950
60—		102,379						136,818					
65—	65—	83,086	83,086	926	76,938	6·44	495,788	107,803	107,803	787	84,841	3·53	299,574
70—		61,657						76,246					
75—		39,652						45,686					
80—		20,574						21,514					
85—		7,831						7,221					
90—		1,931						1,530					
95—		265						187					
All ages ...		...	250,000	621	155,220	5·66	877 852	...	250,000	629	157,243	3·50	550,653

* Taken the same as married and widowed of population living at ages.
† Taken the same as offspring of population in prisons at ages.

II. *The Natural Fertility of Criminals and the Influences that lead to Aberrations of Fertility in all and different Grades of Criminals.*

A. *Nature of Inquiry.*—Some rather startling differences have appeared between the fertility of habitual offenders as found in convict prisons and that of the general population. Are these differences due to a natural diminution of generative power, and of inclination to marry, in criminals? Are they due to the fact that imprisonment serves as a mechanical restraint upon marriage, and upon the fulfilment of natural fecundity? Or do bachelors tend to be imprisoned more than married people? And is the tendency of a parent to transgress against the law held in check by the possession of offspring? Statistically, we may look in three directions for information upon these points. Firstly, from fertility statistics of criminal stocks, we can compare the procreative power of law-abiding parents, who have begotten criminal offspring, with that of other classes of non-criminal parents in the general community. Secondly, from statistics as to the marriage and reproductive power of star-class convicts (*i.e.*, criminals who, at the time of observation, were undergoing their first sentence of imprisonment) the natural fertility of the actual criminal can be assessed, before it has been influenced by the restraints of imprisonment. Thirdly, from comparative marriage and natality statistics of habitual offenders, grouped according to their penal records, we can estimate the progressive effects upon natural fertility resulting from, or associated with, (*a*) increasing frequency of imprisonment, and (*b*) with younger age at first imprisonment.

B. *The Fertility of Criminal Stocks.*

The following statistics give the frequency distribution of offspring in 1,356 families, in which neither parent, but at least one child, has been convicted of crime.

which the insane are begotten, and 1·3 more members than families in which the tubercular are being bred. And yet, according to Pearson and Heron, tuberculous and insane stocks are more fertile than healthy stocks of the same class in the general community. Parents belonging to the peerage produce on the average 1·2 less offspring than the parents of criminals; parents of the professional class in New South Wales—where fertility is generally high, independent of class—produce, on the average, 1·6 less offspring. The family records which show the closest resemblance to our natality statistics of criminal stock are those quoted for New South Wales. But, since these records refer only to marriages lasting at least 15 years, whereas our statistics are not limited by any such selective condition, the results, as they stand, are not strictly comparable. Our criminal statistics, when limited, like those quoted for New South Wales, to the fertility of marriages lasting at least 15 years, would show the average family of criminal stock to be well in excess of the average for all classes in New South Wales. We repeat: the criminal is unquestionably a product of the most prolific stocks in the general community.

C. *The Fertility of Star-class Convicts.*

As already explained, star-convicts belong to the class of criminals convicted of crime, and imprisoned, for the first time. Statistics of this class of convict, therefore, illustrate the *natural* fertility of criminals, as yet uninterrupted by the *artificial* restraints of confinement. Our object is to compare the marriage- and natality-rates of this *special* class of criminals with those rates we have already obtained for *habitual* criminals, and for the *general population.* We have accordingly arranged our new statistics of star-class criminals in the same form, and have obtained their marriage- and natality-rates by precisely the same plan as we employed in dealing with the statistics of habitual criminals.

TABLE 127.

Numbers married (including widowed and deserted) amongst first offenders found in convict prisons, and in the general population, England and Wales. (Reg. Gen. Rep., 1906.)

Ages.	Numbers in sample.	Married per thousand.	In general population, married per thousand.	Actual numbers married.	In general population of like numbers, the number married.
15-	32	—	3	—	—
20-	152	257	174	39	26
25-	210	504	641	106	135
35-	183	754	842	138	154
45-	88	887	890	78	78
55-	64	906	911	58	58
65-	17	883	926	15	16
All ages ...	746	582	627	434	468

TABLE 128.

Offspring, surviving birth, of first offenders found in convict prisons, and offspring of married males dying at same ages, New South Wales experience, 1901–1902.

Ages.	Numbers of married in sample.	Offspring per individual married.	In general population, offspring per individual married.	Actual number of offspring.	In general population, number of offspring of like numbers of married.
20-	11	1·09	·91	12	10·01
25-	16	1·81	1·23	29	19·68
30-	24	2·79	2·33	67	55·92
35-	20	4·65	3·05	93	61·00
40-	27	4·48	4·06	121	109·62
45-	27	4·22	4·85	114	130·95
50-	12	7·17	5·32	86	63·84
55-	15	5·80	6·09	87	91·35
60-	14	5·14	6·09	72	85·26
65-	3	5·33	6·36	16	19·08
70-	—	—	6·66	—	—
75-	—	—	6·18	—	—
80-	—	—	6·48	—	—
All ages ...	169	4·12	3·83	697	646·71

TABLE 129.

Frequencies of number of offspring of married first offenders found in convict prisons, distinguished by the duration of their marriage, and the age of their wife at marriage; and offspring of similarly circumstanced individuals in the general population, New South Wales experience, 1901–1902.

Number of offspring.	Duration of marriage.											
	Under 5 years.				5–10 years.				10–15 years.			
	Age of wife at marriage in years.				Age of wife at marriage in years.				Age of wife at marriage in years.			
	15 and under 25.	25 and under 35.	35 and under 45.	All ages.	15 and under 25.	25 and under 35.	35 and under 45.	All ages.	15 and under 25.	25 and under 35.	35 and under 45.	All ages.
0	4	2	—	6	1	4	—	5	—	2	—	2
1	10	2	1	13	—	2	—	2	2	1	2	5
2	7	1	—	8	4	2	—	6	2	2	—	4
3	—	2	—	2	1	2	—	3	3	—	—	3
4	1	—	—	1	2	2	—	4	2	2	—	4
5	—	—	—	—	—	1	—	1	6	1	—	7
6	—	—	—	—	2	—	—	2	1	—	—	1
7	—	—	—	—	1	—	—	1	1	—	—	1
8	—	—	—	—	—	—	—	—	1	—	—	1
9	—	—	—	—	—	—	—	—	1	—	—	1
10	—	—	—	—	—	—	—	—	—	—	—	—
11	—	—	—	—	—	—	—	—	—	—	—	—
12	—	—	—	—	—	—	—	—	—	—	—	—
13	—	—	—	—	—	—	—	—	—	—	—	—
14	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—
20	—	—	—	—	—	—	—	—	—	—	—	—
Total married criminals	22	7	1	30	11	12	—	24	19	8	2	29
Offspring per marriage...	1·27	1·43	1·00	1·30	2·45	1·92	—	2·63	4·37	2·25	1·00	3·55
Offspring per marriage, New South Wales experience	·94	·97	·40	·93	2·64	2·60	—	2·50	4·12	3·42	·77	3·70

Number of offspring.	Duration of marriage.												All durations of marriage and ages of wives at marriage found in criminal sample.
	15–20 years.				20–25 years.				Over 25 years.				
	Age of wife at marriage in years.				Age of wife at marriage in years.				Age of wife at marriage in years.				
	15 and under 25.	25 and under 35.	35 and under 45.	All ages.	15 and under 25.	25 and under 35.	35 and under 45.	All ages.	15 and under 25.	25 and under 35.	35 and under 45.	All ages.	
0	—	1	—	1	2	—	1	3	4	2	—	6	23
1	—	—	—	—	2	—	—	2	—	1	—	1	23
2	2	—	—	2	1	1	—	2	1	1	—	2	24
3	1	1	—	2	1	3	—	4	1	1	—	2	16
4	4	1	—	5	2	—	—	2	—	3	—	3	19
5	5	—	—	5	7	—	—	7	1	2	—	3	23
6	3	1	—	4	1	—	—	1	4	2	—	6	14
7	3	—	—	3	2	—	—	2	5	1	—	6	13
8	1	—	—	1	—	—	—	—	4	1	—	5	7
9	1	—	—	1	—	1	—	1	3	1	—	4	7
10	—	—	—	—	2	—	—	2	3	—	—	3	5
11	—	—	—	—	—	—	—	—	—	—	—	—	—
12	—	—	—	—	—	—	—	—	1	1	—	2	2
13	—	—	—	—	—	1	—	1	—	—	—	—	1
14	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—
20	—	—	—	—	—	—	—	—	1	—	—	1	1
Total married criminals	20	4	—	24	20	6	1	27	28	16	—	44	178
Offspring per marriage...	5·20	3·25	—	4·87	4·50	5·50	·00	4·56	6·79	4·75	—	6·05	3·99
Offspring per marriage, New South Wales experience	5·64	4·20	—	5·40	7·17	4·20	·77	6·27	7·17*	4·20*	—	6·09	4·23

* Assumed to be the same as for duration of marriage, 20–25 years.

These tables show* how, when compared age for age, the marriage-rates of star-class convicts approximate to those for the general population; and when they are compared both age for age, and for equal periods of marriage duration, these tables demonstrate the resemblance—relatively to the offspring of "habituals," the *close* resemblance—between the average number of legitimate offspring born, respectively, to star-class convicts, and to

* *See also* Figs. xlii and xliii, pages 291, 293.

parents in New South Wales.* The results of the above comparisons must next be considered in relation to those we have already obtained for habitual criminals. Before proceeding to this consideration, however, let us advert for a moment to, and take cognizance of—

D. *The Modifications in Criminal Fertility associated with increasing Frequency of Imprisonment, and with younger Age at First Conviction.*

To illustrate and define these relations, we have arranged our marriage and natality statistics of habitual offenders in the following Tables 130, 131, 132, 133, illustrated in Figs. (xliv), (xlv), (xlvi), (xlvii) :—

TABLE 130.

Numbers per 1,000 married of habitual, and first, offenders found in convict prisons, distinguished by the number of their previous convictions ; and the numbers per 1,000 married of the general population, (males), England and Wales, 1906, at the same (present) ages.

Ages at present conviction.	In general population, numbers married per 1,000.	—	Number of previous convictions. 0.	1, 2.	3, 4.	5, 6.	7, 8.	9, 10, 11, 12.	13, 14, 15, 16.	17, 18, 19, 20.	Over 20.
15—		Numbers	32	17	10	4	3	2	1	—	1
		Numbers married ...	0	0	1	1	1	0	0	—	0
	3	Numbers married in general population.	·10	·05	·03	·01	·01	·01	·00	—	·00
20—		Numbers	152	81	83	73	45	75	21	10	9
		Numbers married ...	39	21	13	10	8	15	6	0	1
	174	Numbers married in general population.	26·45	14·09	14·44	12·70	7·83	13·05	3·65	1·74	1·57
25—		Numbers	210	135	109	132	101	163	85	52	65
		Numbers married ...	106	62	48	41	35	46	29	16	11
	641	Numbers married in general population.	134·61	86·53	69·87	84·61	64·74	104·48	54·49	33·33	41·66
35—		Numbers	183	77	58	49	55	82	58	39	53
		Numbers married ...	138	53	34	30	20	28	20	11	18
	842	Numbers married in general population.	154·09	64·83	48·84	41·26	46·31	69·04	48·84	32·84	44·63
45—		Numbers	88	34	36	28	25	48	29	14	16
		Numbers married ...	78	27	26	19	11	21	12	5	7
	890	Numbers married in general population.	78·32	30·26	32·04	24·92	22·25	42·72	25·81	12·46	14·24
55—		Numbers	64	18	20	17	21	27	20	12	17
		Numbers married ...	58	12	15	9	15	15	12	6	8
	911	Numbers married in general population.	58·30	16·40	18·22	15·49	19·13	24·60	18·22	10·93	15·49
65—		Numbers	17	12	11	14	17	15	16	4	6
		Numbers married ...	15	11	9	10	12	12	13	3	5
	926	Numbers married in general population.	15·74	11·11	10·19	12·96	15·74	13·89	14·82	3·70	5·56
At above ages.		Total numbers in sample ...	746	374	327	317	267	412	230	131	167
		Total numbers married ...	434	186	146	120	102	137	92	41	50
		In general population, numbers married.	467·6	223·3	193·6	192·0	176·0	267·8	165·8	95·0	123·1
		Numbers married per 1,000 (criminals).	582	497	446	379	382	333	400	313	299
		Numbers married per 1,000 (general population).	627	597	592	606	659	650	721	725	737

* The resemblance is even closer than it appears to be ; for, as we have already pointed out, *our* statistics refer to the offspring of criminals who were alive at the various ages recorded, whereas the New South Wales data refer to the offspring of individuals who died at these respective ages. For this reason, the non-criminal males, during the earlier decades of life, would be expected to have fewer offspring than male criminals.

TABLE 132.

Numbers per 1,000 married of habitual offenders found in convict prisons, distinguished by their age at first conviction; and the numbers per 1,000 married of the general population, males, England and Wales, 1906, at the same (present) ages.

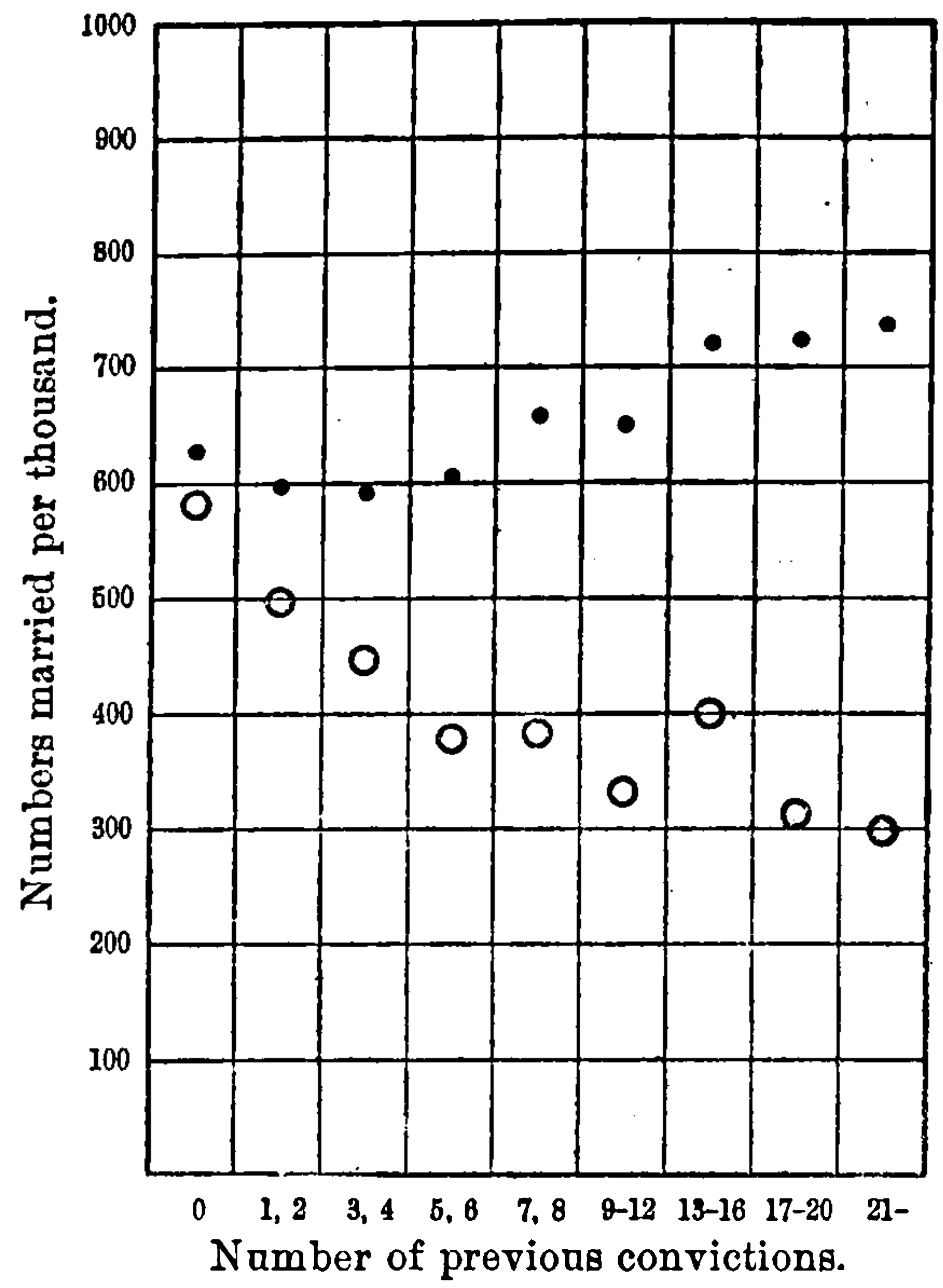
Ages at present conviction.	In general population, numbers married per 1,000.	—	Age at first conviction. 10–	15–	20–	25–	30–	35–	40–	45–	50–
15–	3	Numbers	14	23	—	—	—	—	—	—	—
		Numbers married ...	3	0	—	—	—	—	—	—	—
		Numbers married in general population.	·04	·07	—	—	—	—	—	—	—
20–	174	Numbers	90	249	56	—	—	—	—	—	—
		Numbers married ...	17	46	11	—	—	—	—	—	—
		Numbers married in general population.	15·66	43·33	9·74	—	—	—	—	—	—
25–	641	Numbers	140	387	199	102	15	—	—	—	—
		Numbers married ...	46	123	74	36	9	—	—	—	—
		Numbers married in general population.	89·74	248·07	127·56	65·38	9·61	—	—	—	—
35–	842	Numbers	58	132	100	74	71	32	6	—	—
		Numbers married ...	21	50	40	33	39	24	6	—	—
		Numbers married in general population.	48·84	111·14	84·20	62·31	59·78	26·94	5·05	—	—
45–	890	Numbers	17	44	50	28	31	17	25	13	4
		Numbers married ...	4	22	23	20	25	10	14	8	3
		Numbers married in general population.	15·13	39·16	44·50	24·92	27·59	15·13	22·25	11·57	3·56
55–	911	Numbers	11	21	19	16	21	15	18	14	16
		Numbers married ...	5	12	14	6	16	13	12	9	7
		Numbers married in general population.	10·02	19·13	17·31	14·58	19·13	13·66	16·40	12·75	14·58
65–	926	Numbers	5	3	11	16	15	7	9	6	23
		Numbers married ...	4	3	8	12	9	4	8	5	22
		Numbers married in general population.	4·63	2·78	10·19	14·82	13·89	6·48	8·33	5·56	21·30
At above ages.	Total numbers in sample ...		335	859	435	236	153	71	58	33	43
	Total numbers married ...		100	256	170	107	98	51	40	22	32
	In general population, numbers married.		184·1	463·7	293·5	182·0	130·0	62·2	52·0	29·9	39·4
	Numbers married per 1,000 (criminals).		299	298	391	453	641	718	690	667	744
	Numbers married per 1,000 (general population).		550	540	675	771	850	876	897	906	916

TABLE 133.

Average offspring of married habitual offenders found in convict prisons, distinguished by their ages at first conviction; and the average offspring of married males dying at same (present) ages, experience of New South Wales, Census 1901–2.

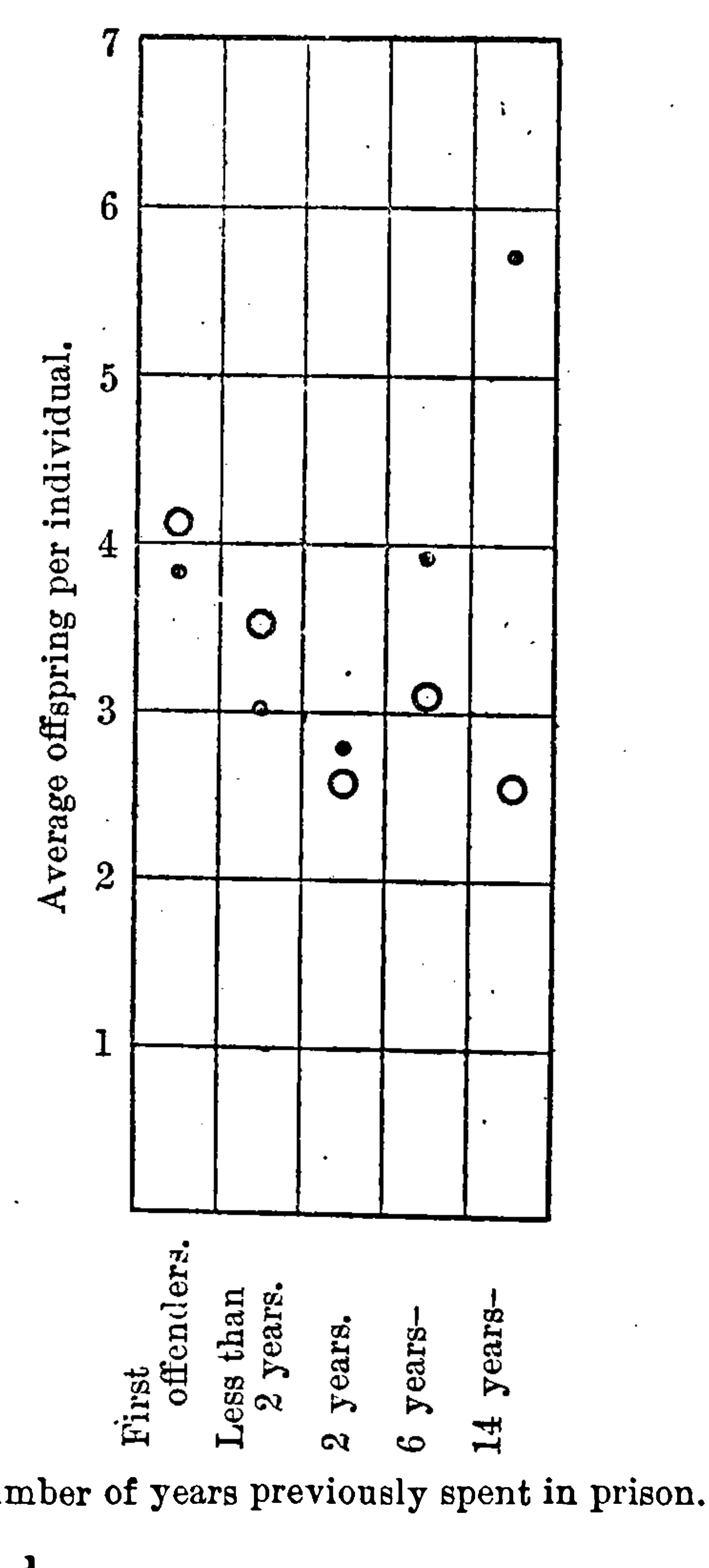
Ages at present conviction.	In general population, number of offspring.	—	Age at first conviction. 10–	15–	20–	25–	30–	35–	40–
20–		Numbers married	1	7	—	—	—	—	—
		Number of offspring ...	3	8	—	—	—	—	—
	·91	Number of offspring in general population.	·91	6·37	—	—	—	—	—
25–		Numbers married	2	14	10	1	—	—	—
		Number of offspring ...	5	19	9	1	—	—	—
	1·23	Number of offspring in general population ...	2·46	17·22	12·30	1·23	—	—	—
30–		Numbers married	4	10	4	11	—	—	—
		Number of offspring ...	12	24	13	16	—	—	—
	2·33	Number of offspring in general population.	9·32	23·30	9·32	25·63	—	—	—
35–		Numbers married	3	7	4	6	8	4	—
		Number of offspring ...	10	18	10	21	26	12	—
	3·05	Number of offspring in general population.	9·15	21·35	12·20	18·30	24·40	12·20	—
40–		Numbers married	—	4	2	2	1	5	—
		Number of offspring ...	—	8	12	4	9	26	—
	4·06	Number of offspring in general population.	—	16·24	8·12	8·12	4·06	20·30	—
45–		Numbers married	3	2	4	1	3	2	2
		Number of offspring ...	11	5	20	0	7	5	22
	4·85	Number of offspring in general population.	14·55	9·70	19·40	4·85	14·55	9·70	9·70
50–		Numbers married	—	4	2	1	1	1	5
		Number of offspring ...	—	11	1	2	0	3	23
	5·32	Number of offspring in general population.	—	21·28	10·64	5·32	5·32	5·32	26·60
55–		Numbers married	1	3	1	1	2	—	2
		Number of offspring ...	5	3	0	9	6	—	9
	6·09	Number of offspring in general population.	6·09	18·27	6·09	6·09	12·18	—	12·18
60–		Numbers married	1	2	2	1	2	3	2
		Number of offspring ...	1	8	15	5	2	19	15
	6·09	Number of offspring in general population.	6·09	12·18	12·18	6·09	12·18	18·27	12·18
65–		Numbers married	1	1	—	3	3	3	7
		Number of offspring ...	1	1	—	5	8	10	39
	6·36	Number of offspring in general population.	6·36	6·36	—	19·08	19·08	19·08	44·52
70–		Numbers married	—	—	1	—	2	—	4
		Number of offspring ...	—	—	0	—	2	—	18
	6·66	Number of offspring in general population.	—	—	6·66	—	13·32	—	26·64
75–		Numbers married	1	1	—	—	1	—	—
		Number of offspring ...	5	3	—	—	0	—	—
	6·18	Number of offspring in general population.	6·18	6·18	—	—	6·18	—	—
80–		Numbers married	—	—	—	—	1	—	2
		Number of offspring ...	—	—	—	—	5	—	7
	6·48	Number of offspring in general population.	—	—	—	—	6·48	—	12·96
At above ages.		Total numbers married in sample...	17	55	30	27	24	18	24
		Total number of offspring	53	108	80	63	65	75	133
		In general population, number of offspring.	61·1	158·4	96·9	94·7	117·7	84·9	144·8
		Average offspring per individual (criminals).	3·12	1·96	2·67	2·33	2·71	4·17	5·54
		Average offspring per individual (general population).	3·59	2·88	3·23	3·51	4·91	4·72	6·03

FIG. xliv. (To accompany Table 130.)



Habitual and first offenders ... ... O
General population at same ages ... ... •

FIG. xlv. (To accompany Table 131.)



Habitual and first offenders ... ... O
General population at same ages ... ... •

Table 130 shows how increasing frequency of conviction is associated with a progressively decreasing marriage-rate, and in Table 131 a similar association is shown for the natality-rates—*i.e.*, how, with increasing length of time spent in prison, the offspring begotten by criminal parents become fewer in average number. In the same way, as evinced by Tables 132, 133, there would seem to be a tendency for the marriage- and natality-rates of habitual criminals to decline in accordance with the earlier age at which they are first convicted of crime. But the tendency, although appreciable, is very slight.

E. We have now before us all the statistical evidence we have been able to collect concerning the marriage, and the procreative power of criminals: and from this evidence we can formulate the following statistical statements:—

Of 100 *males in the general population, at the ages of the habitual criminals in our sample,* 64·6 *are married and have* $64{\cdot}6 \times 3{\cdot}88 = 250{\cdot}65$ *offspring; whilst, out of* 100 *of the habitual criminals, only* 38·9 *are married and have* $38{\cdot}9 \times 2{\cdot}97 = 115{\cdot}53$ *offspring. The rate, therefore, at which habitual criminals produce children, relatively to the general population, is* $\frac{115{\cdot}53}{250{\cdot}65} = {\cdot}4609$: *that is to say, habitual criminals, as represented in our sample, are less than half as fertile as the general population.*

Of 100 *males in the general population, at the ages of the first offenders or star-class convicts in our sample,* 62·7 *are married and have* $62{\cdot}7 \times 3{\cdot}83 = 240{\cdot}14$ *offspring; whilst, out of* 100 *of the first offenders,* 58·2 *are married and have* $58{\cdot}2 \times 4{\cdot}12 = 239{\cdot}78$ *offspring. The rate, therefore, at which first offenders produce children, relatively to the general population, is* $\frac{239{\cdot}78}{240{\cdot}14} = {\cdot}9985$: *that is to say, criminals, as represented in our sample, prior to incarceration, are precisely equal in fertility with the general population.*

Unimprisoned criminals are more than twice as fertile as criminals who have been frequently in prison.

Passing from unimprisoned criminals to those who have been frequently confined, there is a progressive decline in both the marriage- and the natality-rate, associated with increasing frequency of incarceration.

F. *Influences determining the Decline in Fertility of Criminals.*

These are general statements of the statistical facts. How are these facts to be explained? What is the nature of the causes, or influences, which determine the marked decline we have discovered in the marriage-rate and fertility of all and different grades of habitual criminals. An analytical comparison of our data should throw light upon this question. We have before us two sets of facts which, having been elicited in both cases by precisely the same method, are legitimately comparable with each other, and with similar facts relating to the general population. One set of these facts—the set relating to habitual criminals—refer to criminals whose tendency to marry, and whose potentiality of procreative life, have been frequently interrupted by confinement in prison. The other set refers to criminals—star-class convicts—whose tendencies and potentialities, up to the time of observation, have never been so interfered with. The comparative examination of these facts should throw light upon the influences we are seeking. The analysis and comparison of these facts should, at any rate, separate and define the extent to which anomalous marriage and fertility conditions, in habitual criminals, result, on the one hand, from imprisonment, or from causes inseparably associated with imprisonment, and, on the other hand, from causes, which, be they constitutional or environmental, have no connection with incarceration. We now propose to look for these influences through a further analysis and comparison of all the evidence presented in the preceding pages.

The differences we have found in the gross fertility of criminals who have, and criminals who have not, been subjected to imprisonment, is unequivocal and startling. That this difference in fertility is associated, directly or indirectly, with imprisonment, seems a plausible conclusion: but, at the present stage of our inquiry, it is not an indisputable one. Before any statement can be legitimately made, we must seek elucidation of certain points by a finer statistical analysis. So far, we have been comparing the gross marriage and fertility statistics, on an equalised average of all ages grouped together. Let us now see how these same statistics compare when separated into consecutive age-groups. Let us see how, at each successive age, criminals, who have spent varying portions of their life in prison, compare with first offenders, and with the general population, in regard to (1) their marriage-rate; and (2) the rate at which those who are married reproduce their kind. It will be convenient to consider the latter first.

(a) *The Effect of Imprisonment and of other Influences upon the Natality-rates of Criminals.*—Figure xliii shows that not only on an average of all ages, but that at each successive age, the average number of offspring, begotten by offenders who have *not* been subjected to imprisonment, tallies closely with the average number of offspring of the non-criminal population. It will be seen that, in spite of certain minor differences, the general type of the natality curve is the same in the two cases. The initial fertility of these unimprisoned criminals is the same as that of the general population, their degree of fecundity at different ages is also consistently the same, their procreative life continues approximately to the same age, and, their rate of producing offspring shows no sensible deviation from the normal rate. For equal duration of marriage, then, the number of offspring produced respectively by married convict criminals of the star-class, and married non-criminals, is practically identical. Turning now to the fertility for *habitual offenders* who, for the most part, have been in and out of prison all their lives, we find a certain close agreement with the fertility curve for first offenders, and a certain very pronounced difference. A comparison of these curves illustrates the fact that, up to the age of 40, the fertility of habitual criminals is in close accord with the fertility, both of first offenders, and of the non-criminal population at large. But further comparison shows that, *after* the age of 40, this agreement ceases. After this age, the curve which, for first offenders as well as for the general population, continues to rise until it reaches a summit at age 70, in the case of habitual offenders remains at the same level to the end of life. After the age of 40, the reproductive life of the habitual criminal comes abruptly, and, we infer, prematurely, to an end.

What is the cause of this abortive change in the fertility of habitual criminals, which occurs about the age of 40? All the statistical evidence we have produced rules two possible explanations out of court. The change is certainly *not* due to any lack of physiological generative power in the habitual criminal; nor is it due to imprisonment acting *directly* as an involuntary restraint to connubial intercourse. We have shown that criminals are bred from the most fertile of human stocks. Our statistics of first offenders have proved that. prior to imprisonment, *i.e.*, unhampered by imprisonment, the criminal himself breeds at the normal rate. Finally, our statistics, relating to habitual offenders, show that this class of criminal also, between the ages of 15 and 40, attains, if it does not exceed, what may be regarded as a normal standard of physiological fruitfulness. So far as *initial* fertility is concerned, there is no evidence of any tendency to physiological sterility such as criminologists, in the past, have frequently maintained to be the case.* The facts also prove that this sudden cessation of fertility at the age of 40 cannot be due *directly* to imprisonment. Prior to the age of 40, habitual criminals go in and out of prison at much the same rate as after that age. During the first fifteen years of married life, the intermittent restraint of imprisonment has no tendency to check fertility. During this first period of married life, criminals who have been frequently in prison, and those who have never been imprisoned, *have the same average number of offspring.* But, at the age of 40, though his condition of intermittent imprisonment is not sensibly changed, the fertility of the habitual criminal begins to fail. Is this sudden failure due to the onset of a premature sterility? The evidence from our statistics of first offenders does not suggest the existence of any such tendency in the criminal. There seems to be only one possible explanation of this anomalous condition of fertility amongst habitual criminals. The failure in fertility from the age of 40 onwards is, we consider, due to the circumstance that, after a certain period of continually interrupted married life, habitual criminals are deserted by their wives. It is true the sentences of habitual criminals do tend to increase with their increasing age; and more men receive sentences of penal servitude after 40, than before that age. This additional imprisonment might account for any *slight* diminution in fertility: but it is not enough to account for its complete cessation. A week of freedom would be sufficient to undo the effect of a year's enforced abstinence, admitting that, when released from prison, the criminal returned to his wife. We repeat: the diminution in fertility of the habitual criminal is not due to physiological sterility nor, *directly*, to his confinement in prison. It is due to a definite, psychological, human reaction; and is only in a subsidiary sense the effect of prison conditions.†

(b) *The Effect of Imprisonment and of other Influences upon the Marriage of Criminals.*

(I) *General Remarks.*—We have stated that, when compared on an equalised average

---

* Dr. John Lyell in his presidential address to the Perth Branch of the British Medical Association, Nov., 1910, stated "that criminals in many cases share in the relative sterility of all degenerate stocks."

† Many habitual criminals admit that their women have deserted them to live with other men.

of all ages, the general marriage-rate of first offenders approximates closely, whilst that of habitual offenders deviates widely, from the marriage-rate registered for the general population. This statement expresses the result of a perfectly legitimate comparison: that is to say, a comparison which has been made not without regard to a certain source of error which, if disregarded, might lead us to fallacious conclusions. The point always to be borne in mind, when comparing "percentages" or "rates," is that a rate, calculated from any local population—as, for instance, the number of individuals per 1,000, within any district, who die or marry—is fundamentally dependent upon the age-distribution of the population in question. As the preceding tables show, when estimating the marriage-rates for comparison, due allowance was made for existing differences of age in the populations to be compared. That is to say, the marriage-rates presented in these tables were, in each case, calculated on the assumption of an age-distribution in the general population reduced to the corresponding age-distribution in the criminal group.

Assuming, then, the accuracy of our statistics, we may conclude that there is a considerable difference between the rate of marriage with habitual criminals and the marriage-rate of first offenders who, at the time of observation, had not yet been imprisoned: which latter rate, as it stands, corresponds closely to the rate of marriage in the general population. Before proceeding, however, to draw conclusions from these general rates as to the influence of imprisonment upon marriage, we must compare the statistics, on the basis of a finer analysis.

(2) *Comparison of Marriage-rates at each Quinquennium.*

(*a*) *Habituals, First Offenders, and the General Population.*

These rates are represented diagrammatically in Fig. xlii. Reference to this figure shows at a glance how the marriage-age curve, in the case of *first offenders*, corresponds approximately, both in form and extent, to that for the general population, and, in the case of *habitual criminals*, deviates widely from it. Are we then to assume that this difference in form and extent between the two curves, that the deviation from the normal in the case of habitual criminals, represents solely the effect of imprisonment upon marriage? When dealing with the natality-rates, there was no need to carry the analysis further than we have now done with the marriage statistics, in order to gauge the influence of imprisonment *upon natality*. But the relation of this influence upon *marriage* is not yet so conclusively apparent. The marriage-rates we have obtained for successive age-periods, presented in Fig. xlii, yield, so far, only a surface view of the problem. This view confirms, as plausible, the conclusion that the difference between the curves in Fig. xlii does represent the effect of imprisonment upon marriage. We have before us two curves, both expressing the marriage-rate for criminals at the same successive age-periods: one of them related to criminals who have been frequently imprisoned, the other to offenders who have never been incarcerated. Surely, the differences between the two curves, especially when we bear in mind how increasing frequency of conviction is also associated with a decreasing marriage-rate, ought to represent the influence upon marriage of imprisonment? This is the obvious conclusion from a surface view of the matter. But, *au fond*, our problem is more intricate.* The factors and varying influences

* And, moreover, it illustrates characteristically the necessity for proceeding always with statistical caution, and of avoiding the pet temptation of the statistician, which is to form hasty judgments upon glib, but only partial, evidence. This is immediately shown by the following table—which compares, at different ages, the marriage-rates of habitual criminals at the time of observation with their marriage-rates at the time of their first conviction.

TABLE 134.

The numbers married in habitual criminals at age of first offence.

Ages.	Totals	Numbers married at age of first offence.	Per cent. married at age of first offence.	Per cent. married at present age. (Table 121.)
10-	273	3	1·1	7·5
20-	85	14	16·5	18·8
25-	121	42	34·7	33·0
35-	44	28	63·7	45·3
45-	12	7	58·3	56·9
55-	7	7	100·0	66·9
All ages ...	542	101	18·6	19·9

We see that *prior* to incarceration, the marriage-rates of habitual criminals are of much the same order as *after* frequent imprisonment.

different orders of crimes committed. Habitual offenders are, the bulk of them, thieves and burglars. It is justifiable, on this ground, to regard "habituals" as one, homogeneous class. But the justice, or advisability, of grouping together thieves and murderers, fraudulent offenders, criminals who have committed arson and rape, into one composite class, is more open to question. It is a reasonable hypothesis that such different orders of crime may have different associations with the marriage estate of their perpetrators. Also we know there is a close association between certain kinds of crime and the age of the individual who commits them—as, for instance, between crimes of violence, committed in the main by young people, and fraudulent crimes, committed generally by persons of maturer age. Is it not very possible that the deviations from the normal standard in the marriage-rates we have found for *all* star-convicts, at certain ages, may be due to a difference in the marriage-rate associated with different *orders of criminals*, convicted at these ages? To test this point, we have grouped our sample of star-class convicts according to the kinds of crime committed by them; and, for each group, we have analysed the marriage-rates at different ages.

TABLE 135.

Marriage, at each age, of first offenders distinguished by nature of crime. Number of individuals. Number married. Number married per 1,000 at age.

Ages.	Nature of crime.								
	Malicious damage to property.	Stealing and burglary.	Sexual offences.	Violence against the person.	Offences against the currency.	Forgery and Fraud.	Damage, stealing, sexual offences, violence.	Forgery and fraud and offences against the currency.	Totals.
15–	—	3	21	10	—	—	34	—	34
	—	0	0	0	—	—	0	—	0
	—	*0*	*0*	*0*	—	—	*0*	—	*0*
20–	4	13	36	76	1	14	129	15	144
	0	2	8	17	1	9	27	10	37
	0	*154*	*222*	*224*	*1,000*	*643*	*209*	*667±82*	*257*
25–	7	12	46	94	3	33	159	36	195
	3	5	18	40	1	24	66	25	91
	429	*417*	*391*	*426*	*333*	*727*	*415*	*694±52*	*467*
35–	13	16	44	59	2	50	132	52	184
	6	10	32	43	1	46	91	47	138
	462	*625*	*727*	*729*	*500*	*932*	*689*	*904±28*	*750*
45–	5	3	14	26	—	38	48	38	86
	4	3	9	24	—	37	40	37	77
	800	*1,000*	*643*	*923*	—	*974*	*833*	*974±18*	*895*
55–	5	6	17	22	2	26	50	28	78
	3	6	13	21	2	26	43	28	71
	600	*1,000*	*765*	*955*	*1,000*	*1,000*	*860*	*1,000*	*910*
All ages.	34	53	178	287	8	161	552	169	721
	16	26	80	145	5	142	267	147	414
	471	*491*	*449*	*505*	*625*	*882*	*484*	*870*	*574*

(β) *Comparison of Quinquennial Marriage-rates of First Offenders convicted of different Crimes.*

It will be observed, from the figures in the above table, that our sample of convicts is not homogeneous, either in regard to the age-distribution, or marriage estate of at least two sub-sections of individuals within the sample. The data are not sufficient for us to draw any final conclusion from the percentages of married persons within each age-group. But, upon the evidence of the figures in this table, regarded as a whole, and especially from the figures in the last column, giving the general marriage rate for different crimes upon an average of all ages—we come to the following conclusion: that crimes of fraud, which include forgery, coining and embezzlement, as well as every kind of fraudulent pretence, distinguish particularly a class which, at the same time, has a larger proportion of married persons than have other classes of criminals, and has also a different age-distribution, *i.e.*, crimes of fraudulence are committed at a later age than other crimes. The age-distributions of offenders convicted of incendiarism, and other forms of wilful damage to property (average age 36·58 years), stealing (average age 36·11 years), sexual offences (average age 33·52 years), and of crimes of violence against the person (average age 32·60 years), are fairly similar to each other; their respective marriage-rates, allowing for expected variation due to random sampling, are in close accord. On an average of all ages, the maximum difference between any two of the four groups just mentioned, is only 5·5 per cent. Directly, however, we come to criminals who have committed *fraudulent* offences, we find a sudden wide increase in their marriage-rate; an increase which stands out prominently and consistently within each age-group, and which, upon an average of all ages, is 40 per cent. greater than the rate of marriage amongst first offenders convicted of other crimes.

The difference that has transpired between fraudulent and other criminals is very important, and for our present inquiry is a most fortunate discovery.* Consequently, before proceeding further with our analysis, it would be well to obtain a clearer view of the nature of this difference, and to get it into more definite focus. From the comparison of percentages, any existing relation may be roughly apprehended: but, for precise exactitude, we must measure such relations on the correlation scale between -1 and $+1$. To appreciate fully, in the above table, the significance of all the figures "en bloc," and to comprehend with the least effort the ultimate relation between fraudulent and other criminals, we must express this complex relationship in a single value of a correlation coefficient: that is to say, we must find the partial correlation between fraudulent crime and marriage for constant age.† To determine this partial correlation, three correlation coefficients must be calculated, (1) r_{FA} = the correlation coefficient between fraudulent criminality and age; (2) r_{MA} = the correlation coefficient between marriage and age, and (3) r_{FM} = the correlation between fraudulent criminality and marriage. The following table gives the ages of criminals convicted of fraud, and of criminals committed to prison for crimes other than fraud. The correlation coefficient r_{FA} was determined from these data by Pearson's new method‡ for determining correlation, when one variable (criminality) is given by alternative categories (fraudulent and non-fraudulent criminals), and the other variable (age) by quantitative groupings.

TABLE 136.

Correlation of fraudulent crime and age in first offenders.

Ages.	Fraudulent offenders.	Non-fraudulent offenders.	Totals.	Ages.	Fraudulent offenders.	Non-fraudulent offenders.	Totals.
15-	0	34	34	50-	18	18	36
20-	15	129	144	55-	10	18	28
25-	13	91	104	60-	13	21	34
30-	23	68	91	65-	3	8	11
35-	23	67	90	70-	2	2	4
40-	29	65	94	75-	—	1	1
45-	20	30	50				

The constants are as follows:—

Mean age of total criminals... ... ... 36·245
Standard deviation of age ... ... 12·469
Mean age of fraudulents ... ... 42·494
$\frac{1}{2}(1-\alpha)$ ... ... ·234
Z ... ... ·3069

* As we have already pointed out (see page 39, Part I.), the sub-group of fraudulent criminals is in many ways representative of the well-to-do classes in the general population; and this fact opens the possibility for our comparing criminals with the general community in certain directions that would otherwise be closed to us.

† The reasons that make it important, where such be possible, to express results of comparison in the form of a correlation coefficient, are manifold. The exact quantitative significance of any relation is most easily grasped when expressed by a single figure. Measured always upon the same scale between -1 and $+1$, a relation expressed by a correlation coefficient becomes legitimately comparable with other relations, similarly expressed. By repeated usage of such coefficients, the mind acquires in time certain ideal standard values, by reference to which the strength of every newly-discovered association can be tested. Perhaps the first merit of the correlation coefficient lies in its precise meaning as a factor in prediction. In fact, the real meaning of any particular value for the strength of association between two characters lies in the information this value supplies as to how, and to what precise extent, the variability in a prediction of the one character will be modified by a knowledge of the other character, associated with it. For instance, from a knowledge of the mean value and variability in the stature of man, the chances can be predicted that the stature of any unknown individual will fall within a certain range. But, if the length of the thigh bone of the unknown individual can be ascertained, this, combined with the knowledge of the correlation coefficient between the stature of men generally and the length of their thigh bones, will definitely modify the range of the prediction, which will become much more precise. See pages 47 and 92.

‡ Biometrika, Vol. VII., p. 96. Refer to Part I., p. 89 of the present work.

And the correlation coefficient r

$$=\frac{6\cdot249}{12\cdot469}\div\frac{\cdot3069}{\cdot2344}=\frac{1\cdot4648}{3\cdot8267}=\cdot383\pm\cdot021.$$

This correlation coefficient expresses the degree to which, with increasing age, first offenders are more likely to be convicted of fraudulent crime than of crime non-fraudulent in designation; or it may be regarded as a measure of the extent to which fraudulent criminals are likely to be older than persons committing other types of crime.

The next table gives the ages of criminals who are married and non-married, respectively.

TABLE 137.

Correlation of marriage and age in first offenders.

Ages.	Married.	Unmarried.	Totals.	Ages.	Married.	Unmarried.	Totals.
15-	0	34	34	50-	31	5	36
20-	37	107	144	55-	26	2	28
25-	37	67	104	60-	31	3	34
30-	54	37	91	65-	9	2	11
35-	63	27	90	70-	4	—	4
40-	75	19	94	75-	1	—	1
45-	46	4	50				

The constants determined by the same method as before, are :—

Mean age of total criminals	36·245 years.
Standard deviation of age	12·469 ,,
Mean age of the married	41·981 ,,
$\frac{1}{2}(1+a)$	·5742
Z	·3921

Whence the correlation coefficient r

$$=\frac{5\cdot736}{12\cdot469}\div\frac{\cdot3921}{\cdot5742}=\frac{\cdot4599}{\cdot6829}=\cdot672\pm\cdot014$$

This value, ·67, expresses the degree, on a scale between -1 and $+1$, to which increasing age tends to be associated with a higher marriage rate.

Finally, the numbers, married and unmarried, given in Table 137, may be redistributed as follows for fraudulent and non-fraudulent criminals, and the correlation may be determined by the fourfold table method.

TABLE 138.

Correlation of marriage and fraudulent crime in first offenders.

——	Married.	Unmarried.	Totals.
Fraudulent offenders ...	147	22	169
Non-fraudulent offenders	267	285	552
Totals	414	307	721

The equation from this table is : $\cdot0693=\cdot1203r-\cdot0081r^2-\cdot0092r^3$; which gives

$$r=\cdot584\pm\cdot017.$$

This correlation coefficient enables us to predict that persons convicted of fraud will have a higher marriage-rate than other criminals. The value of this coefficient ·58 is fairly high ; and it measures the extent to which a prediction of the probable marriage estate of any criminal is rendered more precise by a knowledge of the crime he has committed. But, as an exact measure of a *direct* relation of crime and marriage, the value ·58 is too high. As we have seen, the *age* of criminals is associated with the *type* of crime they commit (Table 135) ; and the age of criminals is also associated with their *marriage-rate*. It follows, therefore, that the relative age-distribution of our criminals, grouped according to the type of crime committed, must introduce a spurious element into the *apparent* association between types of crime and marriage. To obtain a true estimate of the direct relation between crime and the marriage-rate, this spurious element must be eliminated. We must ascertain how much of the value ·584 is due, not to a tendency to commit

Now, in calculating the expectancy of marriage for criminals, relatively to that for the general population, from the small sample we are instancing, we find:

(n) = the indefinitely large sample of the general population;

$(m) = 15$, *i.e.*, the number of individuals in the sample of criminals;

$(\bar{p}) = \frac{10}{15}$, *i.e.*, the proportion married in the criminal sample;

$(\bar{q}) = \frac{5}{15}$, *i.e.*, the proportion unmarried in the criminal sample:

Therefore, the proportion of married persons yielded by this sample may be expected, without any significance being attached to the variation, to deviate from the proportion of the general population by:

$$\cdot 67449 \times \sqrt{\frac{\frac{10}{15} \times \frac{5}{15}}{15}} = \cdot 082 \text{ or } 8\cdot 2 \text{ per cent.}$$

Referring to Table 135, it will be seen that this 8·2 per cent., its probable error, preceded by the sign $\pm$, has been attached to the married-rate 66·7 per cent. The marriage-rate thus qualified (66·7 per cent. $\pm$ 8·2 per cent.) means that any other sample of 15 individuals, instead of yielding 66·7 per cent. married, might have yielded any other percentage between 59 per cent and 75 per cent. In other words, the expression (66·7 per cent. $\pm$ 8·2 per cent.) asserts the fact that the result obtained from the sample of 15 individuals might, with equal likelihood, be expected to fall anywhere within a range of variability of 16·4 per cent.; variations within this range being inseparable from the process of sampling with so small a number as 15 individuals. Now, it is generally considered that *twice* the probable error gives the best idea of the range of variation that may reasonably be attributed to random sampling. The expression (66·7 per cent. $\pm$ 8·2 per cent.), interpreted at twice the value of the probable error, means that one out of every five or six samples of 15 individuals examined may be expected to yield a percentage which, without any significance attaching to the variation, may fall even *outside* the limits of a range of 50 per cent.—83 per cent. Where so wide a range of results may be expected from random sampling alone, the uselessness of dealing with very small samples is obvious.

We return now to the marriage-rates, recorded in Table 135, for fraudulent criminals, and compare these with those recorded in Tables 121 and 127, for the general population. At each successive age period, the rates for the former are higher than are those for the latter. But, subtracting twice the value of its probable error from each percentage recorded, there is only a small margin left that can be quoted as a significant difference between the proportion of married persons amongst fraudulent criminals, and the proportion of married persons in the community at large. For criminals convicted of fraud between the ages of 20–24, the difference is more pronouncedly significant, theoretically. But it is questionable whether any final conclusion ought to be drawn from examination of so small a sample as one composed of 15 individuals only. However, from the general trend of the figures, from the fact that the percentages recorded for fraudulent criminals are at every age-period in excess of the standard records,* and, especially in view of the very large difference in excess for the age-period 20–24, the following statement is perhaps reasonable—that, at every age of life, married individuals tend to commit crimes of fraud rather more than do those who are single; and that this is particularly the case for individuals convicted of fraud between the ages of 20–24, *i.e.*, during a period of age when individuals, who are married, must be newly married, and must have contracted the bond relatively early in life: the implication being that the stress of marriage is a factor which, as an additional inducement to fraudulence, in the long run leads to a slightly increased marriage-rate amongst criminals convicted of this crime.

Another interesting suggestion presents itself from the comparison of fraudulent criminals with the general population. The close similarity in their respective marriage-rates, the proportionate class differences amongst fraudulent criminals, much the same as in the population at large, the finer physical development, the higher average of intelligence, of criminals who commit this type of crime, compared with criminals who commit other crimes—these facts permit the assumption *that fraudulent first offenders form a fairly representative sample of the general population.*

Turning, now, to the marriage-rates of first offenders who have been convicted for other crimes than fraud, the figures given within successive age-periods for each "crime" group in Table 135 are obviously useless for detailed comparison. The numerical strength of such samples within the group (damage and arson), for instance, is in one case only two individuals; and in no case is it more than thirteen individuals. Upon the evidence of such samples, no legitimate conclusion can be drawn. The only way to compare with

* Variations due to random sampling do not all occur in one direction—they oscillate, rather, above and below a central mean value.

each other our statistics of marriage-rates of criminals differentiated by the type of crime committed, is to deal with the general marriage-rate of each criminal class, calculated upon the basis of a standardised age distribution. Reducing, as in previous calculations, the age-distribution of the general population to that of each criminal group, taken in turn, as a standard, the actual and expected rates, tabulated side by side, are as follows* :—

TABLE 139.

Numbers per 1,000 married of first offenders found in convict prisons, distinguished by the nature of their crime; and the numbers per 1,000 married of the general population (males, England and Wales, 1906), at the same ages.

Ages.	In the general population, the numbers married per 1,000.	—	Marriage in first offenders, classed under six criminal heads.						The same, classed under two criminal heads.		Totals.
			Malicious damage to property.	Stealing and burglary.	Sexual offences.	Violence against the person.	Offences against the currency.	Forgery and fraud.	Damage, stealing, sexual offences, and violence.	Forgery, fraud, and offences against the currency.	
15–		Numbers	—	3	21	10	—	—	34	—	34
		Numbers married ...	—	0	0	0	—	—	0	—	0
	3	Numbers married in general population.	—	·01	·06	·03	—	—	·10	—	·10
20–		Numbers	4	13	36	76	1	14	129	15	144
		Numbers married ...	0	2	8	17	1	9	27	10	37
	174	Numbers married in general population.	·70	2·26	6·26	13·22	·17	2·44	22·45	2·61	25·06
25–		Numbers	7	12	46	94	3	33	159	36	195
		Numbers married ...	3	5	18	40	1	24	66	25	91
	641	Numbers married in general population.	4·49	7·69	29·49	60·25	1·92	21·15	101·92	23·08	125·00
35–		Numbers	13	16	44	59	2	50	132	52	184
		Numbers married ...	6	10	32	43	1	46	91	47	138
	842	Numbers married in general population.	10·95	13·47	37·05	49·68	1·68	42·10	111·14	43·78	154·93
45–		Numbers	5	3	14	26	—	38	48	38	86
		Numbers married ...	4	3	9	24	—	37	40	37	77
	890	Numbers married in general population.	4·45	2·67	12·46	23·14	—	33·82	42·72	33·82	76·54
55–		Numbers	5	6	17	22	2	26	50	28	78
		Numbers married ...	3	6	13	21	2	26	43	28	71
	918	Numbers married in general population.	4·59	5·51	15·61	20·20	1·84	23·87	45·90	25·70	71·60
All ages.	Total numbers in sample ...		34	53	178	287	8	161	552	169	721
	Total numbers married ...		16	26	80	145	5	142	267	147	414
	In general population, numbers married.		25·18	31·61	100·93	166·53	5·61	123·38	324·25	128·99	453·24
	Numbers married per 1,000 (criminals).		471	491	449	505	625	882	484	870	574
	Numbers married per 1,000 (general population).		741	596	567	580	701	766	587	763	629

The figures in this table show that, when age is taken into account, there is a significant relation between the characteristic criminality of any offender and his likelihood of marriage. Starting with fraud, where the degree of marriage is in excess of the normal standard, there is a progressive falling-away from this standard as we pass to violence, sexual offences, stealing, damage and arson. Considering the probable errors, however, the significance of each variation in the marriage-rate is not the same for the different

* The expected rates are those we would expect on the assumption that the proportion of married to unmarried in each criminal group is identical to the proportion in the general population.

crime groups. The deviation from the standard found for the fraud group is three times greater than the probable error of the marriage-rate of this group ; in the case of the stealing group, the difference is 2·7 times greater than the value of the probable error. Now, a deviation from an expected value, equivalent to three times the probable error of the ascertained value, may always be regarded as a possible, although not very probable, variation, to be explained solely on the grounds of random sampling. The chances are that, once in 23 times, a deviation from the expected result, equal to three times the probable error, might be found ; although unconditioned by any particular cause apart from those inherent in the sampling process. While agreeing, therefore, that the deviations from the expected standard of the marriage-rates of first offenders, convicted respectively of fraud and of theft,* are *most probably* significant of some particular agency at work, we have to admit that these deviations *may* have no real significance at all. To those who have a delicate appreciation of probabilities, we would say definitely it is 22 to 1, that variations of this order are not insignificant. On the other hand, the conjecture that variations, in every case greater than three times the probable error, quoted above for the criminal groups distinguished by crimes of wilful damage to property, by sexual crimes, and by crimes of violence to the person—the conjecture that variations of this order might also be only an insignificant expression of random sampling is quite beyond the range of ordinary probabilities.

(3) *Statistical Examination of Influences on Marriage Rates.*

(*a*) *First Offenders.*—We have already discussed the probable causes of the slightly excessive marriage-rate of fraudulent criminals. We have concluded that the excess is due to the fact that, all other factors being equal, those who are married are more tempted to commit fraud than those who are single. The question now to be answered is why the marriage-rate of criminals, convicted of other crimes than fraud, should be *below* the general population standard ? Two explanations are possible : either, bachelors tend to commit these crimes more than do married persons, or else, individuals, convicted of these offences, must possess some constitutional quality, or must be beset by some peculiarity of circumstance, which is inimical to marriage. The differential problem is to define the extent to which criminals who commit arson, stealing, sexual offences and crimes of violence, respectively, are (1) selected from certain sub-sections of the general population who marry at a lower rate than the total population ; or who are (2) possessed by some undefined quality, associated with crime, some criminal characteristic, which at the same time is inimical to their marriage ; or who are (3) selected from the bachelor, rather than from the married, section, of the community. The respective parts played by these possible influences in reducing the marriage-rate of criminals must be differentiated by a process of exclusion. We have repeatedly emphasised the importance of allowing for "age" as a quality closely associated both with marriage and with crime. We have shown how a crude death- or marriage-rate may be modified by allowing for the particular age-distribution of any local population under observation. It is important, then, to ascertain whether there may not be other qualities or conditions which, having a selective value both in regard to the type of crime a criminal may commit, and to his likelihood of marriage, must be equally allowed for. Now, all people familiar with crime and criminals will be struck by the fact, when studying Tables 135, 139, that the decreasing scale of marriage-rates therein set forth, is associated with a scale of crime which, with progressive intensity, has a low grade of intelligence, and a high degree of alcoholism, at its source. It becomes an hypothesis worth substantiating whether defective intelligence and alcoholism may not also be at the source of the *defective marriage-rates* of criminals committing these various orders of crime. Again, there is a tradition to the effect that marriage is influenced by personal appearance, which itself might conceivably be related in some way to crime.† In the same way, destitution or lack of occupation are other conditions which, frequent amongst criminals, may also be related to the marriage estate. We will, then, first ascertain from our statistics, the correlation coefficients between marriage and the physical and economical conditions we have enumerated amongst criminals. And since, as we have shown, the sub-group of fraudulent criminals may be regarded as representative of the general population, the results of the inquiry should have a general value.

* It must be noted that offenders who at their first conviction are sentenced to a convict prison for theft are relatively few in number. Amongst habitual offenders, petty theft is of course by far the commonest cause of conviction.

† Villainous expressions, low types of features, distorted figures, and a slouching gait are frequently met with in convict prisons. They may not be seen there more frequently than outside the prison walls; they may be particularly associated with defective intelligence, which is disproportionately represented in prison : or perhaps the villainous appearance of a prisoner—so much accentuated by his hideous clothes, shaven head, unshaven chin, &c.—is chiefly "in the eye of the beholder," fully aware, of course, of the other's reputation for villainy.

likely to be married if employed in the Services, is not legitimately comparable with the other correlation coefficients we have obtained for the marriage relation. These coefficients have been calculated upon the assumption of a "normal distribution" of the categories correlated. Apart from the particular case (the Services of Army and Navy) under discussion, we believe this assumption to have been in every case legitimately made. But it would not be justifiable to hypotheticate the existence of a graduated tendency, following the Gaussian law, to join the Services. We shall, therefore, be compelled to exclude all criminals who, at the time of their crime, were serving in the Army and Navy, and must treat them as a class apart. Regularity of employment, and general appearance, as influences upon marriage, we shall also exclude. Since the intensity of the relation of these conditions to feeble-mindedness is $-\cdot 328$, and $-\cdot 248$, Table 141, we shall assume

TABLE 141.

—	Weak-minded.	Not weak-minded.	Totals.	Coefficients of correlation with weak-mindedness.
Employment regular	22	210	232	$-\cdot 328$
Employment not regular	12	41	53	
Good appearance	7	93	100	$-\cdot 248$
Not good appearance	27	158	185	
Totals...	34	251	285	

their relation to marriage is contained in the correlation between marriage and feeble-mindedness. So, by the above elimination, we reduce the correlations we shall ultimately require from seven to three in number: thus enormously facilitating the solution of our problem, which we will restate concisely in a few sentences. We know the crude marriage-rate for all star-class convicts, *i.e*, first offenders grouped together. We have ascertained that age, alcoholism, and intelligence, amongst criminals, have a varying degree of association with marriage. We assume, as a working hypothesis, that the differences we have found, between the marriage-rates of criminals, convicted of different types of crime, may possibly have nothing to do with the nature of these crimes, nor with any characteristic peculiarly "criminal" in the perpetrators; but that they may be solely and simply an expression of a varying distribution of age, intelligence and alcoholism, in the classes compared. To test the truth of this hypothesis, we will now find how the crude marriage-rate we have obtained for all criminals will become modified when corrected for age, alcoholism, and feeble-mindedness; the distribution of these conditions, in each criminal sub-group, being in turn taken as a standard. The series of *corrected* rates, thus obtained, will be regarded as a series of *predicted* rates, with which to compare the corresponding series of *actual* rates of the criminal sub-groups. If we find that, within the limits of the probable error, the predicted and observed marriage-rate of each criminal sub-group is the same, we shall assume that our working hypothesis is correct. We shall assume that the varying marriage-rates we have found for different classes of criminals are due solely to the varying distributions of age, intelligence, and alcoholism, within these groups. On the other hand, if the crude marriage-rate of all criminals, when fully corrected, does not correspond to the observed marriage-rate for any particular sub-group of criminals, we shall have to look for additional causes apart from age, alcoholism and intelligence, to explain the difference. Finally, since we have decided that the sub-group of fraudulent criminals may be regarded as a sample of the general population, the comparison, between the predicted and actual marriage-rate for this sub-group, will illustrate how the fully-corrected marriage-rate of star-class criminals generally corresponds with the fully-corrected marriage-rate for the community at large.

The proper way to correct a crude marriage-rate, percentage, or average value, so as to allow duly for any number of varying conditions, is through the medium of the *multiple regression prediction formula*. This formula is an equation for predicting the average value of a character from a knowledge of the values of other characters correlated with it. In its simplest form it is :—

$$y = x\, r_{xy}{}^{*}$$

where (y) is the unknown average value of a first character, (x) a known value of a second character,* and r_{xy} the correlation coefficient between the characters (x) and (y).

* It being understood that the values y and x are measured from the means of the respective characters.

We stated a short while ago that the true worth of a correlation coefficient lies in its significance for prediction. As the value of any coefficient increases from 0 to 1, a prediction based upon it becomes more and more precise, and the range of variability in the prediction becomes smaller and smaller; until, when the correlation coefficient equals 1, this range equals 0, and the prediction is absolute. For instance, from the knowledge that the average stature in man is 5 feet 5 inches, the standard deviation being 2 inches, we are able to predict, with definite probability, that the statute of any individual, taken at random, will fall within a range of 5 feet 3 inches and 5 feet 7 inches—the prediction being subject to an error measured by the standard deviation. But if, in addition to the above, the age of the unselected individual be also known, and if it has been ascertained that the correlation coefficient between age and stature is, say, ·5, our prediction becomes more precise. The variation in the prediction becomes reduced to the extent of the expression $\sqrt{(1-r^2)}$: which equals, in this case, $\sqrt{1-\cdot 25}=\cdot 87$. That is to say, the range of our prediction, which previously was within 4 inches, is now contracted to ·87 of 4 inches $=3\frac{1}{2}$ inches, *i.e.*, the prediction is subject to less error. We can now predict the definite chance of an unknown stature falling within a range of $\pm 1\frac{3}{4}$ inches of the corrected mean. The knowledge of additional correlation coefficients, relating stature to other qualities, will, in the same way, add still further precision to a prediction. But, when dealing with *individual* human qualities or conditions, the range of variability in a prediction will never be reduced to zero, *all* the causes leading to individual variation being at present unascertainable. In fact, the range of variability in the best individual prediction will always be so large as to be practically useless.* Statistical knowledge of man, however, is not concerned with individual prediction. The aim of the science of statistics is to predict average, and not individual, values, *i.e.*, values ascertained for men taken in the mass: the values that remain when individual variation has been eliminated. The knowledge of a sufficient number of correlation coefficients may here, if the masses referred to be large enough, reduce the variation of prediction almost to zero. The range of this variation, in a fully completed prediction formula, becomes constricted to the narrow limits of the probable error due to random sampling. That is to say, by dealing with large samples, whose probable error becomes very small, the knowledge of man *in the mass* may become as absolute as an exact science.

To return to the prediction formula,

$$y = x\, r_{xy},$$

what are the units employed in this equation? (y) may refer to head-length, measured originally in millimetre units, (x) may be age, a character usually expressed in units of one year, whereas (r_{xy}), the correlation coefficient between age and head-length, is a value independent of any fixed unit. Millimetre units and year units cannot be indiscriminately employed together in the same equation. All values introduced into the regression formula must be expressed in relation to a prescribed standard of measurement. The plan adopted is to express all values in terms of their "standard deviation" from the mean value. Thus, in the above equation, the value of the deviation from the mean of head-length (y), and of the deviation from the mean of age (x), will not be expressed in millimetre units, and in year units, but in terms of the standard deviation of head-length, and the standard deviation of age, as shown by writing the equation:—

$$\frac{y-\bar{y}}{\sigma_y} = \frac{x-\bar{x}}{\sigma_x}\, r_{xy}$$

where (σ_y) = the standard deviation of the y character, "head-length," and (σ_x) = the standard deviation of the x character "age," the term $\left(\frac{y-\bar{y}}{\sigma_y}\right)$ = the difference between the mean head-length of a sub-group and the mean head-length of the total group, expressed in terms of the standard deviation of head-length; and the term $\left(\frac{x-\bar{x}}{\sigma_x}\right)$ = a corresponding difference between the average ages of the total group and the sub-group, respectively, expressed in terms of the standard deviation of age.

* This illustrates the uselessness, as we pointed out a short while ago, of dealing with small samples. An individual prediction is a prediction of what may be expected in the case of a sample of one individual. The range of variability, inseparable from an individual prediction, is the same thing, in other words, as the value of the probable error due to random sampling, where the sample consists of one individual only.

This is the formula for predicting, in a sub-group (*e.g.*, fraudulent criminals), the average value (y) of a character (*e.g.*, marriage), from a knowledge, in that sub-group, of the average value (x) of a second character (*e.g.*, age), whose correlation coefficient (r_{xy}) with the first is known for the total group (*e.g.*, total criminals). Or, expressing the same idea in other words,* we may regard this equation as a formula for correcting, in a general population, (*e.g.*, total criminals), the crude average value ($\bar{y}$) of a first character (*e.g.*, marriage), for any second character (*e.g.*, age), on the basis of the distribution (x) of this second character in a standard local population (*e.g.*, fraudulent criminals). However regarded, this is the formula for either predicting or correcting an average value, upon the basis of *one* known character. In the present inquiry, we want to predict a marriage value (y), or to correct a marriage value ($\bar{y}$), upon the basis of *three* known characters—age (x), feeble-mindedness (w), and alcoholism (a). The formula, extended to these requirements, becomes :—

$$\begin{aligned}\frac{y-\bar{y}}{\sigma_y} &= \frac{x-\bar{x}}{\sigma_x} \times {}_{wa}\rho_{yx} \times \sqrt{\frac{\Delta_{xx}}{\Delta_{yy}}}\\ &+ \frac{w-\bar{w}}{\sigma_w} \times {}_{xa}\rho_{yw} \times \sqrt{\frac{\Delta_{ww}}{\Delta_{yy}}}\\ &+ \frac{a-\bar{a}}{\sigma_a} \times {}_{xw}\rho_{ya} \times \sqrt{\frac{\Delta_{aa}}{\Delta_{zz}}}\end{aligned}$$

where (y) is the predicted degree of marriage for any sub-group of criminals, and is equal to :—

($\bar{y}$) *i.e.*, the degree of marriage for total criminals,
+ a correction for the mean *age* of the sub-group,
+ a correction for the mean *feeble-mindedness* of the sub-group,
+ a correction for the mean *alcoholism* of the sub-group—

the values of the corrections depending mainly upon the partial correlation coefficient of marriage (y) upon its associated variables x, w, and a.† Thus :—

(1) The correction for the mean *age* of the sub-group depends upon (${}_{wa}\rho_{yx}$), the coefficient for marriage and age with weak-mindedness and alcoholism constant.
(2) The correction for the mean *feeble-mindedness* of the sub-group depends upon (${}_{wa}\rho_{yw}$) the coefficient for marriage and weak-mindedness with age and alcoholism constant.
(3) The correction for the mean *alcoholism* of the sub-group depends upon (${}_{xw}\rho_{ya}$) the coefficient for marriage and alcoholism with age and weakmindedness constant.

All these values may be obtained from our data ; and when introduced into the formula will give the regression equation of marriage (y), upon age (x), weak-mindedness (w), and intemperance (a) : from which equation the amount of marriage (y) for each criminal sub-group can be subsequently predicted.

We will first obtain from the data, and enter into the general formula, the three correction coefficients for age, weak-mindedness and alcoholism. The value of each of these corrections depends upon the six correlation coefficients, within the total criminal population, of the following four quantities—degree of marriage ; age ; degree of feeble-mindedness ; extent of alcoholism. The data of these quantities, for the total population of first offenders, distributed in the form presented in Tables 142, 143 yielded the following series of inter-correlations of age, weak-mindedness, intemperance and marriage.

—	Age.	Weak-mindedness.	Intemperance.	Marriage.
Age	—	−·121	−·088	·672
Weak mindedness ...	−·121	—	·121	−·388
Intemperance ...	−·088	·121	—	−·151
Marriage	·672	−·388	−·151	—

* Predicting a deviation from the mean is the same thing as predicting a correction for the mean.

† That is to say, omitting effects due to $\sqrt{\frac{\Delta_{xx}}{\Delta_{yy}}}$ &c., which represent the restriction in the standard deviation of marriage for constant-age, feeble-mindedness, and alcoholism.

These give the following determinant Δ :—

$$\begin{vmatrix} 1 & -\cdot121 & -\cdot088 & \cdot672 \\ -\cdot121 & 1 & \cdot121 & -\cdot388 \\ -\cdot088 & \cdot121 & 1 & -\cdot151 \\ \cdot672 & -\cdot388 & -\cdot151 & 1 \end{vmatrix}$$

leading to $-\Delta_{41}=\cdot6086$, $\Delta_{42}=\cdot2941$,

$-\Delta_{43}=-\cdot0567$, $\Delta_{44}=\cdot9657$,

from which $-\dfrac{\Delta_{41}}{\Delta_{44}}=\cdot6302, -\dfrac{\Delta_{42}}{\Delta_{44}}=-\cdot3045, -\dfrac{\Delta_{43}}{\Delta_{44}}=-\cdot0587$;

and the regression equation of marriage upon age (x), weak-mindedness (w), and intemperance (a), which is—

$$\frac{y-\bar{y}}{\sigma_y}=-\frac{\Delta_{41}}{\Delta_{44}}\times\frac{x-\bar{x}}{\sigma_x}-\frac{\Delta_{42}}{\Delta_{44}}\times\frac{w-\bar{w}}{\sigma_w}-\frac{\Delta_{43}}{\Delta_{44}}\times\frac{a-\bar{a}}{\sigma_a}$$

becomes—

$$\frac{y}{\sigma_y}-\cdot187=\cdot630\times\frac{x-\bar{x}}{\sigma_x}-\cdot304\times\frac{w-\bar{w}}{\sigma_w}-\cdot059\times\frac{a-\bar{a}}{\sigma_a}$$

The next step is to discover, from the data for total criminals, the mean degree of marriage, the mean age, the mean degree of defective intelligence, and the mean extent of alcoholism, and to introduce these values into the formula.* The data distributed to give these values, are as follows :—

Mean age, 36·245 years	S.D. of age, 12·469 years.
Mean weak-mindedness	$-1\cdot173$.*
Mean alcoholism	·253.*

Introducing these mean values of marriage, age, feeble-mindedness and alcoholism, for total criminals, into the equation, we can say that the regression formula† for predicting the distribution of marriage from a knowledge of the distribution of age, feeble-mindedness and alcoholism of any sub-group, is :—

$$\frac{y}{\sigma_y}-\cdot187=\cdot630\times\frac{x-36\cdot245}{12\cdot469}-\cdot304\times\left(\frac{w}{\sigma_w}+1\cdot173\right)-\cdot059\times\left(\frac{a}{\sigma_a}+\cdot253\right)$$

The formula as it stands requires one further modification. A prediction of the mean value of any sub-group, from the unaltered formula, would involve us in the assumption that the standard deviation of marriage, weak-mindedness and intemperance

---

* The mean and standard deviation values of marriage, feeble-mindedness and alcoholism, are not directly determinable from the data, which give only the number of criminals who are married, feeble-minded and alcoholic, relatively to the number who are single, intelligent and temperate. On what hypothesis can the mean values of these quantities be indirectly determined ? We have determined these values, on the assumption that the distribution of marriage, intelligence and alcoholism in the community follows, approximately, the Gaussian law. Knowing from the data the total number of all criminals, and the proportion of the total who are married and single, feeble-minded and intelligent, alcoholic and temperate, respectively, the position of the mean, on a scale of deviations from the mean—the standard deviation being taken as unit—follows theoretically from the general principle of a binomial distribution.

† The variability of marriage from this determination is $\sqrt{\dfrac{\Delta}{\Delta_{44}}}\times\sigma_y=\cdot6701\times\sigma_y$. The probable error of prediction is $\cdot6745\times\cdot6701\ \sigma_y=\cdot4520\ \sigma_y$. The probable error of the mean marriage predicted for a random sample of n individuals in a large population, whose characters are as above, is $\dfrac{\cdot4520\,\sigma y}{\sigma_n}$. The partial correlation coefficients are :—

Marriage and age	$\dfrac{-\Delta_{41}}{\sqrt{\Delta_{44}\ \Delta_{11}}}=\cdot771\pm\cdot010$
Marriage and weakmindedness... ...	$\dfrac{-\Delta_{42}}{\sqrt{\Delta_{44}\ \Delta_{22}}}=-\cdot409\pm\cdot021$
Marriage and intemperance	$\dfrac{-\Delta_{43}}{\sqrt{\Delta_{44}\ \Delta_{33}}}=-\cdot086\pm\cdot025$

in any sub-group has the same value we have found for the total group. Now, assuming the distribution of weak-mindedness and intemperance to be approximately normal or Gaussian, we can test this point—*i.e.*, we can test whether the standard deviation of each sub-group is the same as the standard deviation of the whole—by dividing each character into three divisions, instead of into two divisions, as we have done heretofore. Thus, with regard to their intelligence, we can distribute our subjects into the three categories weak-minded, unintelligent, intelligent; and with regard to their alcoholism, into intemperate, temperate and abstinent.* The data thus redistributed is shown in Table 144, and

TABLE 144.

The same as Table 143, with extended distribution of characters.

—	Married.	Unmarried.	Totals.
Weak-minded...	24	50	74
Unintelligent ...	93	67	160
Intelligent ...	246	138	384
Totals ...	363	255	618

—	Married.	Unmarried.	Totals.
Intemperate...	129	114	243
Temperate ...	196	122	318
Abstinent ...	32	14	46
Totals ...	357	250	607

—	Weak-minded.	Un-intelligent.	Intelligent.	Totals.
Intemperate...	35	83	125	243
Temperate ...	31	62	225	318
Abstinent ...	7	11	28	46
Totals ...	73	156	378	607

the regression equation, using the three divisions to determine the standard deviation, takes the final form—

$$\frac{y}{\sigma_y} = \cdot 187 + \cdot 630 \times \frac{x - 36\cdot 245}{12\cdot 469}$$
$$- \cdot 304 \times \left(\frac{w}{\sigma_{wy}} \times \frac{\sigma_{wy}}{\sigma_w} + 1\cdot 173\right)$$
$$- \cdot 059 \times \left(\frac{a}{\sigma_{ay}} \times \frac{\sigma_{ay}}{\sigma_a} + \cdot 253\right)$$

This is the formula by which the expected amount of marriage in any criminal sub-group can be predicted, when the mean and standard deviations of age, feeble-mindedness and alcoholism for the sub-group, have been ascertained from the data. The average values and standard deviations of these characters, for sub-groups of criminals distinguished by various types of crimes, and for a sub-group of criminals who, at the time of arrest, were serving in the Army or Navy, are derived from the following frequency table 145:—

TABLE 145.

The frequencies of age, intelligence, intemperance, and marriage, in groups of first offenders, in habitual offenders at time of present conviction, and in habitual offenders at time of first conviction.

Groups.	Ages. 15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–	Totals.
[illegible] Malicious damage to property	—	4	5	2	3	9	2	2	2	1	2	—	—	—	32
Stealing and burglary ...	3	12	10	2	10	6	1	2	3	2	1	—	—	—	52
Sexual offences	19	32	17	25	23	20	8	6	5	9	1	2	—	—	167
Violence against the person	5	48	46	32	27	28	18	7	8	9	4	—	1	—	233
Forgery, coining, and fraud	—	14	13	23	23	27	18	18	10	11	3	2	—	—	162
Services, Army and Navy ...	7	34	13	7	4	4	3	1	—	2	—	—	—	—	75
Totals—first offenders ...	34	144	104	91	90	94	50	36	28	34	11	4	1	—	721
Habitual offenders at time of crime							See	Table	151.						
Habitual offenders at time of first conviction.							See	Table	134.						

* No third category being possible for "marriage," we have to assume that the standard deviation of marriage is the same for each sub-group as for the total group.

TABLE 145—*continued.*

Groups.		Weak-minded.	Unintelligent.	Intelligent.	Totals.	Intemperate.	Temperate.	Abstinent.	Totals.	Married.	Unmarried.	Totals.
Excepting services.	Malicious damage to property	9	9	11	29	12	15	2	29	16	16	32
	Stealing and burglary	4	9	31	44	13	27	4	44	26	26	52
	Sexual offences	27	57	53	137	66	57	14	137	79	88	167
	Violence against the person	24	57	118	199	102	89	8	199	137	96	233
	Forgery, coining, and fraud	4	13	125	142	20	105	17	142	141	21	162
Services, Army and Navy		5	11	40	56	30	25	1	56	15	60	75
Totals—first offenders ...		73	156	378	607	243	318	46	607	414	307	721
Habitual offenders at time of crime ... Habitual offenders at time of first conviction...		295	314	389	998	1,121	964	147	2,232	875 101	1,357 441	2,232 542

By introducing the values derived into the prediction formula, we obtain the predicted or determined amount of marriage, and its probable error: which, tabulated for each criminal sub-group, side by side with (1) the actual amount of marriage given directly by the data, and (2) with the amount of deviation of the actual from the determined marriage, are shown in Table 146, and are represented diagrammatically in Fig. xlviii, page 330.

TABLE 146.

The deviations in marriage of several criminal groups from the experience of marriage amongst first offenders generally—as exhibited in the regression equation of marriage upon age, weak-mindedness, and intemperance.

Groups.		Number in group.	Mean marriage ·187.	Mean age of group x.	Correction of marriage for age.	$\frac{w}{\sigma wg}$ of group.	$\frac{\sigma wg}{\sigma w}$.	Correction for weak-mindedness.	$\frac{a}{\sigma ag}$ of group.	$\frac{\sigma ag}{\sigma a}$.	Correction for intemperance.	Predicted marriage. Mean, and rate per 1,000.	Actual marriage. Mean, and rate per 1,000.	Excess of actual over predicted. Mean, and rate per 1,000.	Probable error of prediction. Mean, and rate per 1,000.
Excepting services, all convicted of—	Malicious damage to property	32 —	·187 —	— 40·625	·221 —	— — ·495	— 1·075	—·195 —	— — ·218	— ·992	—·002 —	·211 *584*	·000 *500*	—·211 *—84*	±·080 *± 31*
	Stealing and burglary ..	52 —	·187 —	— 34·808	—·073 —	— —1·336	— 1·080	·082 —	— — ·537	— ·900	·014 —	·210 *583*	·000 *500*	—·210 *— 83*	±·063 *±25*
	Sexual offences	167 —	·187 —	— 34·746	—·076 —	— — ·852	— ·756	—·161 —	— — ·045	— 1·282	—·011 —	—·061 *476*	—·067 *473*	—·006 *— 3*	±·035 *± 14*
	Violence against the person	233 —	·187 —	— 35·483	—·039 —	— —1·172	— ·920	—·029 —	— ·031	— ·981	—·017 —	·103 *541*	·222 *588*	·119 *47*	±·030 *± 12*
	Forgery, coining, and fraud	162 —	·187 —	— 42·222	·302 —	— —1·908	— 1·179	·328 —	— —1·077	— ·749	·032 —	·849 *802*	1·129 *870*	·279 *68*	±·035 *± 10*
Services, Army and Navy		75 —	·187 —	— 28·167	—·408 —	— —1·345	— 1·107	·096 —	— ·089	— ·840	—·019 —	—·144 *443*	—·842 *200*	—·698 *—243*	±·052 *± 21*
Habitual offenders at time of crime.		2,232 —	·187 —	— 36·170	—·004 —	— — ·537	— 1·056	—·185 —	— ·006	— 1·123	—·015 —	—·016 *494*	—·274 *392*	—·258 *—102*	±·010 *± 4*
Habitual offenders at time of first conviction.		515 —	·187 —	— 22·695	—·685 —	— — ·596	— 1·056	—·166 —	— ·371	— 1·123	—·039 —	—·703 *241*	—·802 *186*	—·099 *— 55*	±·020 *± 6*

In every case, with one exception, the observed marriage-rate, although it does significantly differ, does not markedly deviate from its predicted value by more than the expected amount, which is inseparable from the process of random sampling. Once, out of every two trials, random sampling, unaugmented by any specific agency, would lead to an as equally wide variation from prediction as that recorded for sexual offenders. Once out of every 15 or 20 trials, random sampling, by itself, would account for the degree of deviation of the predicted, from the actual, marriage-rate of offenders distinguished by the crime of malicious damage to property. The deviations in rate, however, associated with

Table 147.

Groups	Number in group.	Mean Marriage.	Mean age of group $\bar{x}$.	Correction of marriage for age.	$\frac{w}{\sigma_{wg}}$ of group.	$\frac{\sigma_{wg}}{\sigma_w}$	Correction for weak-mindedness.	$\frac{a}{\sigma_{ag}}$ of group.	$\frac{\sigma_{ag}}{\sigma_a}$	Correction for intemperance.	Predicted marriage, and rate per 1,000.	Actual marriage. Mean, and rate per 1,000.	Excess of actual over predicted. Mean, and rate per 1,000.	Probable error of prediction. Mean, and rate per 1,000
Malicious damage to property	32	·160	40·625	+·174	−·495	1·075	−·191	−·218	·992	−·003	+·184 *573*	·000 *500*	− 184 − *73*	±080 ± *31*
Stealing and burglary ...	52	·160	34 808	−·120	−1·336	1·080	+·087	−·537	·901	+·013	+·183 *573*	·C00 *500*	−·183 − *73*	±·063 ± *25*
Sexual offences	167	·160	34 746	− 123	−·852	·756	−·157	−·046	1·282	−·012	−·088 *465*	−·067 *473*	+·021 + *8*	±·035 ± *14*
Violence against the person ...	233	·160	35·483	− 086	−1·172	·920	−·024	+·032	·981	−·017	+·076 *530*	+·222 *588*	+·146 + *58*	±·030 ± *12*
Forgery, coining, and fraud ...	144	160	42 222	+·255	−1·908	1·179	+·333	−1·077	·749	+·032	+·822 *794*	+·867 *807*	+·045 + *13*	±·035 ± *10*

It will be seen that the depletion of the data has produced a decrease in the mean marriage of the total group, some small modifications in the values of the corrections for age, alcoholism and intelligence, within each sub-group, and an obvious fall in the actual or recorded amount of marriage within the sub-group of fraudulent criminals. It will be further seen that, resulting from these modifications, the predicted marriage-rate of each sub-group of criminals has changed in value; and with the change, a corresponding difference has been produced in the excess of each actual marriage-rate over the attendant predicted rate. The excess in the case of fraudulent criminals, as well as that for sexual offenders, is now within the limits of variation prescribed by the probable error of the prediction. The excess of the actual marriage-rate over the predicted rate, for the sub-group of first offenders convicted of crimes of violence against the person, has increased beyond its previous value. Originally less than four times, the excess is now nearly five times greater than the value of the probable error of the predicted marriage-rate. On the other hand, the predicted rates for the sub-group of incendiaries, &c., and for the sub-group of thieves, have now approached nearer to the actual rates; contracting in the former case to within a little more than twice, and in the latter case to within three times the limits of the probable error of the prediction. The only significant differences, therefore, between the actual and predicted marriage rates that, now remain, are one of plus five per cent., for the sub-group of criminals distinguished by crimes of violence, and one of minus five per cent., for the sub-group of thieves. In seeking an explanation of these small differences, two facts must not be forgotten: first, that our sub-group of fraudulent criminals, with regard to its degree of intelligence and its extent of alcoholism, represents a random sample of the general population; and secondly, that the marriage-rate of fraudulent criminals, the group having been depleted by the seventeen individuals whose crimes were associated with their married estate, is now identical with the marriage-rate of the general population. Bearing these two facts in mind, it is clear that our sub-group of fraudulent criminals becomes a standard by reference to which any other sub-group of offenders, or, indeed, criminals generally, can be indirectly compared to the general population. From which it follows, that the only significant differences between the fully corrected marriage-rates of first offenders, and the fully corrected marriage-rate of the general population, are the plus five per cent., and the minus five per cent. which, as pointed out above, are associated respectively with crimes of violence and of stealing. Accordingly, the questions that remain to be answered are: Why is it that criminals who commit crimes of violence against the person have a marriage-rate five per cent. higher, and, why is it that thieves have a marriage-rate five per cent. lower than the marriage-rate recorded for the general community? To those familiar with criminals and crime, a possible answer to the first question immediately suggests itself. It is that criminals who commit crimes of violence have a higher marriage-rate than the general community because the indictment against so many criminals of this order is for murder of, or manslaughter of, or for other forms of physical violence inflicted upon, their wives. In other words, just as we previously had to conclude that marriage is itself an influence upon crimes of fraudulence, so again do we conclude that marriage is also an influence towards crimes of violence; an influence which shows itself in the long run by an abnormally high marriage-rate amongst criminals indicted for this particular kind of crime. Referring to our data, in order to test the point, we find that 14 out of 185 individuals, or 7·6 per cent. in our sub-group of first offenders distinguished by crimes of violence, were indicted for committing violence against their wives. And, when the 14 individuals are duly allowed for, the interesting result follows that, not only does the excess of the actual over the predicted marriage-rate disappear in the case of the sub-group of criminals convicted of crimes of violence, but that, in the compensatory rebound, the opposite deviation in the case of thieves disappears also. When this allowance has been made, we find that the differences between the predicted and actual marriage-rates for all our sub-groups of criminals have contracted within the limits of variation due to random sampling. And, since our sub-group of fraudulent criminals may be regarded as approximately representative of the general population, the final conclusion is this: that, excluding 4 per cent. of fraudulent criminals, and 5 per cent. of criminals indicted for violence—*i.e.*, excluding criminals whose crimes are directly associated with their married estate—the proportion of married persons amongst convicts, prior to their first conviction, is approximately the same as for individuals of the same age, class, alcoholism and intelligence, who are never sentenced to imprisonment. In other words, the apparent differences of marriage-rates, found for star-class convicts, depend upon the class or sub-class of the community from which they are selected, and have no relation to crime nor to any veritable criminal characteristic in the perpetrators.

(β.) *Habitual Criminals.*—Reinforced with this knowledge, let us return once more to Fig. xlii, page 291, wherein the marriage-rates of habitual criminals are compared diagrammatically with the marriage-rates of star-class convicts, and of the general population. In view of the conclusion arrived at for first offenders, the method of approaching the marriage problem, in its relation to habitual offenders, is fairly cut and dried. Referring to Fig. xlii, it will be observed that at ages –20, and 20–25, the proportion of habituals who are married is greater than the proportion of married amongst first offenders. At all other periods of life, the married section of the latter is proportionately greater than that of the former. The points to be explained are (1) what is the cause of this reversal from the general trend of the comparative marriage-rates, at ages under 25; (2) what are the causes of the consistent, although progressively decreasing, decline in the marriage-rate, for consecutive age periods over 25? Are these differences the result of selective mating associated with age, defective intelligence and alcoholism? Are they due to an artificial restraint upon marriage, resulting from incarceration? Do bachelors tend to become habitual offenders more than married people? We will attempt to differentiate and assess proper values for these various possible influences upon the marriage of habitual criminals.

There is only one explanation of the fact that, under the age of 25, a larger proportion of habitual criminals, than of the general population, are married. Habitual criminals are disproportionately selected from sections of the community wherein early and improvident marriages are contracted. In proof of this contention we refer to Tables 148, 149, where, for a criminal, contrasted with the non-criminal, population, statistics of the

TABLE 148.

Ages at marriage of husband and wife in the general population of England and Wales. Frequencies from Registrar General's Report, 1906.

Age at marriage of wife.	Age at marriage of husband.															Totals.
	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	85-	
15–	2,343	13,440	3,026	533	118	40	12	8	1	1	—	—	—	—	—	19,522
20–	1,204	73,966	41,360	8,563	1,994	574	218	68	31	19	10	2	1	—	—	128,270
25–	80	13,182	39,466	13,568	3,667	1,222	514	184	89	38	18	5	4	1	—	72,240
30–	11	1,282	7,063	8,729	3,717	1,690	861	330	179	83	28	10	4	1	—	23,988
35–	4	142	1,118	2,279	2,948	1,692	1,046	496	278	124	62	21	7	3	1	10,261
40–	1	46	184	514	933	1,435	1,054	788	374	217	67	26	10	—	—	5,601
45–	—	9	59	190	290	533	961	694	474	249	139	40	17	4	—	3,569
50–	—	—	7	23	46	131	254	530	398	266	189	48	12	3	1	1,851
55–	—	—	3	5	8	24	61	163	313	223	128	50	15	3	—	1,016
60–	—	—	—	2	3	9	20	60	101	198	130	54	16	5	1	599
65–	—	1	—	—	—	1	4	6	22	40	96	45	14	2	—	231
70–	—	—	—	—	1	—	1	4	1	8	24	20	10	1	—	70
75–	—	—	—	—	—	—	—	—	1	—	3	2	4	—	—	10
Totals	3,743	102,128	92,488	34,276	13,927	7,354	5,026	3,281	2,252	1,466	844	328	114	23	5	267,248
Mean age of wife...	23·60	24·23	24·79	25·37	26·04	26·80	27·52	28·36	28·95	29·57	30·28	30·67	30·63	30·24	29·87	—

Mean age at marriage of husband ... ... 28·360 years.
" " " " " wife ... ... 26·199 "
Standard deviation of age at marriage of husband ... 7·817 "
" " " " " " " wife ... ... 6·649 "
Coefficient of correlation between age at marriage of husband and age at marriage of wife ... ... $\cdot 7903 \pm \cdot 0005$

TABLE 149.—Ages at marriage of husband and wife in criminals found in convict prisons. Frequencies from sample.

Age at marriage of wife.	Age at marriage of husband.																														Totals.
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	42	44	50	52	65	
16	1	2	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
17	—	2	4	2	2	1	2	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16
18	—	2	6	2	4	3	1	—	1	2	1	1	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	25
19	1	—	2	6	8	6	4	6	1	1	2	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	38
20	—	—	3	4	6	8	4	9	3	1	1	2	—	—	3	—	1	—	1	—	—	—	—	—	1	—	—	—	—	—	47
21	—	—	—	1	3	11	8	1	1	3	1	3	4	—	—	1	1	—	—	—	—	—	—	—	1	—	—	—	—	—	39
22	—	—	—	3	5	2	10	3	7	4	2	—	1	—	—	1	2	—	—	—	—	—	—	—	—	—	—	—	—	—	40
23	—	—	1	1	2	2	2	—	3	7	2	3	2	1	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	28
24	—	—	—	—	—	2	1	—	6	3	3	1	1	—	1	1	—	1	1	—	—	—	—	—	—	—	1	—	—	—	22
25	—	—	1	—	1	3	1	3	3	2	4	1	1	1	2	—	—	1	1	2	—	—	—	—	1	—	—	—	—	—	28
26	—	—	1	1	—	1	—	—	3	—	2	1	2	—	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	14
27	—	—	—	—	—	—	—	—	—	1	—	2	2	2	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	9
28	—	—	—	—	—	1	—	1	3	—	2	—	1	2	—	—	1	1	2	—	1	—	—	—	—	1	—	—	—	—	16
29	—	—	—	—	—	—	—	1	2	1	1	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7
30	—	—	1	—	—	—	—	1	—	—	—	1	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	6
31	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	1	—	—	—	—	1	—	—	—	—	1	—	5
32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—	—	3
33	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
34	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	1	—	1	—	—	—	4
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
36	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2	—	—	—	—	—	—	—	3
37	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
38	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
39	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
40	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
41	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
60	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
Totals	2	6	20	20	31	40	33	25	34	26	22	17	16	7	12	5	9	7	7	4	2	1	2	1	4	2	3	1	1	1	361
Mean age of wife.	19·98				22·16				24·26						26·93					30·28					33·33						

Mean age at marriage of husband—25·30 years. Standard deviation of age at marriage of husband—5·88 years.

Mean age at marriage of wife—23·58 years. Standard deviation of age at marriage of wife—5·20 years.

Coefficient of correlation between age at marriage of husband and age at marriage of wife—·632 ± ·021·

respective ages of husbands and wives at time of marriage are presented ; and where the mean ages of husbands and wives at marriage, and the correlation coefficients between their respective ages, are evaluated and recorded. For criminals, the mean age of husbands at marriage is 25·30 years ; the mean age of their wives is 23·58 years. In the general population, these ages are respectively 28·36 years, and 26·20 years. It is obvious, therefore, that criminals marry at an earlier age than do individuals belonging to the law-abiding community ; and consequently—despite the fact that the general rate of marriage of criminals is less than the marriage-rate of non-criminals—to a marked degree below the age of 20, and to a smaller degree below the age of 25, there is a greater percentage of married criminals than of married non-criminals in the general population. This contention receives additional confirmation from the figures in Table 150, where the

TABLE 150.—Age at first conviction, and age at marriage, in habitual criminals.

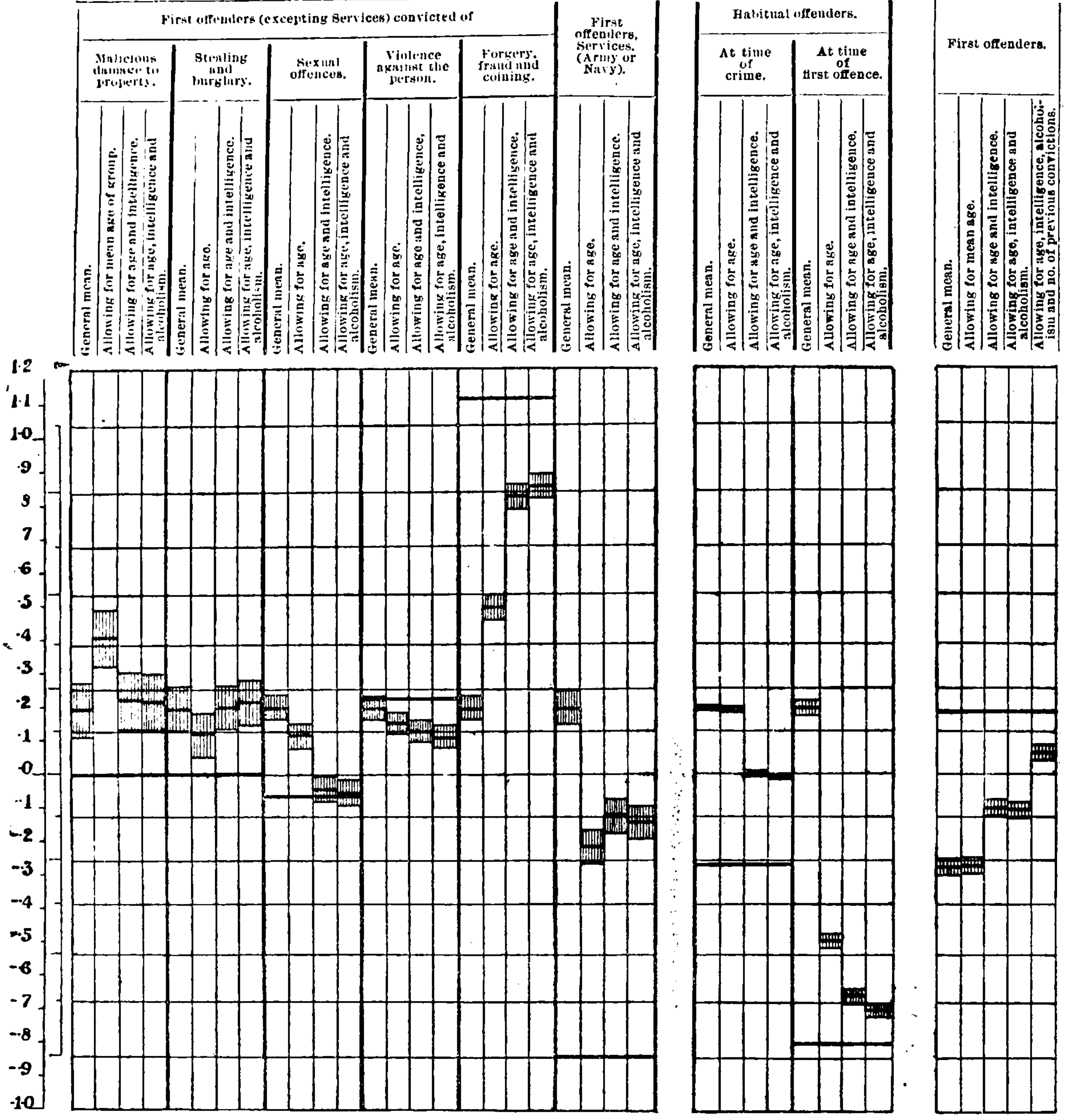
Age at first conviction.	Age at marriage.								Totals.
	15–	20–	25–	30–	35–	40–45	50–55	65–70	
10–	6	6	4	—	—	1	—	—	17
15–	12	25	7	6	—	2	—	—	52
20–	4	19	6	5	—	—	—	—	34
25–	4	13	5	5	1	—	—	—	28
30–	2	7	8	4	1	—	1	1	24
35–	—	12	5	2	—	—	—	—	19
40–	1	5	4	1	—	1	1	—	13
45–	1	1	—	—	1	—	—	—	3
50–	1	2	—	1	—	—	—	—	4
55–	—	1	1	—	—	—	—	—	2
60–	—	2	—	1	—	—	—	—	3
65–	—	1	—	—	—	—	—	—	1
Totals ...	31	94	40	25	3	4	2	1	200

Mean age at marriage—25·125 years. Standard deviation of age at marriage—6·55 years.

Mean age at first conviction—27·125 years. Standard deviation of age at first conviction—11·32 years.

Coefficient of correlation of age at first conviction with age at marriage : ·148 ± ·047·

FIG. xlviii.—DIAGRAMS TO SHOW (1) THE DIFFERENCES IN MARRIAGE DEGREE DISTINGUISHING CERTAIN GROUPS OF CRIMINALS FROM THE EXPERIENCE OF FIRST OFFENDERS, AND (2) THE ANALYSIS OF THESE DIFFERENCES INTO THE AMOUNTS DUE TO AGE, INTELLIGENCE, INTEMPERANCE, AND OTHER UNDETERMINED CAUSES.



The full line indicates the marriage degree of the group named at head. The first hatched band indicates, by its centre, the marriage degree of first offenders generally, and, by its width from centre, the probable deviation for any *random* sample of the limited number of the group. The distance of the full line from the centre of the band is the actual deviation of the group's marriage degree from that of first offenders generally. The second hatched band corrects the first (by the regression equation) for the group's deviation in mean age from that of first offenders generally; the third, in like manner, corrects for deviations in age and intelligence; and the fourth for deviations in age, intelligence, and intemperance. The distance of the full line from the centre of the fourth hatched band is the residual deviation of the group's marriage degree from that amongst first offenders generally, after due allowance has been made for the determining factors of age, intelligence, and intemperance in that group; and the width of the band is the probable deviation in any random sample with similar characteristics, and of the limited numbers, of the group.

It will be seen that the predicted marriage-rate of habitual criminals differs from the actual marriage-rate of habituals at the time of their first offence (*i.e.*, prior to incarceration) by + 5 per cent., and from the actual marriage-rate of habituals at the time of observation (*i.e.*, after their frequent imprisonment), by + 10 per cent.

One conclusion can be drawn from these results: that the wide difference which, on the face value of the crude statistics, appears to exist between the marriage-rate of habitual criminals and the marriage-rate recorded for star-class convicts, is accounted for mainly by the differences in the distribution of age, feeble-mindedness and alcoholism, within these two contrasted populations. When the distributions of age, feeble-mindedness and alcoholism, within both these populations, are reduced to those of the standard population, we see that the apparent difference in their respective marriage-rates disappears to a marked extent; and that a difference of 10 per cent. alone remains to be otherwise accounted for. What are the influences that lead to this deficiency of 10 per cent.

in the marriage-rate of habitual criminals? Does this 10 per cent. represent solely, and if not solely, to what extent does it represent, the influence of imprisonment upon marriage? In anticipation of this question, we applied our formula to predict the mean marriage of habitual offenders at the time of their first conviction. As shown in Table 146, the predicted value proved to be 5 per cent. greater than the actual or statistical value. Consequently, since at the time of their first conviction, *i.e.*, prior to incarceration, the marriage-rate of habitual criminals is 5 per cent. lower, and at the time of observation, *i.e.*, after repeated convictions, is 10 per cent. lower than the marriage-rate of star-class criminals, *i.e.*, than the general community marriage-rate,* fully corrected for age, feeble-mindedness and alcoholism—two final conclusions follow. The first is that bachelors, to a disproportionate extent of 5 per cent., tend to become habitual criminals more than do married persons. The second is that, under the influence of incarceration, the marriage-rate of habitual criminals is lowered by another 5 per cent.

To test these conclusions, and incidentally to test the soundness of all the previous calculations, we have obtained from the data of habitual criminals the regression equation of marriage, not only upon age, feeblemindedness and alcoholism, but, in addition, upon the number of their previous convictions; and from this equation we have predicted the mean marriage of first offenders, or star-class convicts, entering in the equation the mean value of their previous convictions as zero. The statistics, and the various values of the constant utilised in the equation, will be found in Tables 151, 152, 153 and 154; and the intercorrelations of age, weak-mindedness, intemperance, previous convictions, and marriage, are as follows:—

—	Age.	Weak-mindedness.	Intemperance.	Previous Convictions.	Marriage.
Age	—	−·131	·083	·178	·396
Weak-mindedness	−·131	—	·086	·222	−·355
Intemperance	·083	·086	—	·270	−·013
Previous convictions	·178	·222	·270	—	−·138
Marriage	·396	−·355	−·013	−·138	—

These give

$$\Delta = \begin{vmatrix} 1 & -\cdot131 & \cdot083 & \cdot178 & \cdot396 \\ -\cdot131 & 1 & \cdot086 & \cdot222 & -\cdot355 \\ \cdot083 & \cdot086 & 1 & \cdot270 & -\cdot013 \\ \cdot178 & \cdot222 & \cdot270 & 1 & -\cdot138 \\ \cdot396 & -\cdot355 & -\cdot013 & -\cdot138 & 1 \end{vmatrix}$$

and,

$$-\frac{\Delta_{51}}{\Delta_{55}} = \cdot3851 \qquad -\frac{\Delta_{52}}{\Delta_{55}} = -\cdot3088 - \qquad \frac{\Delta_{53}}{\Delta_{55}} = \cdot0188 \qquad -\frac{\Delta_{54}}{\Delta_{55}} = -\cdot1503$$

The regression equation is:—

$$\frac{y-y}{\sigma_y} = -\frac{\Delta_{51}}{\Delta_{55}} \times \frac{x-x}{\sigma_x} - \frac{\Delta_{52}}{\Delta_{55}} \times \frac{w-w}{\sigma_w} - \frac{\Delta_{53}}{\Delta_{55}} \times \frac{a-a}{\sigma_a} - \frac{\Delta_{54}}{\Delta_{55}} \times \frac{c-c}{\sigma_c};$$

and, when the various numerical values are substituted, the equation becomes†:—

$$\frac{y}{\sigma_y} + \cdot274 = \cdot385 \times \frac{x - 36\cdot170}{13\cdot142} - \cdot309\left(\frac{w}{\sigma_w} + \cdot538\right)$$
$$+ \cdot019 \times \left(\frac{a}{\sigma_a} - \cdot005\right) - \cdot150 \times \left(\frac{c - 9\cdot237}{8\cdot134}\right)$$

* We have already shown that the fully corrected marriage rate of star-class criminals and of the general community are practically the same.

† The variability of marriage from this determination is $\sqrt{\frac{\Delta}{\Delta_{55}}} \times \sigma_y = \cdot8545 \times \sigma_y$. The probable error of a prediction is $\cdot6745 \times \cdot8545\,\sigma_y = \cdot5764\,\sigma_y$. The probable error of the mean marriage, predicted from a random sample of n individuals in a large population, whose characters are as above, is $\frac{\cdot5764}{\sqrt{n}}$. The partial correlation coefficients are:—

Marriage and age $\frac{\Delta_{51}}{\sqrt{\Delta_{55}\Delta_{11}}} = \cdot399 \pm \cdot012$

Marriage and weak-mindedness $\frac{-\Delta_{52}}{\sqrt{\Delta_{55}\Delta_{22}}} = -\cdot331 \pm \cdot013$

Marriage and intemperance $\frac{\Delta_{53}}{\sqrt{\Delta_{55}\Delta_{33}}} = \cdot021 \pm \cdot014$

Marriage and previous convictions $\frac{-\Delta_{54}}{\sqrt{\Delta_{55}\Delta_{44}}} = -\cdot160 \pm \cdot014$

Table 151.

Among habitual offenders, the correlations with age of marriage, intemperance and weak-mindedness.

Ages.	Marriage.		Intemperance.			Weak-mindedness.		
	Married.	Un-married.	Intemper-ate.	Not in-temperate.	Totals.	Weak-minded.	Not weak-minded.	Totals.
15-	3	36	13	26	39	8	4	12
20-	75	324	143	256	399	57	117	174
25-	153	341	247	247	494	55	158	213
30-	136	217	191	162	353	44	110	154
35-	124	150	179	95	274	52	84	136
40-	85	104	99	90	189	20	50	70
45-	70	67	73	64	137	23	27	50
50-	61	38	54	45	99	11	23	34
55-	33	19	25	27	52	7	23	30
60-	61	41	51	51	102	12	39	51
65-	41	13	28	26	54	5	35	40
70-	21	5	12	14	26	1	19	20
75-	8	2	5	5	10	—	10	10
80-	4	—	1	3	4	—	4	4
Totals	875	1,357	1,121	1,111	2,232	295	703	998
Mean ages ...	41·27	32·88	37·04	35·29	36·17	35·25	38·40	37·46
Deviations from mean of all.	—	−3·29	·87	—	—	—	·93	—
Standard deviations.	—	—	—	—	13·14	—	—	14·50
$\frac{1}{2}(1+\alpha)$ ...	—	·608	·502	—	—	—	·704	—
z	—	·384	·399	—	—	—	·345	—
Coefficients of correlation with age and prob. errors.	·396 ± ·012		·083 ± ·014			− ·131 ± ·021		

Table 152.

Among habitual offenders, the correlation with age of the number of previous convictions.

Age at present conviction.	Number of previous Convictions.																												Totals.
	1, 2.	3, 4.	5, 6.	7, 8.	9, 10.	11, 12.	13, 14.	15, 16.	17, 18.	19, 20.	21, 22.	23, 24.	25, 26.	27, 28.	29, 30.	31, 32.	33, 34.	35, 36.	37, 38.	39, 40.	41, 42.	43, 44.	45.	48.	49, 50.	51, 52.	73.	78.	
15	17	10	4	3	2	—	1	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	39
20	83	82	72	46	44	31	15	7	8	2	2	—	1	2	1	1	—	2	—	—	—	—	—	—	—	—	—	—	399
25	81	67	87	64	48	43	23	21	18	11	3	7	8	5	1	2	—	3	1	—	1	—	—	—	—	—	—	—	494
30	58	41	48	36	33	38	23	17	13	12	6	3	5	2	2	5	3	1	1	3	2	—	—	—	—	1	—	—	353
35	47	36	24	33	23	17	21	16	11	11	3	3	6	3	3	3	1	2	4	2	—	1	—	—	1	3	—	—	274
40	27	22	25	21	26	15	10	10	9	7	2	4	2	2	1	2	1	—	—	—	1	1	—	1	—	—	—	—	189
45	23	21	13	11	16	11	9	9	4	8	2	1	—	1	1	—	1	—	1	1	—	—	1	—	1	—	1	1	137
50	14	17	15	14	9	12	5	7	1	1	2	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	99
55	8	6	4	4	8	5	2	5	1	3	3	—	1	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	52
60	9	14	14	16	9	6	7	8	3	5	2	1	—	1	1	—	1	—	—	2	—	1	—	—	2	—	—	—	102
65	4	8	8	10	3	5	4	3	3	1	—	—	1	2	—	—	—	—	—	2	—	—	—	—	—	—	—	—	54
70	5	4	3	5	3	2	1	2	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	26
75	3	—	—	2	—	2	2	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10
80	—	—	2	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
Totals ..	379	328	319	265	224	187	125	106	71	61	25	21	25	18	10	16	7	9	7	10	4	3	1	1	4	4	1	1	2,232

Mean present age, 36·170 years. Standard deviation of present age, 13·142 years.

Mean number of previous convictions, 9·237. Standard deviation of number of previous convictions, 8·124.

Coefficient of correlation of number of previous convictions with present age, ·178 ± ·014.

Substituting the values, given on p. 322, of the mean age (36·245), the mean weak-mindedness (– 1·173), and the mean alcoholism (– ·253), found for first offenders;* and putting their number of previous convictions (c), = to zero—the predicted value of the mean amount of marriage of first offenders is given by :—

$$\frac{y}{\sigma_y} = -\cdot 274 + \cdot 385 \times \frac{36\cdot 245 - 36\cdot 170}{13\cdot 142} - \cdot 309 \times (-1\cdot 173 + \cdot 538) + \cdot 019 \times (-\cdot 253 - \cdot 005) - \cdot 150 \times \frac{0 - 9\cdot 237}{8\cdot 124}$$

$$= \cdot 090 \pm \cdot 021$$

Accordingly, for first offenders—
The predicted amount of marriage
= ·090 ± ·021, equivalent to 53·6 per cent. ± ·8 per cent. married.
The actual or recorded amount of marriage
= ·187, equivalent to 57·4 per cent. married.
The difference between the amount of marriage predicted, and the amount recorded
= – 3·8 per cent.

We see, therefore, that when, in addition to correcting for age, weak-mindedness, and alcoholism,† a correction has also been made for the number of previous convictions of habitual criminals, the actual marriage-rate of these persons is 3·8 per cent. less than theoretically we would expect it to be: that is to say, it is 3·8 per cent. less than would be expected on the assumption that, prior to their incarceration; the marriage-rate of habitual criminals is the same as the marriage rate of star-class convicts, *i.e.*, of those sections of the general community with the same distribution of age, weak-mindedness, and alcoholism, shown by habitual criminals. From this determination, then, we are forced to the conclusion that habitual criminals are selected more from the bachelor, than from the married section, of the general community; and that they are so selected to the extent of 3·8 per cent. The result of our previous determination was that habitual criminals were selected from bachelors over married persons to the extent of 5 per cent. The two determinations are not precisely concordant; but we think they are sufficiently so to strengthen the conclusion we formulated on p. 331: that, under the influence of incarceration, the marriage-rate of habituals is lowered by about 5 per cent.‡

G. To resume: The objects of this inquiry were to determine, on the basis of a representative series of statistics, what differences there may be in the absolute fertility of the criminal and non-criminal classes; to indicate how different orders of offenders differ from each other, and from the general population, in their rates of marriage and powers of procreation; and to discover, and, as far as possible, to assess, the relative values of the different influences leading to aberrations of fertility in all and different kinds of criminals. In concluding the inquiry, let us give a *summary of the principal results we have reached:—*

(1) Of 250,000 males born in the general population, 621 per 1,000, or 155,220 males marry, and have an average number of 5·66 offspring, or 877,852 offspring (male and female) in all.

Of 250,000 male criminals born, 629 per 1,000, or 157,243 marry, and have an average number of 3·50 offspring, or 550,653 offspring (male and female) in all.

The ratio of the absolute fertility of criminals to the absolute fertility of the general community is $\frac{550{,}653}{877{,}852}$.

(2) In their general rate of producing children, habitual criminals, as represented in our sample, are less than half as fertile as star-class convicts who have never been imprisoned, and who, in *their* general rate of producing children, are precisely equal in fertility with the general population.

(3) The average value of completed families of criminal stock is 6·97. Comparison of this figure with the average families of other stocks proves that criminals are a product of the most prolific stocks in the community.

(4) The falling off in the number of offspring produced by habitual criminals, relatively to the number produced by the law-abiding community, does not occur prior to

* The assumption is that the standard deviations are the same for first offenders and habituals.

† *See* Fig. xlviii., page 330.

‡ Comparison of Fig. xliv., page 304, with this result, and the small degree of association (·13) it represents, between marriage and frequency of imprisonment, illustrates the danger of drawing hasty conclusions from the graphical presentation of percentages; and conclusively proves that the one reliable measure of association is the partial regression coefficient.

the age of 40. The diminution of the fertility of habitual criminals, after this age, is not due to physiological sterility, nor, *directly*, to their confinement in prison: but is due to a definite psychological human reaction which, after a certain period of continually interrupted married life, induces the desertion of habitual criminals by their wives.

(5) There are wide differences in the marriage-rates of different orders, and different grades, of criminals; precisely as there are marked differences in the marriage-rates of different sections and sub-sections of the law-abiding community: which differences, however, when they are reduced to the distribution of age, alcoholism, and intelligence, of a standard population, almost entirely disappear. The only differences between the fully corrected marriage-rates of criminals and of the general population are (1) an excess of 5·4 per cent. in the marriage-rate of fraudulent criminals, due to the fact that stress of marriage is itself an influence upon fraud; (2) an excess of 7·6 per cent. in the marriage-rate of criminals who commit crimes of violence, which excess represents the extent to which criminals, committing this order of crime, are indicted for committing violence upon their wives; (3) a difference of 5 per cent. representing the extent to which bachelors, rather than married people, tend to become habitual criminals; (4) a deficiency of 5 per cent., which is a maximum estimate of the restriction upon marriage due to imprisonment.

(6) The apparent decline of fertility of habitual criminals, progressively increasing with the increasing frequency of their incarceration, is partly an indirect effect of an increasing degree of feeble-mindedness, which likewise is associated with the increasing frequency of conviction of habitual criminals.

Appendix to Chapter VI.

We must draw attention to four qualifying considerations which, were they statistically allowed for, might modify to some extent the finality of our conclusions, embodied in Statement I. above, as to the absolute fertility of criminals and non-criminals. From lack of suitable data, we were unable to take any account of possible differences (1) in the balance between emigration and immigration, (2) in the infant and child mortality, (3) in the amount of illegitimacy, (4) in the average length of a generation, of the two sections of the community (criminal and non-criminal), whose fertility we have been comparing. In reference to *migration*, we can quote the Registrar General's statement that: "Since 1850, the yearly number of emigrants has always exceeded the number of immigrants," amongst the total population of these islands. Amongst criminals, on the other hand, we would infer that the balance of migration is on the side of the immigrants. The only evidence we can produce in support of this inference is that the number of foreigners, enumerated in England and Wales at the Census of 1901, was 151,000 males, out of a total enumeration of 15,000,000 males—*i.e.*, approximately 1 per cent.; whereas, estimated from our sample of convicts, the proportion of aliens in English prisons is, roughly, 3 per cent. It is clear, therefore, that the proportion of criminal to non-criminal aliens is greater than the proportion of criminal to non-criminal natives, in the British Isles. That is to say, total criminal immigration is likely to be in excess of the total non-criminal immigration. How many criminal aliens, however, are annually deported from these shores, and how many are the native criminals (fugitives from justice, &c.), who emigrate voluntarily, we cannot say, having no definite information on the matter. Now, our calculation of the relative fertility of criminals and non-criminals was based upon the assumption that the balance between emigration and immigration was the same for these two sections of the community.* A correction for any difference in this respect would probably, to some small extent, increase the value we reach for the fertility of criminals; but we do not think that the increase would be appreciably significant.

(2) *Infant mortality*, if substantially different for criminals and non-criminals, is a factor of greater practical importance in our fertility estimates. Out of the total deaths registered in the ten years 1891–1900, the loss of infants under one year of age, although fluctuating widely in different localities, was, in the country as a whole, 156 per 1,000. The mortality of infants, between the ages of 1 and 2 years, was 44 per 1,000. In our sample of convicts, the records are to the effect that 314 male parents produced 1,310 offspring, of whom 415—or 315 per 1,000 born—died before reaching the second year of life. This difference between the infant mortalities in the criminal and the general population is substantial and alarming; but it is to a certain extent explained by the

* The assumption was contained in the calculation of the age-distribution of criminals at death. This calculation was based upon the Registrar General's life-table for the general community: which table makes no allowance for the ratio of emigration to immigration, at different ages.

Registrar General's statement that, in many manufacturing and mining centres, the wastage in the first year of life amounts to over 20 per cent. Taking the figures for the country as a whole, we may conclude that 31 per cent. of the offspring of criminals as represented in our sample, but only 20 per cent. of the offspring of non-criminals, die before attaining the age of two years. Our under-estimate of the fertility of criminals, by neglecting to allow for migration, would be more than counterbalanced, if duly corrected for infant mortality.

(3) The next consideration is whether the conclusion, formulated in Statement I, would have been appreciably modified had *statistics of illegitimacy* been included in the analysis of criminal and non-criminal fertility. We do not know of any direct evidence for the view that criminals are responsible for more than their proportional share in the production of the annual illegitimate birth-rate. On *a priori* grounds, one would imagine that criminals would be less fertile in this respect than the law-abiding community. Criminals, as we have seen, are drawn from the more feeble-minded and alcoholic sections of the populace. As is well known, alcoholism and imbecility in the female, are a fruitful source of illegitimacy; but, in a matter of this kind, the case for the male cannot be reasoned from what happens to the female. The female imbecile and al coholic admittedly tends to give herself freely and promiscuously to sexual intercourse. The male, on the other hand, has to seek and secure a mate to share his purpose. We have seen that increasing alcoholism and feeble-mindedness are associated with a decreasing rate of legitimate marriages amongst male criminals. By parity of reasoning, we can easily imagine that the same influences would militate in a similar way against the illegitimate consummation by criminals of the sexual relationship. The type of prostitute, moreover, successfully secured by the habitual criminual, destitute on leaving prison and deserted by his wife, is not a significant source in the production of the annual illegitimate, birth-rate. In this connection we may contrast the statistical facts that, between 1896 and 1900, the rate of illegitimate, in proportion to total, births, was 39·5 per 1,000; and that amongst a sample of 500 convicts, 11 were born of illegitimate, and 12 of doubtful illegitimate parentage—thus yielding a proportion of between 22 and 46 per 1,000 for the rate of illegitimacy amongst criminals. Illegitimacy of birth, therefore, cannot be regarded as a significant factor in the production of criminals.

(4) We turn now to the final consideration: the difference between *the average length of a generation* of criminal, and a generation of non-criminal, stocks? By "length" of a generation for any community, we understand *the average period of time* elapsing between the births of individuals composing the community, and the births of their first offspring. It is apparent that any marked difference between two communities, in the respective lengths of this period, will, after the lapse of several generations, produce a substantial modification in their comparative fertilities, based upon an estimate from one generation only. Now, the average age at marriage is 25 for male criminals, and 23 for their wives; in the general population, these respective ages are 28 for males, and 26 for females.* It follows, then, since we found no difference in their initial fertility *i.e.* no difference in the length of period between marriage and the birth of a first child—that, for each successive age of the parents, the average age of offspring will be three years more for those with criminal parentage than for those whose parents were non-criminals. That is to say, a generation of criminal stock is three years less in length than a generation of the law-abiding community. After a lapse of 200 years, assuming the same conditions to have prevailed during the whole of the period, eight generations of criminal stock would have been produced to seven of non-criminal stock, and their respective absolute fertilities at the end of this period would be, not $\frac{551,000}{878,000}$, as we found in our comparisons for *one* generation, but $\frac{551,000 \times 8}{878,000 \times 7} = \frac{4,408,000}{6,146,000}$.

(5) In relation to the decreased fertility of criminals, and to the conclusion we have formulated, that a hundred criminals in one generation bequeath altogether 220 offspring to the next, it is worth while noting another point of interest—*to what extent*, upon the evidence of our records, *criminals in one generation are finally replaced by actual criminals in the next?* We have seen that a hundred criminals produce 220 offspring, of whom, according to the Registrar General's report, 48 per cent., or 105, will be males, and 77 will survive to the minimum age (14) for becoming a criminal. Of these 77 males, as we shall see later, 26 actually do become criminals. According to these figures, crime ought to be decreasing; or, since we know the criminal population has, in point of fact, been numerically constant during the past 30 years, individuals convicted of crime to-day, ought to be different constitutionally to their prototypes of the last generation.

---

* See Tables 148, 149, page 327.

it is one about which most people have a very definite opinion. The whole trend of recent legislation—following, of course, upon popular opinion—has been affected by the notion of the influence of environment. People believe in the effective action of material things they can see. They may, perhaps, *think* there is "something in heredity"; but they *feel* that circumstances make the man and determine his condition. It is argued that men break the law because they drink, they drink because they are poor, they are poor because they are illiterate or cannot "find employment"; similarly, it is stress of circumstances that provokes insanity, defective hygiene that leads to constitutional disease; it is upon athletic training that physique depends, it is from lack of exercise that obesity results—and so on, through all the list of popular beliefs. On the other hand, there are those of a more philosophic and introspective temperament who are inclined to put all the weight of their belief in an opposite direction. These seem aware of a force within themselves compelling them to be what they are, despite of their surroundings, despite of themselves. So they assume that heredity is a transcendent influence on life. The blows of circumstance may be felt, they would say, but they do not permanently dent and modify the shape bequeathed by heredity. Between these two extremes are the more cautious minds, who, while not doubting the reality of the germinal force, are at the same time so conscious of the complexity of life, of the disproportionateness of environmental conditions, that they withhold judgment as to which influence may be the more vital. So they contend that man is a product of inherited tendency, moulded by circumstance; and they argue that the original influence of heredity may be augmented, reduced, or entirely overcome, by every kind of environmental influence. Finally, to these conflicting, but personal, convictions, must be added the various acquired opinions of those who, guided consciously or unconsciously by doctrinaire principles, try to bring their belief about facts into harmony with their knowledge of theory. These are the persons who assert, for instance, that "only those diseases are influenced by heredity whose appearance conform to the laws of Mendel";* and who are satisfied to make such statements of belief as the following, that "it is both rational and feasible that insanity should be inherited," but it is "the climax of absurdity to imagine that the criminal could breed his kind."†

We have described current conviction and opinion upon the influence of human inheritance, in order to show the futility of appealing to authority, or theory, in the estimation of this influence, and to emphasise the necessity of a scientific study of natural inheritance: which is to disperse unwarranted conviction, and to replace vague opinion by precise and explicit knowledge. Our object is to obtain the same exact knowledge of the mode of action of heredity, that physicists have obtained with regard to the mode of action of such a physical force as terrestrial gravitation. From a complexity of conditions the physicist has been able, by observation and experiment, to disentangle and isolate the influence of gravity, and to formulate its mode of action in a universally valid law. Will the influence of heredity ever be similarly isolated from the tangle of environmental conditions, so that a universally valid law of natural inheritance may be formulated? This is the ultimate theoretical problem. In the meantime, our immediate practical endeavour is to obtain exact numerical cognizance of the power of heredity, by independent examination of each case as it arises. How may this be done? How is one to estimate scientifically the part played by heredity in the case of any particular character?

Science is measurement. The science of heredity is the measurement of the influence of heredity. But measurement presupposes a standard of reference. What, then, must be our standard? Germinal action is not a visible thing: its power cannot be directly appreciated by the senses. The existence of germinal influence is only known from its effect—from its effect in producing an organic relation of resemblance between generations. Obviously, then, the only standard, or test, of hereditary influence, is that of resemblance. The test of parental inheritance is the resemblance between parents and offspring; the test of remoter inheritance is the resemblance between generations more distantly removed. Of course, the existence of any likeness does not necessarily imply the inheritance of such a likeness; but, unless absolutely screened by environmental influences, the absence of likeness does imply the absence of inheritance. The first essential, then, for estimating the intensity of hereditary influence in any character, is to measure the degree of resemblance of this character in successive generations. Upon what scale is such resemblance to be measured? Before answering this question, it is necessary to realise explicitly what is meant by *ancestral resemblance*. There seems to be a general misconception that inheritance of a quality implies the actual transmission of this quality, which is supposed to pass, as it were, from one generation to another, just as inherited

* One of the expressed opinions, at the recent inquiry into the influence of heredity upon disease held by the Royal Society of Medicine.

† "Recidivism," pp. 68-70, J. F. Sutherland.

property passes between father and son. For instance, it is often authoritatively stated that because the immediate cause of microbic disease is infection by a micro-organism, there can be no such thing as hereditary transmission of microbic disease. Interpreted literally, this is of course true. There is no transmission of microbic disease because there is no transmission of any disease; because, literally interpreted, there is no such thing as hereditary transmission at all. Heredity is not the power to *transmit*, or to *withhold transmission* of, any definite thing. Heredity is the tendency to *reproduce* a more or less approximate likeness of that thing. Hereditary transmission is merely a figurative expression describing the tendency of every newly created being to develop the likeness of those within, and the relative unlikeness of those without, his own line of ancestry.* Following upon this misconception with regard to hereditary transmission—a misconception induced by the literal interpretation of a figurative formula—is the notion that hereditary influence is variable and intermittent. There seems to prevail an idea that the appearance of any marked ancestral trait in an individual is a manifestation of hereditary influence at work, whereas the absence of any such appearance is a manifestation of this influence in abeyance. In short, it seems currently believed that there is such a thing as "natural disinheritance," as well as "natural inheritance." In hospital and asylum records, the occurrence of the same disease in successive generations is frequently noted as "a history of heredity"; whereas, when there is no family history of similar disease, the note made is "no history of heredity."† In the same way, the compilers of Lunacy Returns, in their report every year, record a percentage of the number of individuals whose insanity is supposed to have been influenced by heredity. Now, the only conclusion to be drawn from such records is that the effects of heredity are intermittent; and that, consequently, our object should be to obtain a numerical estimate of this intermittence. But the mode of action of heredity here assumed is entirely imaginary, and is opposed to that conception of heredity which, as a formula of general experience, is the only valid conception, viz., that all living things breed true to, and develop within, the likeness of their ancestral type. With regard to specific characters we know heredity is not an intermittent, but is an invariable influence: consequently, with regard to any individual attribute occurring within the species, we are bound to assume that hereditary influence, if it occurs at all, must be equally invariable. From which it follows that not only—in the words of our hospital records—is an obvious resemblance between ancestors and their offspring a "history of heredity," but that *any* relation of resemblance, even comparative unlikeness, is a "history of heredity," of equal significance and importance. The stature of the short son of a tall father should tell us as much as the stature of the tall son of a tall father. A tubercular parent who begets a healthy child, a tubercular child begotten by a healthy parent, or tubercular children whose parents are similarly diseased, should all be equally significant to the interpreter of the secret of heredity. Heredity is not postulated as a power that will reproduce an exact counterpart of any particular ancestral quality: it is postulated as an influence which tends on the whole, and in the long run, to reproduce some likeness of the ancestral genius. It is inconceivable that the effect of heredity should be other than this. For to imagine a power which could reproduce living things, identical to their forbears, would be

* The difference between the inheritance of disease, and the inheritance of the diathesis of disease, is sometimes insisted upon. It is argued that, where some environmental factor, such as invasion by a noxious agent, is implicated in the causation of disease, although the disease may be restricted to certain stocks, it cannot be described as heritable. This seems to us a distinction which, without amplifying our conception of hereditary influence, is apt to be very misleading. The only difference between microbic and other diseases is, that the inherited likeness in the latter is visible, or may be inferred from impaired function; whereas, in the former, the likeness resulting from inheritance is invisible, and unverifiable in terms of actual experience, until revealed by microbic invasion. There is no real difference in the nature of the part played by hereditary influence in the two cases. Environmental influence, *i.e.*, microbic invasion, affecting microbic disease, may modify the importance of the hereditary influence, but does not alter its nature or mode of action any more than a surgical operation modifies the influence of heredity upon a congenital deformity. The test of the power of heredity in the occurrence of congenital deformity, or of microbic disease, is the same: and is the extent to which the condition is restricted to certain stocks. It is as fallacious to say microbic disease, such as tuberculosis, cannot be heritable, because of the environmental factor in its causation, as it would be to say that stature is not heritable, because growth is dependent upon nutriment and exercise. And, inversely, even in such positive hereditary conditions as congenital deformities, these are not produced independently of environmental determinants. As pointed out by Professor His, "to think that heredity will build up organic beings without mechanical (*i.e.*, environmental) means is a piece of unscientific mysticism."

† However interpreted, this way of expressing the facts is very misleading. If the effects of heredity upon any disease are unknown, to instance the occurrence of this disease as "a history of heredity" is obviously begging the question. On the other hand, if it be admitted that heredity *may* modify the disease, it does not follow that the appearance of this disease in successive generations is necessarily an example of hereditary influence. Because a son suffers from the same morbid condition as his father, it no more follows that he has inherited it from his father than the possession of an equal fortune, by father and son, is a proof of legal inheritance.

to conceive a universe where there was no such thing as variability: which is unthinkable. A universe in which heredity played no part is within the reach of the imagination; but a universe without variation is not to be imagined. One can picture fairyland where human beings give birth to goblins, where they may be transformed into toads or swans, where grapes grow from thorns and figs from thistles: but we can form no vision of a world so fantastic that all things living within it have identical attributes. Heredity is a universal influence which tends to produce likeness; but, we must add, it tends to do this in the face of a counter genetic influence tending to produce variation. Although, in consequence of this conflict between natural inheritance and natural variability, perfect ancestral likeness cannot be reproduced, a likeness of some sort will be found which would not be there were the influence of heredity absent, were the distribution of qualities fortuitous, and independent of ancestry. This, then, is what is meant by "ancestral resemblance." It means, not an *exact* resemblance, occasionally produced by the intermittent transmission of somatic characters between the generations, but an *approximate* resemblance, achieved, in the long run, by the tendency of all offspring to grow into the likeness of their progenitors. In technical language, ancestral resemblance means ancestral correlation: which explains our original contention, *i.e.*, that the problem of heredity rests upon a statistical basis. We know how widely human beings differ; what we want to know is, how nearly they approach one another, under the influence of heredity. In all their mental and physical attributes and morbid states, and conditions resulting from these, how do offspring ultimately resemble their ancestors? What, in actuarial language, is the "expectation" of stature in offspring of parents of a given stature, the "expectation" of mental endowments in the offspring of parents who are gifted, and of those who are imbecile? What are the chances that a child of tubercular parents will become tubercular, the probability that the son of a convicted felon will go to prison? Since direct breeding experiments in man are impossible, the only way to measure precisely this ancestral resemblance, and to deduce from it these expectations and probabilities, is to measure the residual resemblance that remains after the effects due to variation have been eliminated. In other words: "You must record, by the method of averaging large numbers, the patent somatic characters of ancestry, and find their direct correlation with the somatic characters of the offspring." To discover the facts of human inheritance, our first appeal must not be to theorists, nor to biological, clinical or other authority, but to the statistician.

The purpose of the present chapter is to present some results derived from an application of the statistical method to the problem of heredity and crime, *i.e.*, of the influence of heredity upon the production of criminals; and to contrast these results with those already obtained relating to the influence of environment.

(B) *The Problem of Heredity in its Relation to Crime and the Production of Criminals.*

We only know that there is such a thing as heredity by its effect in producing ancestral resemblance. The first step, then, when studying the influence of heredity, is to obtain a measure of this resemblance. The first step towards determining the hereditary character of crime, the influence of heredity in the production of criminals, is to ascertain how successive generations of individuals resemble each other in the fact of their conviction and imprisonment for crime. It must be understood that this estimation of resemblance is only a first stage towards the solution of the hereditary problem. Inheritance presupposes resemblance: but resemblance need not necessarily be due to hereditary influence. We can imagine that hereditary resemblance, actually present in an individual, may be augmented or reduced, or that, absent in him, may be mimicked, under the manifold influences of the home environment. For instance, a child, inheriting a tendency to lisp, might have this disposition increased by living in constant companionship with a father who lisps; or, again, an imitative child, without any such innate tendency, might yet, living in these conditions, acquire the habit of lisping. The first step, then, in the study of criminal heredity, leads only to the discovery of certain facts of family history, certain statistical facts of family resemblance, resulting from the analysis of family and legal statistics. These facts alone, apart from their interpretation, are of the greatest economic and social importance; but it must be realised that they do not in themselves provide answers to the wider questions they lead up to: which are, to what extent the appearance of criminals in society depends upon the inheritance of a constitutional anti-social disposition; and to what extent it depends upon the influence of family contagion. It is often dogmatically argued, on purely theoretic grounds, that unless criminality be regarded as dependent upon a pathological mental state, akin to insanity, or unless, by the presence of congenital physical stigmata in him, the criminal can be shown to be a product of anomalous biological conditions, the study of criminal heredity is a futile endeavour. For, it is argued, unless the criminal can be regarded as a biological anomaly, which certainly he

in man), each character is divided up into so many small groups upon a quantitative scale, and the number of individuals falling within each group is recorded. The whole series of frequencies, which results when a population is thus sorted, is called a "frequency distribution"; and the correlation coefficients between any two characters thus distributed* represent how, and to what degree, the mean value of one varies with any change in an assigned value of the other. The correlation between head-length and stature, for instance, depends upon the manner in which these characters are associated. Or, to take another instance, the correlation in heredity of stature, *i.e.*, the resemblance with regard to stature between parents and offspring, depends upon the way the mean stature of children is associated with the stature of their parents. If, as one variable increases, the mean value of the other remains unchanged, there is no correlation between these two variables; if, on the other hand, with increase of one variable, the mean value of the other either *progressively* increases, or decreases, there is either positive or negative correlation, as the case may be. Now, the calculating, in this way, of a correlation coefficient, although it has the merit of being a universally valid method, applicable to all characters independently of their distribution, involves much labour. It was partly with the view of economising some of this labour that Professor Pearson devised a shorter method for calculating correlation coefficients—the method of the fourfold table already referred to. In the memoir we have quoted, Professor Pearson showed that, by employing the fourfold table method, characters, broadly divided into two groups, can be almost as accurately correlated as when they are divided into the many groups of a frequency-distribution. For instance, by this method, stature can be correlated with head-length from records of a population classified as tall and short individuals, and as individuals with large heads and with small ones; and the result will be almost as accurate as if the usual elaborate correlation method had been employed. Professor Pearson has also shown that, so long as the classification adopted is consistently adhered to, it is immaterial where the line of demarcation is drawn (provided the group percentages are not too markedly diverse). Whatever grouping may be adopted, the result will be the same. It will be seen that the fourfold table is a method particularly appropriate for correlating mental and moral characters in man: characters which, although they cannot be precisely measured on a finely divided scale, can be broadly classified as belonging to one or other of two sections of this scale. For, just as with regard to their physical characters, individuals can be classified fairly accurately, without precise measurements being taken, as tall and short, as those with large heads and those with small, so can they be classified—and every day the world colloquially does so classify them—by broad distinctions with regard to their mental and moral characters, as intelligent and stupid, righteous and iniquitous, as those with hot temper and those with even temper, and so forth.

The legitimate employment of this shorter method is, however, limited by one condition. We must be able to assume that the frequency-distribution of the characters correlated by this method approximates to that given by the Gaussian, or normal, curve of error: that is to say, we must assume, firstly, that extreme values of any character correlated are relatively rare in frequency, and become rarer as the value becomes more and more extreme; and, secondly, that the most frequent value of this character should not be very far removed on the scale from the average value of the whole distribution.† Our assumption, then, in employing the fourfold table method in the present work, was that these conditions were fulfilled with regard to the distribution of frequency for the criminal diathesis in the general community.

The above assumption presents two questions for our consideration. Is it legitimate to assume the existence of a character in all men which, in the absence of a better term, we will allow ourselves to call the "criminal diathesis"; and if so, is it legitimate to assume that this character is approximately normal in its distribution? The answer to the first question was given in the introduction of this work, page 26, where the reasons will be found, not only for the legitimacy, but also for the necessity of assuming that the criminal diathesis, although present in greater average intensity amongst the lawless, is a certain constitutional fact common to the whole of humanity.

The second question—whether or no the criminal diathesis has an approximately normal distribution of frequency—we think may be answered with an equally indisputable affirmative. Judging from the distribution of human *physical* characters that have been exactly measured, and from our general experience of non-measurable human *mental* characters, whose distribution can be roughly assessed, the conclusion seems to be almost universally proved that human attributes are distributed upon the plan laid down; that they all, to speak technically, have an approximately normal distribution, and, when

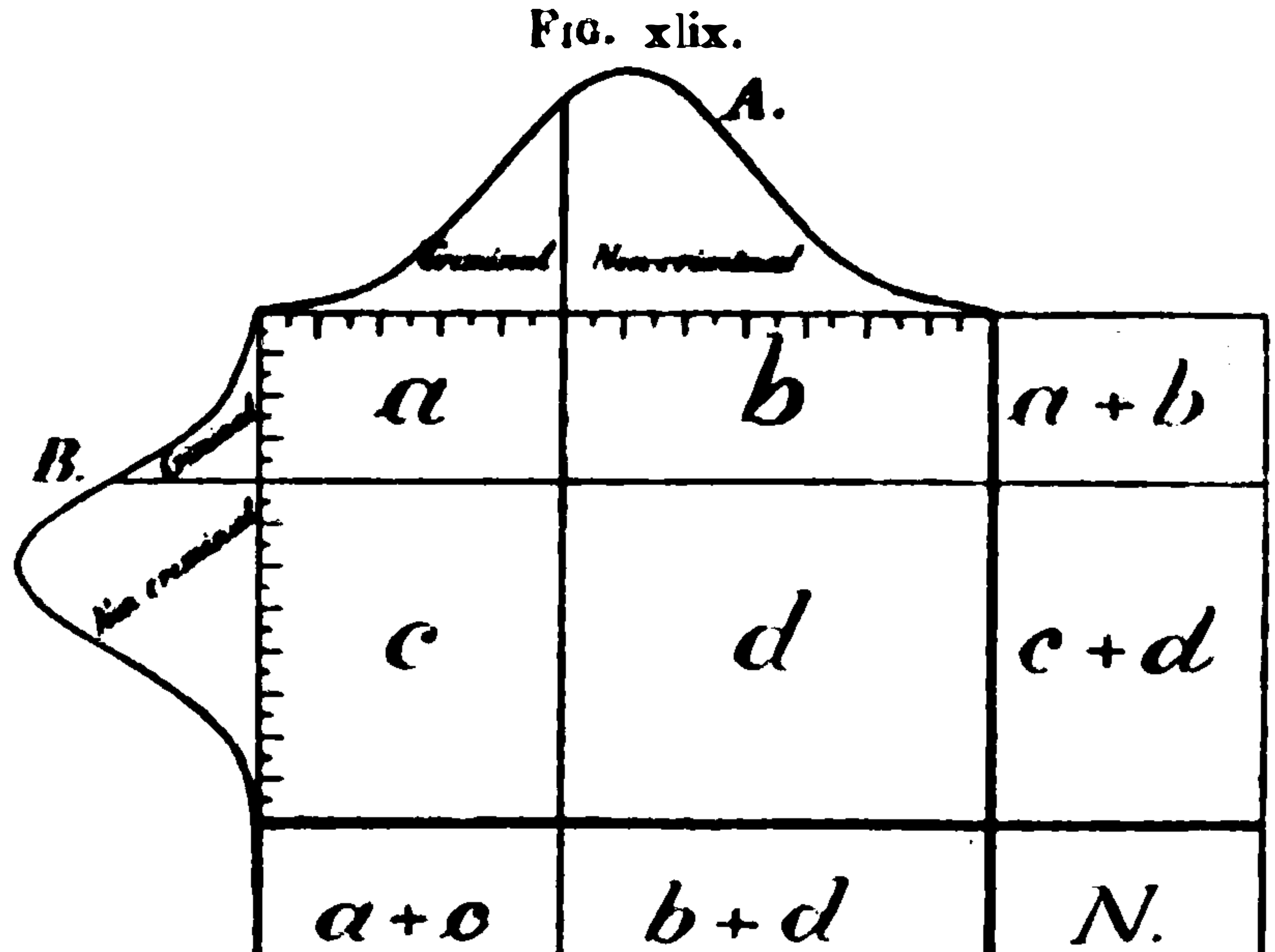
* See Part I., page 34.

† The fourfold table also assumes the "linear regression" of the characters correlated, *i.e.*, it assumes that the means of one variant changes *uniformly* with the assigned values of the other.

correlated, show linear regression.* For instance, it is a certain fact, revealed by actual measurement, that the distribution of stature in adult man follows this plan. Extremely tall and short people are rare. whereas the majority of people are of average stature; and it is also a fact that head measurements are similarly distributed: that is, extremely long and short, broad and narrow, high and low heads are rare, and heads of average length, breadth and height, are the common experience. The same type of distribution has also been found for all other physical qualities that have been measured. And general experience would suggest that the same must be true of mental qualities. Although not precisely measurable, we know by experience, in the case of temper, for instance, that there is every degree of gradation between an extreme violence of bad temper and an extreme serenity of good temper, both of which extremes are rare relatively to the average temper, which approximates to that of the majority of people; and again, with regard to intelligence, we know that between the rare extremes of genius and imbecility, there is every gradation of intelligence, of which the average must be very close to the intelligence of the mass of men.† And if we could assume that the legal designation of "criminal" depended upon one's moral position on a scale of criminality, between extremes of iniquity and righteousness, our general experience would assure us that the criminal diathesis follows the normal distribution. Scientifically, we can assume nothing of the kind. But without any such assumption, we can definitely say that, unless the criminal diathesis be an exception to all other human attributes, it is a character common to all men in varying degrees, which, if it could be measured, would be found to follow the law of normal distribution sufficiently closely to justify the legitimate use of the method of the fourfold table.

Having assumed, then, a normal distribution of frequency for our data, we have calculated the correlation coefficients in the present work by the fourfold table method. In constructing the table, we have been confronted with a difficulty which is likely to occur when this method is employed to elucidate problems of inheritance. As is usually the case in such circumstances, our data have been derived from a very selected series of family histories. The present series consists of the family histories of criminals. The problem to be solved is whether the criminal breeds the criminal: we must determine the exact numerical extent to which the appearance of criminality in our community is restricted to criminal stock; to which criminality is dependent upon, or independent of, criminal lineage. Our method obviously requires that the data arranged in the table should represent the relation of criminality, not only between generations of *criminal* families, but also between generations of families belonging to the *community at large*. A fourfold table, compiled from our data, demands for its construction additional information to that which our family histories of criminals can yield. Undoubtedly the best way of obtaining this information would be to supplement our family histories of lawless people by a proportional number of family histories of law-abiding people—thus applying a general dictum as to pathological statistics to our own special case. Unfortunately, such a random sample of family histories of the general population not being available, we have had to fall back upon some indirect source for the needed information. The precise necessities of the case are best set forth by the help of an explanatory fourfold table.

Fig. xlix.



* See Part I., pages 31, 122 and 130; Chapter I., page 200; and Chapter IV., page 250.
† See foot note, Chapter IV., page 250.

Curve A. represents the distribution of frequency of sons in the general community, with regard to their criminal diathesis. Curve B. represents a similar distribution of their fathers. The graduated scale, forming the base line of each curve, represents progressively increasing intensities of the criminal diathesis. The area between the base line and the curve, being the surface of a solid of unit thickness, represents the total number of individuals in the population; and the area of surface, between verticals, upon any small section of the scale, represents the number of individuals with the particular grade of diathesis corresponding to that section.* The general form of these curves, their close contact with the base line at each extremity, their gradual rise to, and decline from, a central summit, illustrate what we have assumed to be the probable configuration of the criminal diathesis in the general community: in other words, those individuals with very mild, and those with very intense, grades of diathesis are, upon this assumption, relatively few—the diathesis of the majority of individuals approximating to the average intensity of diathesis in the whole community.

Now, both of the frequency curves are separated into two parts by a dividing line. This line intersects the scale on the base line at a point where the gradually increasing intensity of diathesis, indicating a gradually increasing potentiality for committing anti-social acts, passes into those more intense degrees of diathesis which become manifest in convicted criminal action. That is to say, this dividing line differentiates the general population into two sections—the area of surface on one side of the line representing roughly the law-abiding citizens; the area on the other side representing those whose grade of diathesis is so intense that, sooner or later, they become legally designated "criminals."

The fourfold table, adjoining the frequency curves, is really a diagrammatic representation of a frequency solid, produced by combining the two frequencies of fathers and sons. Every father, designated criminal or non-criminal, is paired with each of his sons, similarly designated: the total number of pairs being then sorted into four columns of unit thickness, corresponding to the four categories produced by the conjunction of alternative characters in father and sons. These four categories are separated off by the two lines intersecting the table; and the number of pairs of fathers and sons found in each category are indicated by the letters a, b, c, d. Thus, a, is the number of criminal sons found with criminal fathers; b, is the number of non-criminal sons found with criminal fathers; c, is the number of criminal sons and d, of non-criminal sons found respectively with non-criminal fathers. Our fourfold table, when the letters a, b, c, d, are replaced by the actual numerical data derived from a random sample of completed family histories, describes how N. pairs of fathers and sons in the general population will be distributed into four compartments: each father and each son being then classified as either criminal or non-criminal.†

Now the number of those pairs marked a, and b, that is to say the number of criminal sons who have criminal fathers, and the number of criminal sons who have non-criminal fathers, can be derived from our family histories of criminals. What we want to know, and can only find out by indirect means, is (1) how many law-abiding citizens would be found associated, in the general population, with the number of criminal sons $a+b$; and (2) amongst these law-abiding citizens, what would be the ratio of those with criminal fathers to those with non-criminal fathers? The first problem to be solved, then, is this: *what proportion of individuals in one generation of the general community go to prison at some time of their life?* When this question is answered, our table will be provided with the numerical values to be attached to a, b, $a+b$, $c+d$, and N. The only

* Practically, the height of the curve, from any mark on the scale, gives the proportional frequency of individuals with that particular grade of diathesis

† The reason why characters, correlated by the fourfold table method, should have a normal distribution, will be now understood. The regression coefficient, derived from any correlation table, depends upon the form of the surface—called a frequency surface—of the correlation solid the table represents. Popularly described, if the surface be rotund, there is *no* correlation; where correlation exists, the surface is oblique; and with every increase in the degree of correlation, its obliquity becomes more pronounced. Thus, the problem to be solved from the data, a, b, c, d, distributed in the four quadrants of our diagrammatic table, is this: what is the degree of obliquity in the surface of a correlation solid, which, when properly cut by two planes, represented by the cross-lines of the table, will be divided into four portions, whose volumes are proportional to a, b, c, d? The problem, insoluble by ordinary correlation methods, can only be solved by allowing one assumption: that the surface, whose obliquity is to be determined, belongs to a series of surfaces whose general properties are known. In fact, the alloting of a correlation coefficient which will determine the obliquity of a frequency surface, indicated only by the data in a fourfold table, depends upon the presumption that the surface belongs to a series, called *normal* frequency surfaces, whose general properties have been mathematically studied and tabulated. This order of surface, however, only results when the distribution of correlated characters conforms to a normal curve of frequency: which is the assumption, consequently, upon which the legitimate employment of the fourfold table method depends.

adopted another view of the term ; and the classification of parents into "criminal" and "non-criminal" is based, as far as possible, upon evidence that the parents had, or had not, been convicted of an offence sufficiently serious for his case to have been sent for trial to the assizes, or quarter sessions. Parents who, if convicted at all, had only been convicted summarily by a magistrate, are classed in our records as "non-criminal" parents. The necessity for limiting the idea of "criminal" parents to the description given above is obvious. Unless a parent had committed a *fairly serious* offence, and had been tried at a high court, the chances are that his son would not be aware of his conviction ; and available official records would most probably not refer to it. It is possible that, in any case, certain of the convicts interrogated may have been ignorant of their parents' records. The effect of this ignorance would be an undervaluing on our part of the records of criminal parents : which undervaluation, it must be remembered, would eventually lower the parental correlation. On the other hand, an over-estimate of this correlation, due to ignorance, or unwillingness, in the person interrogated, to give correct information, is practically impossible.

B. *Tabulation of Data.*—The information, described above, in the family histories of 1,428 English male convicts, is summarised in the following table :—

TABLES 155.—TOTAL OFFSPRING. (i.)

Parents.		Total children.			Male children.			
Criminal.	Numbers.	Criminal.	Non-criminal.	Totals.	Totals 48 per cent. of all children.	Criminal.	Non-criminal.	Percentage criminal.
Father only ...	56	74	302	376	182	74	108	40·66
Mother only ...	9	10	44	54	26	10	16	38·46
Father and mother	8	17	64	81	39	17	22	43·59
Neither	1,355	1,509	7,998	9,507	4,600	1,509	3,091	32·80
Totals ...	1,428	1,610	8,408	10,018	4,847	1,610	3,237	

OFFSPRING SURVIVING TO AGE 14. (ii.)

Parents.		Total children.			Male children.			
Criminal.	Numbers.	Criminal.	Non-criminal.	Totals.	Totals 48 per cent of all children.	Criminal.	Non-criminal.	Percentage criminal.
Father only ...	56	74	220	294	142	74	68	52·11
Mother only ...	9	10	34	44	21	10	11	47·62
Father and mother	8	17	47	64	31	17	14	54·84
Neither	1,355	1,509	5,805	7,314	3,529	1,509	2,030	42·64
Totals ...	1,428	1,610	6,106	7,716	3,733	1,610	2,123	

OFFSPRING SURVIVING TO AGE 23. (iii.)

Parents.		Total children.			Male children.			
Criminal.	Numbers.	Criminal.	Non-criminal.	Totals.	Totals 48 per cent. of all children.	Criminal.	Non-criminal.	Percentage criminal.
Father only ...	56	65	169	234	113	65	48	57·52
Mother only ...	9	9	29	38	18	9	9	50·00
Father and mother	8	17	41	58	28	17	11	60·71
Neither	1,355	1,416	4,771	6,187	2,994	1,416	1,578	47·30
Totals ...	1,428	1,507	5,010	6,517	3,153	1,507	1,646	

TABLE 155 (*continued*).—TOTAL OFFSPRING. (iv.)

Nature of Crime.	Parents.		Total children.			Male children.		
	Criminal.	Numbers.	Criminal.	Non-criminal.	Totals.	Totals 48 per cent. of all children.	Criminal.	Non-criminal.
Malicious damage to property.	Father only ...	6	6	31	37	19	6	13
	Mother only ...	1	1	2	3	1	1	10
	Father and mother	1	3	10	13	6	3	3
	Neither	84	93	426	518	269	93	176
Totals ...		92	103	468	571	295	103	192
Stealing and burglary.	Father only ...	20	34	86	120	57	34	23
	Mother only ...	5	6	13	19	9	6	3
	Father and mother	4	10	22	32	15	10	5
	Neither	648	749	3,953	4,702	2,247	749	1,498
Totals ...		678	799	4,074	4,873	2,328	799	1,529
Sexual offences.	Father only ...	9	10	40	50	25	10	15
	Mother only ...	0	0	0	0	0	0	0
	Father and mother	2	3	23	26	12	3	9
	Neither	139	147	843	290	487	147	340
Totals ...		150	160	906	1,066	524	160	364
Violence against the person.	Father only ...	18	20	122	142	68	20	48
	Mother only ...	2	2	22	24	11	2	9
	Father and mother	1	1	9	10	5	1	4
	Neither	245	272	1,434	1,706	826	272	554
Totals ...		266	295	1,587	1,882	910	295	615
Forgery, fraud and coining.	Father only ...	4	4	23	27	13	4	9
	Mother only ...	1	1	7	8	4	1	3
	Father and mother	0	0	0	0	0	0	0
	Neither	237	248	1,343	1,591	773	248	525
Totals ...		242	253	1,373	1,626	790	253	537
TOTAL		1,428	1,610	8,408	10,018	4,847	1,610	3,237

Concerning the data, as tabulated above, there are some points requiring explanation; and some of interest to be noted. It will be seen that, for the same 1,428 families, we have given three tables, recording respectively "total offspring," "offspring surviving to age 14," and "offspring surviving to age 23." Now, as we have said, statistics of offspring surviving to ages 14 and 23, respectively, were entered only in a portion of our 1,428 family histories. We must, accordingly, explain that the proportion of offspring surviving to these ages, in those families where the actual number of surviving offspring was not entered in the record, was deduced from the proportion surviving in those families where the actual number was recorded. Thus, the actual statistics of 474 families, selected at random, gave 3,546 offspring (average in family 7·48), of whom 2,725 had survived, at the time of record, to the age of 14, and 2,299 had survived to the age of 23. From these figures, we accordingly assume that, in 1,428 families, yielding statistics of 10,018 total offspring (average in family 7·01), there ought to have been, at the time of record, 7,716 individuals surviving to the age of 14, and 6,517 to the age of 23. It is needless to add that the number of offspring tabulated above as "criminal," at ages over 14 and 23 respectively, was of course obtained directly from the data—the ages of criminal members of a family being recorded in every history.

Other points requiring explanation are why only the *male* members of a family have been tabulated as "criminal," and how the number of "non-criminal" *males* has been differentiated from the *total* number of offspring. The reasons for separating males from females, when studying the influence of inheritance upon the production of criminals, and for dealing only with males in the present study, are these. Our data have been obtained from a highly selected series of family histories—the family histories of male convicts. In each history, there is a record of at least one male member who has become a convict. In a series of a thousand histories of these convicts, the proportion of sisters to brothers, recorded as "criminal," is 6 to 102. Now, another similarly highly selected series of family histories of convicts, but, this time, a series selected by the occurrence of at least one female convict in every family, might give, almost inevitably would give, very different results to the series we are analysing in the present work. The type of crimes they commit; in many cases the motives leading them to crime; the annual number of convictions for crime—are so entirely different for men and women, that, undoubtedly, the most satisfactory course, when dealing with the problem of criminal inheritance, is to treat the male offender separately from the female. In accordance with this plan, only the males in a family (*i.e.*, the convicts under observation, and their brothers), have been recorded as "criminal" in the above table; the corresponding number of non-criminal males (*i.e.*, the number of non-criminal brothers of the convicts observed), being finally deduced from the number of total offspring, on the assumption of the Registrar General's statement that the proportion of males to females in the general adult population is 48 per cent.

In the above tables as they stand, the most interesting figures are those contained in the column headed "Percentage criminal." These figures demonstrate two important relations: first, that the percentage of criminal offspring increases progressively according to whether neither parents, the mother only, the father only, or both parents, are criminal; and, secondly, that the percentage of criminal offspring becomes steadily greater as the age of the children increases to 14 and 23. The first relation bears resemblance to the result obtained by Pearson for the family incidence of tuberculosis;* and contrasts interestingly with the relation that would have been expected, upon a Mendelian hypothesis of criminal inheritance. Taking our figures from the table relating to offspring surviving to age 23, we have:—

Parents affected.	Offspring affected.		
	Expected Mendelian %	% Tubercular. K. Pearson's memoir.	% Criminals. The present work.
Both	100	57	60·7
One	50	29	53.8
Neither	25	21	47·3

The figures, although deviating widely from the expected Mendelian ratios, seem markedly to suggest that crime has an hereditary nature.

The second relation, disclosed by the above tables (*i.e.*, the increase of the percentage of criminal offspring as the mean age of the children increases), illustrates a fact which, although obvious, it is important to emphasise: the fact that many apparently law-abiding people are, what we would call, *eventual* criminals. They have inherited a certain grade of criminal diathesis; and although not *to-day* so designated, they will ultimately pass into the ranks of recognised criminals. As the table shows, this change occurs whether or no the parents are criminal; and allowance must be made for it, when dealing statistically with incomplete family histories. The necessity for making the allowance when investigating problems of inheritance, and the extent of the allowance that ought to be made in the present investigation, is shown in Table 76, Ch. 3, which gives the age distribution of offenders at the time of their first conviction. We see from this table that

* "A First Study of the Statistics of Pulmonary Tuberculosis (Inheritance)," Drapers' Research Memoirs, Dulau & Co.

C. Statistical Treatment of Data.

Treating male and female parents apart from each other, and counting each child twice over, once for each parent, the data in the previous table, relating to total offspring, can be rearranged as follows :—

TOTAL MALE OFFSPRING.

FATHER.

	—	Criminal.	Non-Criminal.	Totals.
Male Offspring.	Criminal	91	1519	1610
	Non-Criminal	130	$3107+x$	$3237+x$
	Totals	221	$4626+x$	$4847+x$

MOTHER.

	—	Criminal.	Non-Criminal.	Totals.
Male Offspring.	Criminal	27	1583	1610
	Non-Criminal	38	$3199+x$	$3237+x$
	Totals	65	$4782+x$	$4847+x$

The numbers in each quadrant of these tables will be found to correspond to the respective pairs of parents and offspring given in the data of "Total Offspring." The figure in the first quadrant is the number of our convicts, and their brothers, who had a criminal parent (father or mother) ; the figure in the second quadrant is the number of similar individuals who had neither parent criminal. In the third quadrant, the figure corresponds to the number of non-criminal brothers of our subjects who had one parent criminal. The fourth quadrant contains the number of pairs of non-criminal parents and offspring, given in our records, plus (x) corresponding to an unknown number of pairs, the value of which our records could not supply, but which must be ascertained and added to the table before it will be representative of the general population. The only point, then, for consideration here, is to decide the numerical value which should be attached to this unknown quantity (x).

As we have said before, the family records we are analysing in the present work are highly selected records : they are so because at least one member of each family is a convict. These selected records give full information as to how often criminal and non-criminal parents beget criminal offspring ; how often criminal parents beget children who do not become criminals ; and how often non-criminal parents also beget children who, with the exception of at least one child in each family, do not become criminal. It is this one exception which makes it necessary to supplement our records with additional information as to families when both parents, and all their children, *without any exception*, are non-criminals. How many non-criminal children would have been paired with non-criminal parents ? In other words, what would have been the value of the figure in the fourth quadrant of the above table, had our selected family records of criminals been supplemented with a proper proportion of family records relating to non-criminals in the general population ? Thus supplemented, the total records would have represented a random sample of the general population ; and the ratio of criminals to non-criminals in these records would have been equal to the proportion of these two classes in the public at large. Accordingly, to find a correct value for the unknown (x) in the above tables, we must complete these tables so that they contain a number of criminal offspring (1,610) which, to the total offspring ($4847 + x$), may be proportional to the number of criminals in the general population.

The proportion of different orders of criminals in the general population was the subject of a preliminary enquiry : and the ratios then ascertained will be found in

Table 88, Ch. III. It will be seen from this table that the proportion varies, for different orders of criminals, from ·2 per cent. to 21 per cent. Which of these percentages should correspond to the order of criminal referred to in our family records? The actual criminal interrogated, and who formed the basis of these records, was, in every case, a convict. Each had committed a crime sufficiently grave, or, committing a petty crime, had been so frequently convicted, that his case had been tried at a high court of justice, and had resulted in a sentence of penal servitude of at least three years' duration. The penal records, however, of the criminal brothers of our subjects, cannot be defined so explicitly. As already explained, the designation "criminal" to a brother or parent in our records does not imply that these individuals had *necessarily* been *convicts*; but we may assume that where the designation does not signify a conviction to penal servitude, it implies imprisonment for an offence tried at the assizes or quarter sessions. It will be seen in Table 88, Ch. III., that 1·3 per cent. is the proportion in the general population of the above order of criminals: which percentage gives us a minimum limit for the proportion, in a representative fourfold table, of criminal offspring to the total number of offspring. A maximum limit for this proportion would be 7·2 per cent.: a percentage which would assume that the individuals, classed "criminal" in our records, are representative, without reservation, of all persons in the community committing any kind of criminal offence whatsoever—all those convicted summarily, as well as those convicted in a higher court. Assuming these proportions in turn, we have—

(1) on a basis of 7·2 per cent.,

$$1610 = 7{\cdot}2\% \text{ of } (4847 + x) = \frac{1}{13{\cdot}89}(4847 + x), \text{ or } x = 17514;$$

(2) on a basis of 1·3 per cent.,

$$1610 = 1{\cdot}3\% \text{ of } (4847 + x) = \frac{1}{76{\cdot}92}(4847 + x), \text{ or } x = 118999.$$

Dealing, then, firstly, with the records of "Total Offspring" (incomplete family histories); secondly, with the records of offspring who have "survived to age 14" (family histories partially completed, by allowing for infant and child mortality); thirdly, with the records of offspring "surviving to the age of 23" (fully completed family histories); moreover, in every case, treating male and female parents apart from each other, and assuming, first, that 7·2 per cent. and, second, that 1·3 per cent. of the general community are criminals—our original fourfold table may be expressed in the following forms:—

TABLES 157.—RANDOM SAMPLES OF GENERAL MALE POPULATION.

Incompleted Family Histories. 7·2 per cent. Basis.

Father.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	91	1,519	1,610
	Non-criminal	130	20,621	20,751
	Totals ...	221	22,140	22,361

Mother.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	27	1,583	1,610
	Non-criminal	38	20,713	20,751
	Totals ...	65	22,296	22,361

1·3 per cent. Basis.

Father.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	91	1,519	1,610
	Non-criminal	130	122,106	122,236
	Totals ...	221	123,625	123,846

Mother.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	27	1,583	1,610
	Non-criminal	38	122,198	122,236
	Totals ...	65	123,781	123,846

TABLES 158.—RANDOM SAMPLES OF GENERAL MALE POPULATION AGED 14 AND UPWARDS.

Family Histories partially completed. 7·2 per cent. Basis.

Father.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	91	1,519	1,610
	Non-criminal	82	20,669	20,751
	Totals ...	173	22,188	22,361

Mother.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	27	1,583	1,610
	Non-criminal	25	20,726	20,751
	Totals ...	52	22,309	22,361

1·3 per cent. Basis.

Father.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	91	1,519	1,610
	Non-criminal	82	122,154	122,236
	Totals ...	173	123,673	123,346

Mother.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	27	1,583	1,610
	Non-criminal	25	122,211	122,236
	Totals ...	52	123,794	123,846

TABLES 159.—RANDOM SAMPLES OF GENERAL MALE POPULATION AGED 23 AND UPWARDS.

Family Histories fully completed. 7·2 per cent. Basis.

Father.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	82	1,425	1,507
	Non-criminal	59	19,364	19,423
	Totals ...	141	20,789	20,930

Mother.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	26	1,481	1,507
	Non-criminal	20	19,403	19,423
	Totals ...	46	20,884	20,930

1·3 per cent. Basis.

Father.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	82	1,425	1,507
	Non-criminal	59	114,357	114,416
	Totals ...	141	115,782	115,923

Mother.

—	—	Criminal.	Non-criminal.	Totals.
Male Offspring	Criminal ...	26	1,481	1,507
	Non-criminal	20	114,396	114,416
	Totals ...	46	115,877	115,923

In these tables we show, in the various conditions specified, how pairs of parents and sons in the general population would be grouped into four divisions, when each parent and each son is classified either as a criminal or not a criminal. The statistical problem now to be solved is this :—are these fourfold groupings of parents and sons merely arrangements of chance ; are they the groupings that would have resulted had each offspring been linked at random to any parent, selected equally at random ? Or, do the numerical proportions of the four groups give evidence that the sorting of parents and sons has been influenced by some selective bias : and if so, what is the measure of this influence ? The fourfold tables, when reduced by the usual method,* provide answers to these questions in the following coefficients for the correlation in resemblance between parents and sons, both convicted and imprisoned for crime.

* The work of reduction was curtailed by the help of P. F. Everitt's Tables, recently published in Biometrika, Vol. 7, Nov. 1910.

whether or no the parents are criminal; and this increase would have appeared again in the present series of fourfold tables, had these tables been constructed directly from a representative sample of the general population. Actually, the proportion of criminal offspring of non-criminal parents appears, if anything, to decrease, as the tables are corrected for completion of family histories. This apparent anomaly results from the fact that we have been conducting our research, not upon a representative sample of family records, but upon a selected sample, which has been made representative by an artifice. The proportion of criminal offspring of non-criminal parents, given in the fourfold table, depends upon the value of the fourth quadrant of the table. Now, this value in the first table given above, which makes no correction for completion of family history, is obviously too low. This table was only constructed tentatively, from incomplete data, in order to arrive at approximate ideas of the minimum limit of parental resemblance. By the exigencies of the investigation, the value of its fourth quadrant was deduced from the estimate that 7·2 per cent. of the general population are criminal—which, of course, refers only to completed families, and is obviously too high an estimate for incomplete data. Were the number given in this quadrant increased to its correct value, to the value that could only have been given directly from a random sample of records, the increase in the proportion of criminal offspring of non-criminal parents would immediately become manifest, with completion of family history.

The next point to be noted is the general effect, upon the tables and correlation coefficients, of the assumption that 1·3 per cent., rather than 7·2 per cent., of the general population, are criminals. It will be seen that the general effect upon the coefficients is much the same as the effect produced on them by completing the family histories. Not so with the tables. A decrease in the assumed amount of criminality in the general population leaves the percentage of criminal offspring of criminal parents unchanged; but it leads to a pronounced decrease in the percentage of criminals amongst the offspring of non-criminal parents: and, with the decrease, a corresponding increase in the value of *r*. Assuming 7·2 per cent. of the general population to be criminal, we find that the intensity of the paternal resemblance is, for incomplete families, ·45; and for fully completed families ·57; an intermediate value, for the intensity of this relationship where the families are only partially completed, being ·54. Next, assuming a criminal population equal to 1·3 per cent. of the general community, we find the measures of paternal resemblance, corresponding to those just given, increased to ·62 and ·73, with ·67 as a measure intermediate between the two. Now, the first assumption, that the order of criminals in our sample represents 7·2 per cent. of the general population, is obviously too high an estimate. As shown in Table 73, Ch. III., such an estimate is the maximum that could be adopted, implying, as it does, that our sample of convicts are typical, in their grade of criminal diathesis, of all criminal offenders in the community. On the other hand, an estimate of 1·3 per cent. is a minimum, and, we think, much too low a value for the proportion in which the criminality of our convicts exists in the general community: the implication from this latter assumption being that the grade of diathesis of offenders, convicted in the high courts of justice, is invariably more intense than that of offenders convicted summarily.* In the same way, whereas, when no allowance is made for completion of family histories, when not even the infant and child mortality are allowed for, the resulting correlation of parental resemblance must obviously be too low, it must be admitted that the limiting of consideration to offspring surviving at the age of 23 may possibly yield a result too high in value. In the circumstances, our safest conclusion would be that the measure of resemblance between parents and offspring, in regard to their tendency to be convicted and imprisoned for crime, is at some intermediate point within the range of measurements we have obtained—is greater than ·54, and less than ·68, and most probably is midway between these two figures, *i.e.*, ·60. But on the whole, the intensity of resemblance is slightly greater between fathers and sons than between mothers and sons.

E. *Test of an Assumption involved in the Construction of the Previous Tables.*

The assumption referred to was contained in the values assigned to the third quadrant of our fourfold table—in the number of non-criminal offspring paired with criminal parents. These numbers were taken in each case direct from our data, on the supposition that parents, criminal in the sense we have defined, have on the average at least one offspring who becomes criminal.† Was this a legitimate presumption? If not precisely accurate, what is the probable extent of the inaccuracy? How will the correlation coefficients be modified when the error is corrected? Undoubtedly the best way to test the accuracy of

* Generally, this would be the case: but the exceptions must be so many, that the proportion of individuals, with the two grades of diathesis, must be much less than the relative proportion of convictions in the high courts and in the courts of summary jurisdiction.

† Every family in our series of records contained at least one member who was criminal.

our assumption would be to consult statistics of the descendants of criminals. Unfortunately, no such material is available. Our own records of the descendants of criminals are few, and very incomplete, and, for the particular purpose in hand, are not sufficiently reliable. An individual, despite of many imprisonments, might be expected to know the antecedent and salient facts connected with the home of his parents, while being, because of his frequent absence, very ignorant of the happenings in his own household. For instance, he might reasonably be expected to know if a parent or brother had been convicted of serious crime; but, continually away from home, and tending, as we have seen, to become permanently detached from it, he would in most cases not be cognisant of the ultimate fate of his own offspring. The assumption we have referred to must be tested by a reconstruction of our fourfold table. We must obtain the value of its third as well as of its fourth quadrant, without reference to our data, by calculating the proportion of non-criminal offspring with criminal parentage from general statistics of the incidence of crime. Pursuing this plan, we first obtain, from the data of total offspring, the following incomplete table:—

Total Male Offspring.

Father.

Male Offspring. —	Criminal.	Non-criminal.	Totals.
Criminal	91	1,519	1,610
Non-criminal	y	x	$x + y$
Totals	$91 + y$	$1{,}519 + x$	$N = 1{,}610 + x + y$

The only information taken directly from our records is that 91 criminal offspring have criminal parents, and that 1,519 have non-criminal parents. More explicitly stated, we learn from our data that the proportion of criminals, represented by our sample, with fathers who, at some time of life, have been sentenced to imprisonment after trial at a high court of justice, is 91 in 1,610. The corresponding information for non-criminal offspring—the values x and y not contained, we assume, in our records—will proceed from the knowledge of the respective ratios, to be obtained from general criminal statistics, of (1). the proportion of criminals in the community $\left(\frac{1{,}610}{N}\right)$; and (2), the proportion of individuals in the community whose parents are criminals $\left(\frac{91+y}{N}\right)$. To begin with, we will assume, as before, that the value of the first ratio is 7·2 per cent., *i.e.*, $1{,}610 = \frac{1}{13 \cdot 89}N$. What is the value of the second ratio? To state the question explicitly: what is the proportion in the general population of individuals whose fathers have committed crimes sufficiently grave to have been dealt with at a high court of justice? Referring to Table 88, chapter III, it will be seen th t, in the present generation, the proportion of this order of criminals is 1·3 per cent. And since, during the past 30 years, the prevalence of crime in our midst, has been, as we have already demonstrated, fairly constant, we can assume with safety this same proportion 12·94 per thousand, for the generation of our parents. Next, referring to the results (page 296, chapter VI) of our preliminary investigation into the absolute fertility of criminals and the general population, we see that amongst criminals of the type under discussion, 629 per thousand, and amongst the general population, 621 per thousand, marry and become parents; by whom the average number of offspring, begotten at time of death, are respectively 3·50 and 5·66. Finally, on page 335, the reference will be found contrasting the infant mortality of criminals, 315 per thousand, with that of law-abiding people, 200 per thousand. Summarizing these references, we have:—

—	Proportion Last Generation.	Proportion Parents.	Offspring.	Offspring allowing for Infant Mortality.	Per cent. of Offspring with Criminal Parents.
General population	1,000	621	3514·86	2811·9	100
Criminals	12·94	8·139	28·486	19·65	·7033

and, we conclude—on the assumption that the mortality of children, over two years of age, is the same, whether their parents are criminal or non-criminal—that the proportion of persons to-day, with parents criminal in the sense we have defined, is ·7033 per cent, =1 in 142·2.

This proportion gives us the second ratio we require, in order to calculate values for x and y in the above fourfold table. We have :—

$$1{,}610 = \frac{1}{13\cdot 89}(1{,}610 + x + y),$$

$$91 + y = \frac{1}{142\cdot 2}(1{,}610 + x + y),$$

or,

$$x = 20{,}685,$$
$$y = 66.$$

Inserting these values for x and y, the above fourfold table becomes :—

TABLE 160.—TOTAL MALE OFFSPRING.

Basis : Offspring 7·2 per cent.
Parents ·7033 per cent.

Father.

Male Offspring.	Criminal.	Non-criminal.	Totals.
Criminal	91	1,519	1,610
Non-criminal	66	20,685	20,751
Totals	157	22,204	22,361

The equation from this table is :—

$$\cdot 003564 = \cdot 002674r + \cdot 004799r^2 + \cdot 002547r^3 - \cdot 0010517r^4$$

which gives $r = \cdot 5762$·

We need only draw attention to the facts that the figures in the above table, its equation and correlation coefficient, are almost identical with those previously found and presented in Table 159: from which we conclude, on the hypothesis that the criminals, represented in our sample, form 7·2 per cent. of the general population, that there was no significant degree of inaccuracy in our previous presumption that all parents, styled "criminal" in accordance with our definition of the term, have, on the average, at least one offspring who in turn becomes criminal. On the hypothesis, however, that criminals in our sample represent 4 per cent. of the general population, *i.e.*, assuming a percentage midway between the two extreme values, 7·2 per cent. and 1·3 per cent. previously taken—the above table becomes :—

TABLE 161.—TOTAL MALE OFFSPRING.

Basis : Offspring 4·2 per cent.
Parent ·7033 per cent.

Father.

Male Offspring.	Criminal.	Non-criminal.	Totals.
Criminal	91	1,519	1,610
Non-criminal	181	36,929	37,110
Totals	272	38,448	38,720

and the equation is :—

$$\cdot 0020130 = \cdot 001730r + \cdot 003685r^2 + \cdot 002913r^3 + \cdot 000005r^4;\ \text{giving } r = \cdot 4820\cdot$$

Upon this hypothesis, only 33 per cent., instead of the 68 per cent. given by our data, of the male offspring of criminals, are themselves criminal. This estimate is an extreme one, and, although probably nearer to a true value than is the 68 per cent. in our data, is too low : firstly, because this 30 per cent. does not sufficiently allow for completion of family history ; secondly, because the proportion we took of criminal parentage in the general community was a maximum one—a lower proportion ought probably to have been taken, a higher one could not legitimately have been assumed ; and, thirdly, because the conclusion that only 30 per cent. of the offspring of criminals are criminal was deduced from the assumption that the mortality of offspring, over two years of age,

From these tables we get the following equations and correlation coefficients :—

Table 162 (Malicious damage to property). The equation is :

$$\cdot000326 = \cdot000231r + \cdot000752r^2 + \cdot001170r^3 + \cdot000768r^4$$
$$r = \cdot4234.$$

Table 163 (Sexual offences). The equation is :

$$\cdot0001485 = \cdot000124r + \cdot000437r^2 + \cdot000756r^3 + \cdot0005845r^4$$
$$r = \cdot3917.$$

Table 164 (Stealing and burglary). The equation is :

$$\cdot002009 = \cdot001747r + \cdot003709r^2 + \cdot002913r^3 - \cdot000013r^4$$
$$r = \cdot4794.$$

Table 165 (Violence against the person). The equation is :

$$\cdot001088 = \cdot000822r + \cdot002140r^2 + \cdot002411r^3 + \cdot000810r^4$$
$$r = \cdot4594.$$

Table 166 (Fraudulence). The equation is :

$$\cdot000064 = \cdot000380r + \cdot001146r^2 + \cdot001606r^3 + \cdot000882r^4$$
$$r = \cdot1062.$$

On the basis of these correlation coefficients, we would divide our sample of criminals into three groups. First, fraudulent criminals form a relatively small group by themselves, being distinguished from other criminals by the low value of the parental correlation coefficient ·10 ; which, taking into consideration its probable error (·04), is barely significant. There is very little relationship, if there is any at all, between the conviction of offspring for fraudulent offences, and the presence of "criminality" in their parents. We have already seen that, in many respects, fraudulent criminals differ from criminals convicted of other crimes than fraud. This additional point of difference is, in consequence, particularly interesting.* In a second group, we would place offenders convicted of sexual crimes, of arson and other forms of wilful damage to property, and of crimes of violence against the person. The parental correlations here range between ·39 and ·46 ; and probably if the family histories could be completed, they would average about ·45. Finally, in a large group, containing the majority of criminals, come the thieves and burglars. All the so-called "professionals," and most of the "habituals," are included in this group ; which is distinguished from the other groups by its high parental correlation, the value of which, ·48, is a minimum value, and would probably reach as high as ·58, were the family histories fully completed. The respective ratios of criminal to non-criminal offspring of criminal parents, in the above fourfold table, indicates what the relative effects would be, upon the various correlation coefficients, of completing the family histories. For offspring who become thieves and burglars, this ratio is much higher than for other kinds of criminals ; and the corresponding effect upon the parental correlation coefficient, by completing the family histories of this group, would be proportionately greater than for other groups.

In this connection it is worth noting to what extent, upon the evidence of these ratios. law-breakers contrasted with law-abiding persons, in one generation, are replaced by individuals in the next generation who commit different kinds of unlawful offences. We have already shown that a thousand persons convicted, after trial at the high court, in one generation, bequeath at death 770 male offspring who survive to the age of 14, and of whom 33 per cent., or 260, become criminals in the following generation. And we have shown that a thousand persons in one generation, never convicted of crime, bequeath to the next generation 1,230 offspring who survive to the age of 14, and of whom 4·5 per cent.† become criminals at some time in their lives. Taking the various ratios

* It further suggests that circumstantial or quasi-accidental factors, as distinguished from constitutional tendency, are the significant influences to crimes of this kind.

† See Table 88, Chapter III.

from the above table we get :—

TABLE 167.

Criminals convicted of	Offspring of criminal parents.	Offspring of non-criminal parents.	770 male offspring of 1,000 criminals.	1,230 male offspring of 1,000 non-criminals.
Wilful damage and arson ...	9 in 178 = 5·7 %	94 in 25,191 = ·38 %	22	3
Sexual crimes ...	13 in 563 = 2·3 %	147 in 79,437 = ·19 %	10	1
Stealing and burglary ...	4 in 134 = 32·8 %	755 in 18,981 = 4·98 %	145	34
Violence against the person	21 in 122 = 17·2 %	274 in 17,272 = 1·58 %	76	12
Fraudulence	4 in 246 = 1·6 %	249 in 34,796 = ·71 %	7	5
All criminals...	33 % = 59·6	4·5 % = 7·84	260	55
Non-criminals	67 % = 116·4	95·5 % = 168·16	510	1,175
Totals	176	176	770	1,230

Although, (see page 306), criminals are less than half as fertile as the general population, a thousand criminals beget as many criminals as do 5,000 non-criminals.

VII. *The Fraternal Correlation.*

Hitherto we have been measuring, in various specified conditions, the resemblance in criminality between parents and their offspring. We will now measure this resemblance between different offspring of the same parents. We have seen that the probabilities of an individual's conviction are greatly increased when his parents have been convicted of crime. Are they also increased, and if so, to what extent, when a brother has been similarly convicted? The answer will be contained in the results of the present investigation: for our object therein is to measure the extent to which imprisonment for crime tends to occur amongst contemporary members of the same family.

A. *Method of Investigation.*—The method we employ was devised by Pearson, and was adopted by him when investigating the fraternal inheritance of tuberculosis.* Briefly stated, the steps in the process are: first to convert every family into four groups, corresponding to the number of different ways each male member, classified as either criminal or non-criminal, can be paired with his various brothers. Thus, let us premise a family containing nine brothers, of whom three are classified as criminal ($=c$), and six as non-criminals ($=n$). Paired in every possible way, we obtain for this family four groups of different pairs, (1) a group of pairs where both brothers are criminals $= 2\left\{\frac{c \times (c-1)}{2}\right\} = 6$; (2) a group where the first brother is criminal, and the second is non-criminal $= (c \times n) = 18$; and (3) a group where a first brother is non-criminal and a second is criminal $= (n \times c) = 18$; and (4) a group where neither brother in each pair is criminal $= 2\left\{\frac{n \times (n-1)}{2}\right\} = 30$. When every family record has been treated in this way, the second step in the process is to sum the number of pairs in each group, and to distribute the total in a fourfold table thus:—

1st BROTHER.

2nd Brother.	Criminal.	Non-criminal.	Totals.
Criminal	$S\,2\left\{\frac{c(c-1)}{2}\right\}$	$S\,cn$	
Non-Criminal	$S\,nc$	$S\,2\left\{\frac{n(n-1)}{2}\right\}+x$	
Totals			

where, taking the symbol S to mean "the sum of pairs," the first quadrant contains the

* "A first study of the Statistics of Pulmonary Tuberculosis (Inheritance)," Drapers' Research Memoirs, Dulau & Co.

total number of $(c-c)$ pairs given by all the families; the second quadrant the total number of $(c-n)$ pairs; the third quadrant the total number of $(n-c)$ pairs; and the fourth quadrant the total number of pairs yielded by all the records, when both brothers in each pair are non-criminal $(n-n)$. At this stage of its construction, however, the table represents only the distribution of paired brothers in a selected sample of family records. To give a correct fraternal correlation, the table requires some amendment of its present form: in fact, it must be so modified that the numbers within its four quadrants may represent the distribution of pairs that would be given by a series of posthumous family records, obtained from a random sample of the general population. This modification is the third and last step, and it will be accomplished when the table has been corrected for incompleteness in any of the family histories, and when the value has been found for the number of (x) pairs to be added to the fourth quadrant of the table. Taking every pair of brothers from our family records, we get the following:—

B. *Tabulation of Data.**—

TABLES 168.—OFFSPRING SURVIVING TO AGE 14.

Nature of Offences.	Male Offspring.			Pairs.					Additional N-N pairs.	
	Criminal.	Non-criminal.	Total.	C-C.	C-N.	N-C.	N-N.	Total.	Basis 7·2 per cent.	Basis 1·3 per cent.
All	1,605	6,138	7,743	428	3,062	3,062	5,378	11,930	59,640	384,421

OFFSPRING SURVIVING TO AGE 23.

Nature of Offences.	Male Offspring.			Pairs.					Additional N-N pairs.	
	Criminal.	Non-criminal.	Totals.	C-C.	C-N.	N-C.	N-N.	Totals.	Basis 7·2 per cent.	Basis 1·3 per cent.
Damage to property.	105	294	399	26	145	145	162	478	3,171	19,736
Sexual offences.	160	578	738	20	273	273	424	990	5,224	33,431
Violence to the person.	317	948	1,265	80	439	439	698	1,656	10,356	64,871
Forgery and fraud.	243	940	1,183	24	444	444	760	1,672	8,263	53,351
Stealing and burglary.	772	1,980	2,752	276	1,115	1,115	1,572	4,078	29,024	179,247
All ...	1,597	4,740	6,337	426	2,416	2,416	3,616	8,874	55,853	349,608

Incompleteness in the family records is allowed for by limiting the individuals paired to those surviving at ages 14 and 23, respectively. All we have to do, then, before distributing the above pairs into fourfold tables, is to calculate and add the number of non-criminal pairs which are not contained in our selected records, but which would have been included therein, had they been obtained from a random sample of the general population. Our records relate to:—

1,605 male criminals over 14 years of age.
2,111 male non-criminals over 14 years of age.

3,716 total.

Now, let us suppose that 7·2 per cent., or 1 in 13·89 of the general community, have a criminal diathesis, corresponding in its average intensity to the diathesis of these 1,605 offenders. It is plain that the number of non-criminals, over and above the 2,111 accounted for, who have been excluded from our records, but who would have been included in a representative sample, is equal to $1{,}605 \times 13{\cdot}89 - 1{,}605 - 2{,}111 = 18{,}577$. Again, the tabulated data above show that, from 3,716 male individuals, we obtain 11,930 pairs of brothers. It follows, then, that 18,577 individuals should correspond to $\frac{18{,}577 \times 11{,}930}{3{,}716} = 59{,}640$ $(n-n)$ pairs of brothers; which number must be added to the 5,378 $(n-n)$ pairs given by our selected records.

* Many of the 72 families with doubtful parental history, referred to on page 345, are not excluded from this part of the inquiry.

Tables 173.—Random Samples of General Population, Ages 23 and upwards (Male).

Basis 7·2 per cent. *Stock tainted by crimes of Stealing and burglary.* Basis 1·3 per cent.

First brother.

—	—	Criminal.	Non-criminal.	Totals.
Second brother	Criminal ...	276	1,115	1,391
	Non-criminal	1,115	30,596	31,711
	Totals ...	1,391	31,711	33,102

First brother.

—	—	Criminal.	Non-criminal.	Totals.
Second brother	Criminal ...	276	1,115	1,391
	Non-criminal	1,115	180,819	181,934
	Totals ...	1,391	181,934	183,325

Tables 174.—Random Samples of General Population, Ages 23 and upwards (Male).

Basis 7·2 per cent. *Stock tainted by crimes of Violence.* Basis 1·3 per cent.

First brother.

—	—	Criminal.	Non-criminal.	Totals.
Second brother	Criminal ...	80	439	519
	Non-criminal	439	11,054	11,493
	Totals ...	519	11,493	12,012

First brother.

—	—	Criminal.	Non-criminal.	Totals.
Second brother	Criminal ...	80	439	519
	Non-criminal	439	65,569	66,008
	Totals ...	519	66,008	66,527

Tables 175.—Random Samples of General Population, Ages 23 and upwards (Male).

Basis 7·2 per cent. *Stock tainted by crimes of Fraud.* Basis 1·3 per cent.

First brother.

—	—	Criminal.	Non-criminal.	Totals.
Second brother	Criminal ...	24	444	468
	Non-criminal	444	9,023	9,467
	Totals ...	468	9,467	9,935

First brother.

—	—	Criminal.	Non-criminal.	Totals.
Second brother	Criminal ...	24	444	468
	Non-criminal	444	54,111	54,555
	Totals ...	468	54,555	55,023

From these tables, we get the following equations and correlation coefficients :—

Tables 169. (Basis 7·2%) $\cdot 00197 = \cdot 00680r + \cdot 01074r^2 + \cdot 00521r^3 + \cdot 00002r^4$

Total criminals. Incomplete histories $r = \cdot 2120$

(Basis 1·3%) $\cdot 000568 = \cdot 000380r + \cdot 0011465r^2 + \cdot 001606r^3 + \cdot 000882r^4$

$r = \cdot 4462$

Tables 170. (Basis 7·2%) $\cdot 004653 = \cdot 008666r + \cdot 012609r^2 + \cdot 005272r^3 - \cdot 000008r^4$

Total criminals. Completed histories $r = \cdot 3440$

(Basis 1·3%) $\cdot 001125 = \cdot 00048r + \cdot 001394r^2 + \cdot 001847r^3 + \cdot 000882r^4$

$r = \cdot 5676$

Tables 171. (Basis 7·2%) $\cdot 004925 = \cdot 009635r + \cdot 013509r^2 + \cdot 005229r^3 - \cdot 000043r^4$

Arson and wilful damage $r = \cdot 3559$

(Basis 1·3%) $\cdot 001214 = \cdot 000512r + \cdot 001521r^2 + \cdot 0019620r^3 + \cdot 000921r^4$

$r = \cdot 5693$

Tables 172. (Basis 7·2%) $\cdot 000996 = \cdot 009635r + \cdot 013509r^2 + \cdot 005229r^3 + \cdot 000043r^4$

Sexual offences $r = \cdot 1034$

(Basis 1·3%) $\cdot 000509 = \cdot 000512r + \cdot 001521r^2 + \cdot 001962r^3 + \cdot 000921r^4$

$r = \cdot 3694$

Tables 173. (Basis 7·2%) $\cdot 006572 = \cdot 008037r + \cdot 011999r^2 + \cdot 005282r^3 - \cdot 000000r^4$

Stealing and burglary $r = \cdot 4539$

(Basis 1·3%) $\cdot 001447 = \cdot 000428r + \cdot 001267r^2 + \cdot 001725r^3 + \cdot 000898r^4$

$r = \cdot 6528$

Table 174. (Basis 7·2%) $\cdot004733 = \cdot008348r + \cdot012305r^2 + \cdot005279r^3 - \cdot000003r^4$
Violence against the person $r = \cdot3512$
(Basis 1·3%) $\cdot001142 = \cdot00048r + \cdot001394r^2 + \cdot001847r^3 + \cdot000882r^4$
$r = \cdot5722$

Table 175. (Basis 7·2%) $\cdot000197 = \cdot009635r + \cdot013509r^2 + \cdot005229r^3 - \cdot000043r^4$
Fraudulence $r = \cdot0272$
(Basis 1·3%) $\cdot000364 = \cdot000512r + \cdot001521r^2 + \cdot001962r^3 + \cdot000921r^4$
$r = \cdot3195$

We see that the relation between brothers convicted of crime, although lower, is of the same order of intensity as that between father and son. The expectation of any individual being convicted of crime is increased by our knowledge that his brother has been already convicted. When one member of the family has been sentenced to imprisonment, there is a decided tendency for a second member to be similarly sentenced; and the measure of this tendency, of this resemblance in criminal proclivity, between contemporary members of the same family, lies between a minimum value of ·32, and a maximum value of ·58, *i.e.*, the most probable value is about ·45.

With regard to the fraternal resemblance, in stocks selected by the taint of particular forms of crime, the exact meaning of the coefficients we have obtained must be realised. These coefficients measure the extent to which criminality of any kind, or lawlessness generally, tends to occur in certain stocks which have been selected by the fact that one member in each family under investigation has committed a particular kind of crime, has broken the law in some specific way. We see, with one exception (sexual offences), that the fraternal relation in this regard has much the same intensity as we found for the parental relation. In fact, fraudulent offences excepted, and perhaps with the exception of sexual offences also, it would seem, from these relations, that there is a unity in all kinds of lawlessness: its varied manifestations being but different expressions of a similar constitution, different branches of the self-same stem.

TABLE 176.

Families tainted by	Minimum value of "r."	Maximum value of "r."	Probable value of "r."
All offences	·34	·57	·45
Wilful damage to property...	·36	·57	·46
Sexual offences	·10	·37	·23
Stealing and burglary ...	·45	·65	·55
Violence against the person	·35	·57	·46
Fraudulence	·06	·32	·17

Assuming the probable value of the fraternal correlation to be midway between the two extreme values obtained, we see fraternal criminality at its smallest value in association with fraudulent criminals. The occurrence of crime amongst brothers of this order of criminals has little more than the fortuitous distribution we found for their parents. In the same way, we see that the greatest intensity of the fraternal, as well as of the paternal, association, in crime generally, occurs in families tainted by the crimes of stealing and burglary, *i.e.*, the taint of habitual and professional criminality. Such families tend to be the most prolific in the production of criminals generally, who spring up lustily from generation to generation. Similarly, though to a somewhat lesser extent, in families tainted by crimes of wilful damage to property, including arson, and by crimes of violence against the person, criminals of all kinds are found.* The one exception to a similarity in the paternal and fraternal resemblance occurs in families tainted by sexual offences. The tendency to crime generally appears to be twice as strong in the *fathers* of the sexual offenders as in their *brothers*. An explanation of this anomaly may lie in the fact that if the criminal parents of these criminals were also sexual offenders, the resemblance of sexual crime to a general criminal tendency may not be greater between parents and sons than between the male offspring of the same parents. The special physiological conditions, which most probably are at the source of sexual offences, renders this view a plausible one. But, unfortunately, we have not the requisite data for its statistical verification.

* Need we say that we do *not* mean by this that criminals of all kinds are found in every family with the particular taint in question, but that they are found in these families disproportionately to their occurrence in families generally.

VIII.—*The Relative Influence of "Inheritance" and "Contagion" upon the occurrence of Crime and the production of Criminals.*

A. *General Remarks.*—So far, it has been to the statistical basis of the criminal inheritance problem that we have been confining our attention. Taking the family for our social unit, we have been analysing statistics of the family incidence of crime, as recorded in a representative sample of family histories. And one indisputable statistical fact has emerged from the investigation. It is, that the family incidence of crime is not fortuitously distributed, is not entirely independent of lineage; that criminals do not occur equally in *all* families of the general community, but tend to be restricted to *particular stocks* or sections of the community: to those stocks tainted with criminal ancestry. And we have found that the intensity of this limitation, the intensity of this parental resemblance in criminal propensity, ranges between ·45 and ·6·

This measure of the tendency for crime to recur in families already criminally tainted is, as we have said, an indisputable statistical fact:* but it is not in itself a fact of heredity. The correlation coefficients we have reached measure a degree of parental resemblance in crime; but, in themselves, *they do not contain a verdict* on the influences which have conduced to this resemblance. We know that heredity is an influence which inevitably leads to parental resemblance. We can imagine that the hereditary likeness may be simulated, or increased, by the influence of parental contagion. The task now before us is to assign the extent to which family likeness, measured by the parental and fraternal correlation coefficients we have obtained, is due to *inheritance* of an anti-social disposition, and to what extent it is due to *contagion* within the corrupted homes into which criminals are often born. Which of these possible influences towards a parental and fraternal correlation in crime is the leading, which is the subordinate, one? To what extent must parental *example* be aided by *inherited proclivity* before contagion occurs? When an *inherited* instinct is lacking, or is inimical, to what extent can *example*, acting alone upon a well-conditioned person, conduce to a criminal career? In dealing with these matters of vital criminological importance, one assertion, at any rate, may be confidently made: that the nature of these questions is such that their ultimate solution can rest only upon an established basis of *statistical* evidence and conclusions. Neither criminal heredity, nor criminal contagion, are phenomena that can be recorded by *direct observation* of individual cases. One instance of crime may seem to illustrate conclusively the influence of the taint of heredity; another instance will appear to be positive proof of the dire influential effect of a bad home. But it is idle to quote particular cases in illustration of a universal influence, so subtle, so elaborate, and so elusive, that its effect upon separate individuals can never be traced with certainty, and accurately estimated. What we have to do, the only thing that can be done, is to assign, upon statistical evidence of criminals *taken in the mass*, the relative values, as influences to crime, of criminal heredity and criminal contagion.†

---

* Although statistically indisputable, the value of these facts of course depends upon the accuracy of the data they summarise. It may be imagined that information of family delinquency, gathered mainly from the interrogation of members of these families, must necessarily be unreliable. We believe that, in most of the present instances, this is not the case. In the first place, questions can be asked of imprisoned individuals it would be indelicate to put to ordinary law-abiding citizens; moreover, information of family delinquency which, if given, might imperil the welfare of the latter, can be proffered with safety by individuals imprisoned, who have no reputation to lose by their confession. The general experience has been, that whether from vanity and inherent love of autobiography, or from disinterested amiability, or on account of the rare opportunity the occasion presents for sympathetic conversation, the prisoner speaks freely and, to the best of his ability, gives accurate information of his antecedents; enjoying, in the circumstances of his situation, a talk about his domestic affairs and family relations. This, at any rate, may be confidently stated, that whatever inaccuracy there may be in our data would hardly be on the side of exaggeration: and the effect of such inaccuracy would be to lower rather than to strengthen the values of the correlation coefficients we have obtained.

† In saying that particular cases are unavailing for the elucidation of our problem, we refer to, we touch upon, the secret of the science of statistics and its methods. Our science, recognising the protean nature of any one human soul, the mutability and interchangeableness of all human influences, does not attempt to "reckon with" the *individual.* Its methods sketch the broader outline, the cruder features, of a portrait of human beings *in the mass.* In more technical language, we seek to estimate the final resultant value and direction of certain universal influences and tendencies which, invisible and intangible in their action upon individuals, by the study of individuals can never be measured or appraised; but which, by their operation and interaction over a wide field, and in the hearts of all people, lead in the long run to inevitable results: and become not only tangible and visible but capable of the finest definition and measurement.

influence of selective mating. From the marital correlation coefficients obtained by Pope,* Greenwood,†, Ethel M. Elderton,‡ Pearson and others, the fact has been established that there is a very significant resemblance between husband and wife with regard to a variety of physical and mental characters : which is confirmed by the series of similar marital correlation coefficients, obtained for different conditions from our own data,§ and given in the following table :—

TABLE 179.

Marital Correlations.

Conditions.	Number of Couples.	Husband+ Wife−	Husband− Wife+	Husband+ Wife+	Husband− Wife−	% Husband+	% Wife+	Correlation Coefficients *r*.
Pulmonary Tuberculosis.	462	23	27	3	409	5·6	6·5	+·16
Insanity ...	493	6	13	1	473	1·4	2·8	+·35
Alcoholism ...	1,426	277	26	109	1,014	27·1	9·5	+·70
Criminality ...	1,428	56	9	8	1,364	4·5	1·2	+·64

It would seem, then, that there is a certain natural selective influence in marriage, known as the influence of "assortative mating," by which individuals do not mate at random, but tend rather to intermarry with their own kind : the average intensity of this influence lying between ·15 and ·25· We think, therefore, that it would be reasonable to consider from ·2 to ·25 as a probable measure of "assortative mating" amongst criminals—that is to say, the tendency to intermarry, amongst individuals who sooner or later in life will become criminals, may be valued at from ·2 to ·25· If then, we subtract this value, representing "assortative mating," from the value of our marital correlation coefficient ·63, may we assume that the residual ·4 would represent the marital coefficient for a series of random marriages, and be, consequently, a measure of the corrupting influence of criminal environment ? Assuredly we might assume this, were we certain of the fact that the criminal husbands and wives in our records had not been convicted of crime prior to their marriage. Unfortunately, our records give no information on this point. For certain reasons, however, we would conjecture that most probably the greater number of the criminal husbands and wives recorded were so convicted. In the first place, one half of the population in England and Wales, who marry, contract the bond between the ages of 20 and 34, the modal age of marriage being 25 years ; whereas, one half of the population, who sooner or later become criminals, enlist into the criminal ranks between the ages of 16 and 35, the modal age of enlistment being 19 years.‖ It follows that the majority of individuals who will sooner or later become criminal will have already enlisted at the time of their marriage. Moreover, the figures in the above table show that, whereas only one out of eight criminal husbands has a criminal wife, every other criminal wife has a criminal husband. Unless, then, we assume that criminal wives are four times as infective as criminal husbands—an unlikely supposition, even if we admit the effectiveness of general criminal contagion—it again follows that most of the eight pairs of criminal husbands, married to criminal wives, must have already been criminal at the time of marriage. In the absence of direct evidence, we may at least conjecture that female criminals, who marry, tend to mate with criminal husbands : and that, consequently, the greater part of the marital correlation coefficient we have obtained represents, not the influence of criminal contagion, but another phase of selective mating, over and above the "assortative mating" allowed for. Assortative mating, as we have seen, signifies selection in marriage, due to the unconscious tendency of like to mate with like. This new phase is a conscious and deliberate selection, due to the stress of circumstances. It is seen, for instance, in class and racial marriages ; in the marriage of lepers, where the choice of a mate is restricted by the conditions of disease ; and in the marriages of royal houses, which are governed by the law of the land. The marital correlation, in conditions where marriage is thus restricted, may be very high : and in some cases, as in the association of leprosy in husband and

* "A general study of the Statistics of Pulmonary Tuberculosis : Marital Infection," Drapers' Research Memoirs. Dulau & Co.

† "The problem of Marital Infection in Pulmonary Tuberculosis," Proceedings of Royal Society of Medicine, June, 1909.

‡ "Biometricka." Vol. III.

§ The data of insanity and pulmonary tuberculosis relate to "well-to-do," and "prosperous poor" persons, only.

‖ *See* Tables 148, 149.

wife, it might be found almost equal to unity. And it is this factor which, we conjecture, accounts for the high degree of association between criminality in husband and wife. Every other female criminal who is married is found to be married to a criminal husband, not because she infects her husband with her criminal propensities, but because, when selecting a husband, the choice of a woman who has been convicted of serious crime is restricted within the criminal classes. In this connection, it is interesting to note (*see* Table 179) the close resemblance between husband and wife with regard to alcoholism. Here again, while only one out of every three alcoholic husbands is married to an alcoholic wife, four out of every five alcoholic wives have alcoholic husbands. Just as for criminality, the high value, ·7, for this association, represents "assortative mating," augmented by the restriction imposed by circumstances upon the drunken woman's choice of a husband. The subject is an interesting one, and is worthy of further investigation upon the basis of more exact statistical information. In the meantime, and in the absence of more definite data, we would be loth to believe that any but a very small fraction of our marital correlation in crime represents the influence of criminal contagion.

D. *Correlations of Stocks tainted by different Crimes.*

Looking, now, for evidence of a reverse kind to the preceding—evidence of inheritance, where the influence of contagion has been eliminated—we would compare with each other the parental and fraternal correlation coefficients, tabulated above, for criminal stocks tainted by different types of crime. If parental example plays an important part in the causation of crime, if evil influences, permeating family life, explain in part the restriction of criminals to certain families, it follows that the correlation coefficients we have obtained, being a measure of this restriction, should be diminished in intensity as the probability of such contagion becomes more and more unlikely. When contagion is impossible, the residual coefficient should measure the intensity of inheritance only.

Our table, 177, above, starting with crimes of fraud, passes to stealing and burglary—professional crimes, where the influence of criminal contagion should be most intense; and then progressively to violence, arson and sexual offences, in which last it is difficult to understand how the influence of example could have any effect at all. We can understand the influence of parental training in the original moulding of a professional burglar or thief, and, to a certain extent, it is conceivable that the constant spectacle of lack of control in parents might lead their offspring to emulate them in acts of unlawful violence.* But, that parental example could play any part of importance in the perpetration, by their offspring, of crimes such as arson and wilful damage to property, and, particularly, of sexual offences, is not reasonably to be supposed. As seen in the above table, 177, the parental correlation for sexual crimes, and crimes of wilful damage to property, is from ·45 to ·5; for stealing, it is from ·48 to ·58. We would assume then, from this evidence, that the intensity of the inherited factor in criminality is from ·45 to ·5, and the intensity of criminal contagion is anything between ·05 and ·1.

E. *Paternal and Maternal Correlations compared.*

That these figures represent approximately the relative values of inheritance and contagion is confirmed by the relation we have found between the paternal and maternal correlations in crime, where, assuming the influence of paternal and maternal inheritance to be equal, an excess, in the correlation coefficient of one parent over the other, should express a minimum value for the influence of contagion. The difference, averaging about ·05, corresponds to the minimum value given above.

F. *Correlation of Age at First Conviction and Frequency of Re-conviction.*

An indirect method of measuring the relative significance of inheritance and contagion in the production of criminals suggests itself. We might obtain the correlation coefficient between age at first conviction, and the frequency of reconviction for crime: the

* Even here, we should expect an inherited proclivity generally to be the essential factor. It is especially difficult to believe that the gulf between the impulse to make a murderous assault, and the actual execution of the deed, could be bridged by anything but inherited proclivity. "From the purpose of crime to the act there is an abyss;" writes Carlyle: "wonderful to think of! The finger lies on the pistol; but the man is not yet a murderer: nay his whole nature staggering at such a consummation, is there not a confused pause, rather—one last instance of possibility for him?" We repeat: the bridging of that abyss would be so monstrous a task, that cultivated violence, bred solely by example and lack of precept, would be incapable of achieving it. Innate proclivity, the overwhelming force of inheritance behind it: these are the factors required.

presumption being that the earlier in life inherited proclivity becomes manifest in crime, the more ineradicable will that proclivity be, and the more will it continue to express itself by increasing freauency of reconviction. On the other hand, the earlier in life well-conditioned victims of criminal contagion are removed from the source of their infection, the greater will be their chances of reformation. Since frequency of conviction for crime must necessarily be a condition closely associated with age, it is requisite, for the elucidation of the problem, to eliminate any effects due to age. We will, accordingly, thus formulate our problem :—What is the correlation between age at first conviction, and number of convictions for constant period of time after first conviction ?* We require the following points of information :—

r_{ab} = The correlation coefficient between age at first conviction and present age, ·6275.
r_{na} = The correlation coefficient between age at first conviction and number of convictions, $-$·2589.
r_{nb} = The correlation coefficient between present age and number of convictions, ·1240.
σ_a = The standard deviation of age at first conviction, 9·1715.
σ_b = The standard deviation of present age, 13·1045.

Appendix tables 284, 285 and 286, give the data and resulting values of the statistical constants, which, when introduced into the equation, give us the partial correlation between age at first conviction, and number of convictions for constant period of time after first conviction.

$$_{b-a}\rho_{na} = \frac{r_{na}\,(\sigma_b - \sigma_a r_{ab}) + r_{nb}\,(\sigma_a - \sigma_b r_{ab})}{\sqrt{[\sigma^2_a\,(1-r^2_{na}) + \sigma^2_b\,(1-r^2_{nb}) + 2\,\sigma_a\sigma_b\,(r_{na}r_{nb} - r_{ab})]}\ \sqrt{1-r^2_{ab}}}$$
$$= -·243.$$

From the value and sign of this coefficient, we see that the earlier in life a child commits a criminal offence, and is consequently removed from his home, the worse criminal does he become ; and, accordingly, we conclude that criminal proclivities are more bred in the home than inoculated there.

G. *Conclusions.*

A comparison of the results that have emerged from the present investigation, (1) with those that have been deduced, by biometric methods of inquiry, for various physical and mental qualities and pathological conditions in man (see table below), and (2) with the results in Chapters IV and V of the present work, wherein the relations of mental defectiveness, and of environmental conditions upon the genesis of crime, are presented—a general contrast of these relations leads to two very definite general conclusions. The one is that the criminal diathesis, revealed by the tendency to be convicted and imprisoned for crime, is inherited at much the same rate as are other physical and mental qualities and pathological conditions in man. The second is that the influence of parental contagion, although varying somewhat in intensity in different conditions, is, on the whole, inconsiderable, relatively to the influence of inheritance, and of mental defectiveness : which are by far the most significant factors we have been able to discover in the etiology of crime.

---

* If a is the age at first conviction, b is the present age and n is the number of convictions previous to the present one, we require ρ_{na} for constant $b-a$.

$$_{(b-a)}\rho_{na} = \frac{r_{na} - r_{n\,(b-a)}\,r_{a\,(b-a)}}{\sqrt{1-r^2_{n\,(b-a)}}\ \sqrt{1-r^2_{a\,(b-a)}}}$$

Now $\delta n\,\delta\,(b-a) = \delta n\,\delta b - \delta n\,\delta a$; so, $\sigma_n\,\sigma_{b-a}\,r_{n\,(b-a)} = \sigma_n\,\sigma_b\,r_{nb} - \sigma_n\,\sigma_a\,r_{na}$
Also $\delta a\,\delta\,(b-a) = \delta a\,\delta b - \delta a^2$; so, $\sigma_a\,\sigma_{b-a}\,r_{a\,(b-a)} = \sigma_a\,\sigma_b\,r_{ab} - \sigma_a^2$
Also $\delta\,(b-a)^2 = (\delta b - \delta a)^2$; so, $\sigma^2_{b-a} = \sigma_b^2 + \sigma_a^2 - 2\,\sigma_b\,\sigma_a\,r_{ba}$

Hence $_{(b-a)}\rho_{na}$

$$= \frac{r_{na}\,(\sigma_b^2 + \sigma_a^2 - 2\,\sigma_b\,\sigma_a\,r_{ba}) - (\sigma_b\,r_{nb} - \sigma_a\,r_{na})\,(\sigma_b\,r_{ab} - \sigma_a)}{\sqrt{\sigma_b^2 + \sigma_a^2 - 2\,\sigma_b\,\sigma_a\,r_{ba} - (\sigma_b + r_{nb} - \sigma_a\,r_{na})^2}\ \sqrt{\sigma_b^2 + \sigma_a^2 - 2\,\sigma_b\,\sigma_a\,r_{ba} - (\sigma_b\,r_{ab})^2 - \sigma_a}},$$

$$= \frac{r_{na}\,(\sigma_b^3 - \sigma_b\,\sigma_a\,r_{ba}) + r_{nb}\,(\sigma_a\,\sigma_b - \sigma_b^2\,r_{ab})}{\sqrt{\sigma_a^2\,(1-r_{na}) + \sigma_b\,(1-r_{nb}^2) + 2\,\sigma_a\,\sigma_b\,(r_{na}\,r_{nb} - r_{ab})}\ \sqrt{\sigma_b^2\,(1-r_{ab}^2)}},$$

$$= \frac{r_{na}\,(\sigma_b - \sigma_a\,r_{ab}) + r_{nb}\,(\sigma_a - \sigma_b\,r_{ab})}{\sqrt{\sigma_a^2(1-r_{na}^2) + \sigma_b^2(1-r_{nb}^2) + 2\,\sigma_a\,\sigma_b\,(r_{na}\,r_{nb} - r_{ab})} \times \sqrt{1-r_{ab}^2}};$$

which requires for its evaluation r_{na}, r_{nb}, r_{ab}, σ_a, and σ_b.

CONCLUSION.

The ends of Criminological Science, of all Social Science, must be approached across facts, and facts only. The collecting of opinion, the exercising of dialectical ingenuity, the referring to authority, the quoting of illustrative cases—these uncharted ways of the old descriptive sociologists have led only to confusion, dogma, and superstition: they must be abandoned. The discoveries of the explorer cannot be recognised until he produces a verifiable map of his journey; if the goal, professed to have been reached by the sociological pioneer, is to be accepted, he must show that the path he has pursued is one which others may follow.

Now, the road we have attempted to shape, during the past eight years, is paved with statistical facts; each of which, within the limits of our search, we believe to be indestructible by controversy. The credentials of our every statement will be found in the scheduled data, in the tables of analysed data, in the figures resulting from these analysed data; and, by their aid, our path may be re-traced step by step, its bearings tested, and its direction criticised. If we have gone astray anywhere, the fault can be logically demonstrated by the critic pointing the error in our data, or in the analysis of these data, or in their interpretation. But he must not dismiss our results because they may be opposed to his opinion, or to current opinion: he must enforce any condemnation he may make by the production of statistics more representative than ours, and related to a more exhaustive and accurate observation.

Let us resume our results. What is the final point of view we have attained? We need not recapitulate all the qualifying details, and minor issues, explicitly set forth at the close of every chapter. It is sufficient to restate certain broad relations, which appear to underlie the genesis of crime; certain fundamental conclusions, connected with the origin of the criminal: and to contrast these with the current doctrines of criminologists.

In the first place, we were confronted with the notion of a distinct anthropological criminal type: with the idea of the criminal being such in consequence of an hereditary element in his psychic organisation, and of certain physical and mental peculiarities, which stigmatised him as predestined to evil, and which differentiated him from the morally well-conditioned person. In accordance with this notion, every individual criminal is an anomaly among mankind, by inheritance; and can be detected by his physical malformations, and mental eccentricities: the inevitable deduction being that any attempt at his reform must prove vain.

The preliminary conclusion reached by our inquiry is that this anthropological monster has no existence in fact. The physical and mental constitution of both criminal and law-abiding persons, of the same age, stature, class, and intelligence, are identical. There is no such thing as an anthropological criminal type. But, despite this negation, and upon the evidence of our statistics, it appears to be an equally indisputable fact that there is a physical, mental, and moral type of normal person who tends to be convicted of crime: that is to say, our evidence conclusively shows that, on the average, the criminal of English prisons is markedly differentiated by defective physique—as measured by stature and body weight; by defective mental capacity—as measured by general intelligence; and by an increased possession of wilful anti-social proclivities*—as measured, apart from intelligence, by length of sentence to imprisonment.

Reviewing the general trend of our results, it would seem that the appearances, stated by anthropologists of all countries to be peculiar to criminals, are thus described because of a too separate inspection, and narrow view of the facts, by these observers. They cannot see the wood for the trees. Obsessed by preconceived beliefs, small differences of intimate structure have been uncritically accepted by them, and exaggerated to fit fantastic theories. The truths that have been overlooked are that these deviations, described as significient of criminality, are the inevitable concomitants of inferior stature and defective intelligence: both of which are the differentia of the types of persons who are selected for imprisonment. The thief, who is caught thieving, has a smaller head and a narrower forehead than the man who arrests him: but this is the case, not because he is more criminal, but because, of the two, he is the more markedly inferior in stature. The incendiary is more emotionally unstable, more lacking in control, more refractory in conduct, and more dirty in habits, etc. than the thief; and the thief is more distinguished by the above peculiarities than the forger; and all criminals display these qualities to a more marked extent than does the law-abiding public: not because

* We find that it is the most intelligent recidivists who are guilty of the most serious acquisitive offences, (*see* page 288).

any one of these classes is more criminal than another, but because of their inter-differentiation in general intelligence. On statistical evidence, one assertion can be dogmatically made: it is, that the criminal is differentiated by inferior stature, by defective intelligence and, to some extent, by his anti-social proclivities; but that, apart from these broad differences, there are no physical, mental, or moral characteristics peculiar to the inmates of English prisons. We need not recapitulate the social, economic, and legal selective processes which, without drawing upon theories of degeneracy or atavism, have seemed to us sufficient simple explanation of the criminal's physical and mental distinctions. The following figure, however, may assist the imagination in realising the nature and proportions of this differentiation. We may take it that 1 in 13 persons of the general population are convicted at some time of life for indictable offences. If the total adult population were made to file by in groups of 13, and, out of each group, one person was selected, who happened to be the smallest there in stature, or the most defective in intelligence, or who possessed volitional anti-social proclivities to a more marked degree than his fellows in the group—the band of individuals resulting from this selection would, in physical, mental, and moral constitution, approximate more closely to our criminal population than the residue.

The second conclusion resulting from our inquiry defines the relative importance of constitutional and environmental factors in the etiology of crime. The criminal anthropologists assert that the chief source of crime lies in the personal constitution. His physical and mental stigmata, they argue, while showing the anomalous biological origin of the law-breaker, prove also the existence in him of a peculiar constitutional psychic quality: by reason of which he is destined from birth to do evil, and will become criminal, however favourable or unfavourable his circumstances may be. On the other hand, the criminal sociologists say that the source of crime must be sought, not in the constitution of the malefactor, but in his adverse social and economic environment. He is not born, but is made, criminal, it is contended: his physical, mental, and moral characteristics, and the ultimate fate of imprisonment these entail, are products of unfavourable circumstances; in the absence of which, even inborn criminal tendencies will fail to develop.

We have traced and measured the relations of conviction for crime in a variety of constitutional and environmental conditions: and while, with many of the former, high degrees of association have been revealed, with practically none of the latter do we discover any definite degree of relationship. Thus, as already stated, we find close bonds of association with defective physique and intelligence; and, to a less intimate extent, with moral defectiveness, or wilful anti-social proclivities—as demonstrated by the fact that it is the most intelligent recidivists who are guilty of the most serious acquisitive offences. We find, also, that crimes of violence are associated with the finer physique, health, and muscular development, with the more marked degrees of ungovernable temper, obstinacy of purpose, and inebriety, and with the greater amount of insane and suicidal proclivity, of persons convicted of these offences; and that tall persons are relatively immune from conviction for rape; and that fraudulent offenders are relatively free from the constitutional determinants which appear to conduce to other forms of crime. Alcoholism, also, and all diseases associated with alcoholism; venereal diseases, and all conditions associated with venereal diseases; epilepsy, and insanity—appear to be constitutional determinants of crime: although, upon the evidence of our data, it would seem that these conditions, in their relation to conviction, are mainly accidental associations, depending upon the high degree of relationship between defective intelligence and crime. On the other hand, between a variety of environmental conditions examined, such as illiteracy, parental neglect, lack of employment, the stress of poverty, etc., etc., including the states of a healthy, delicate, or morbid constitution *per se*, and even the situation induced by the approach of death*—between these conditions and the committing of crime, we find no evidence of any significant relationship. Our second conclusion, then, is this: that, relatively to its origin in the constitution of the malefactor, and especially in his mentally defective constitution, crime is only to a trifling extent (if to any) the product of social inequalities, of adverse environment, or of other manifestations of what may be comprehensively termed the force of circumstances.

Our third conclusion refers to the influence of imprisonment upon the physical and mental well-being of prisoners. We find that imprisonment, on the whole, has no apparent effect upon physique, as measured by body weight, or upon mentality, as measured by intelligence; and that mortality from accidental negligence is pronouncedly

* At all ages of life up to fifty-five the death rates of prisoners are practically identical with the general population rates.

diminished, and the prevalency of infectious fevers due to defective sanitation—taking enteric as a type—is lessened, by prison environment; on the other hand, mortality from suicide, and from conditions involving major surgical interference amongst prisoners, greatly exceeds the general population standard; while, with regard to the prevalency of, and mortality from, tuberculosis, in English prisons, criminals may be regarded as a random sample of the general population—one-fourth to one-fifth of all deaths in the general population, as well as amongst prisoners, being due to some form of tubercular disease.* We find, moreover, that long terms of imprisonment militate against the regularity of a convict's employment when he is free from prison, but tend to increase the standard of his scholastic education; and that frequency of incarceration leads to a diminution of the fertility of the convict, owing to the circumstance that, after a certain period of continually interrupted married life, habitual criminals are deserted by their wives, or by the women with whom they have lived.

Our fourth conclusion disposes of the current allegation that "criminals share in the relative sterility of all degenerate stocks." Upon the evidence of our statistics, we find the criminal to be unquestionably a product of the most prolific stocks in the general community; and that his own apparent diminution of fertility is not due to physiological sterility, but to the definite, psychological, human reaction we have just affirmed.

The fact that conviction for crime is associated, as our figures have shewn, mainly with constitutional, and scarcely to any appreciable extent with circumstantial, conditions, would make the hypothesis a plausible one that the force of heredity plays some part in determining the fate of imprisonment. We have seen that the principal constitutional determinant of crime is mental defectiveness—which, admittedly, is a heritable condition; and scarcely less than 8 per cent. of the population of this country are convicted for indictable offences—which could only be possible on the assumption that crime is limited to particular stocks of the community:† from these facts the conclusion seems inevitable that the genesis of crime, and the production of criminals, must be influenced by heredity. Our family histories of convicts bear testimony to this truth; and the fifth and final conclusion emerging from our biometric inquiry is as follows: that the criminal diathesis, revealed by the tendency to be convicted and imprisoned for crime, is influenced by the force of heredity in much the same way, and to much the same extent, as are physical and mental qualities and conditions in man.

The scientist, and, in so far as he would be guided by the word of science, the legislator, have to reckon with three natural forces, upon which the fates of men, and the fortunes of society, depend: the forces of heredity, circumstance and chance. In the case of any one, particular, conviction for crime, it could be imagined that the victim was selected entirely at random—by ballot, for instance, as the juryman is chosen: this would be a case illustrating the force of chance; or he might have been selected because, by the spur of hunger, he committed a theft which, in the absence of this stimulus, he would not have committed: such would be a case illustrating the force of circumstance; or, again, dissociated from any special stimulus, apart from temptation to which all men living in the world are equally exposed, it could be imagined that the committing of, and subsequent conviction for, the crime referred to, were inseparably related with an inherent stupidity, lack of control, or other constitutional determinant of anti-social conduct: in this case, *since offspring tend to resemble their parents in constitutional qualities*, the crime could be described as mainly influenced by the force of heredity. The practical problem facing the legislator is, therefore, this one: on the average, and taking criminals in the mass, which of the forces we have enumerated is chiefly responsible for the social phenomenon of crime? We think that our figures, showing the comparatively insignificant relation of family and other environmental conditions with crime, and the high and enormously augmented association of feeble-mindedness with conviction for crime, and its well-marked relation with alcoholism, epilepsy, sexual profligacy, ungovernable temper, obstinacy of purpose, and wilful anti-social activity—*every one of these, as well as feeble-mindedness, being heritable qualities*—we think that these figures, coupled with those showing the marked

* A fact which demonstrates that the current allegations (i) of criminality and tubercular diseases being kindred manifestations of the same form of human decadence, and (ii) that prison conditions foster tubercular disease, are both unsupported by statistical facts.

With regard to sickness generally, the fraction of a year spent, on the average, in hospital, by the inmates of English prisons, is a few hours less than, or practically identical with, the average period during which the members of one of our largest friendly societies receive pay, and are absent from work, on account of sickness.

† If persons convicted, at some time of life, for indictable offences, were distributed at random, every other family in the land would produce a criminal member.

these matters ; that, to obtain the truth, our appeal must be made, not to the opinions of descriptive psychologists, sociologists, and criminologists, but to the facts and calculus of the statistician. For the virtue of statistical inquiry is just this : that its conclusions, whatever they may be, have mathematical accuracy, and the same degree of reliability as the conclusions of an exact science. Upon a basis of such conclusions, drawn from sound and scientific data, practical administration could erect a policy, of unexampled value in the penetration of its view, and the positiveness of its purpose.

APPENDIX.

TABLE 181.—CORRELATION OF STATURE WITH AGE. (Pages 46, 48.)

Schedule Records 1 *to* 3,000.

Ages in Years.	Stature in Inches.																								Totals.	Mean stature 5 ft. + ins.
	48-	52-	54-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-		
15-	—	1	—	—	—	—	—	1	1	2	10	11	7	11	11	4	1	1	2	—	1	—	—	—	64	4·687
20-	—	—	—	—	—	1	—	7	17	22	54	60	60	58	81	72	45	31	10	5	4	8	—	—	555	5·529
25-	—	—	1	2	—	1	—	2	14	30	51	58	86	80	90	83	65	35	12	4	4	1	—	—	609	5·569
30-	—	—	—	—	—	1	—	1	15	24	45	50	51	70	60	50	42	30	12	4	—	2	1	—	448	5·446
35-	1	—	—	—	—	—	1	3	10	12	26	42	51	61	52	49	31	30	9	2	2	3	1	1	377	5·668
40-	—	—	—	—	—	—	2	3	11	13	16	30	34	47	26	32	26	17	8	8	3	—	—	—	286	5·696
45-	—	—	—	—	—	1	1	1	2	10	11	28	37	26	26	21	17	7	3	2	—	—	—	—	188	5·868
50-	—	—	—	—	1	—	—	—	1	7	14	22	28	17	18	15	12	4	1	—	2	2	—	—	180	5·622
55-	—	—	—	—	—	—	—	1	2	8	8	10	13	10	10	6	6	3	2	2	2	—	—	—	88	5·258
60-	—	—	—	—	—	—	—	1	2	11	14	17	21	19	15	14	9	7	6	—	—	—	—	—	137	5·222
65-	—	—	—	—	—	—	1	—	1	3	7	7	9	12	7	10	5	2	1	1	—	—	—	—	66	5·831
70-	—	—	—	—	—	—	—	—	—	—	7	4	5	6	2	2	3	1	—	—	—	—	—	—	30	4·987
75-	—	—	—	—	—	—	—	—	—	—	—	1	1	—	3	1	1	—	—	—	—	—	—	—	7	6·152
80-	—	—	—	—	—	—	—	—	—	—	1	1	2	—	—	1	—	—	1	—	—	—	—	—	6	5·437
Totals	1	1	1	2	1	4	5	21	76	148	268	[illegible]	[illegible]	442	412	360	358	148	67	28	18	11	2	1	2,996	

Mean age in years	... ...	36·206
Standard deviation of age	... ...	13·009
Mean stature in inches	... ...	65·489
Standard deviation of stature	... ...	2·662
Coefficient of correlation of stature with age	... ...	− ·019

TABLE 182.—CORRELATION OF "NATURE OF CRIME" WITH AGE AND STATURE. (Pages 46, 48, 180.)

Schedule Records 1 *to* 2,500.

"D" = damage to property. "S" = stealing and burglary. "R" = sexual offences. "V" = violence to the person. "C" = offences against the currency. "F" = forgery and fraud.

Crimes.	Totals.	Age in years.														Mean age in years.
		15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	
D	97	4	16	17	18	15	12	7	6	1	5	1	—	—	—	35·851
S	1,282	19	280	300	204	165	111	80	62	38	65	28	11	2	3	35·795
R	204	26	41	25	20	28	19	10	6	6	9	1	2	1	—	33·678
V	388	12	90	71	46	41	25	19	9	10	11	5	1	1	1	33·590
C	88	—	5	9	6	9	11	2	4	3	6	2	2	—	1	42·845
F	270	—	21	31	25	30	46	25	34	13	26	10	4	2	—	42·679
Totals	2,349	61	442	462	326	294	234	144	112	66	122	46	20	6	5	

Crimes.	Totals.	Stature in inches.																							Mean stature in inches.
		49-	54-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-	
D	97	—	—	1	1	—	—	1	4	2	8	13	10	15	10	11	8	4	4	1	1	1	—	1	65·530
S	1,282	—	1	1	—	4	1	15	38	77	128	175	150	200	184	143	107	46	27	4	8	2	—	—	65·118
R	204	1	—	—	—	—	1	2	7	5	20	17	26	34	33	25	19	12	4	—	—	1	—	—	65·480
V	388	—	—	—	—	—	1	2	6	14	26	42	40	62	56	48	30	18	9	2	1	1	—	—	65·600
C	88	—	—	—	—	—	—	—	3	4	30	7	6	7	7	4	7	1	1	1	—	—	—	—	64·921
F	270	—	—	—	—	—	—	1	1	9	12	12	29	34	41	44	31	28	15	12	6	2	2	—	66·947
Totals	2,349	1	1	2	1	4	8	21	59	112	208	286	300	361	327	287	282	109	55	20	11	7	2	1	

Mean age in years	... ...	36·235
Standard deviation of age	... ...	13·094
Mean stature in inches	... ...	65·445
Standard deviation of stature	... ...	2·652
Correlation ratio of nature of crime with age	... ...	·213
" " " " stature	... ...	·221

TABLE 183.—The same as Table 182, for AMENDED CLASSIFICATION OF CRIMES IN: CHARACTERS, Nos. 9 to 15.* (Pages 71, 194.)

Means (frequencies omitted).

Crimes.	Totals.	Mean age in years.	Mean stature in inches
D	98	36·581	65·529
S	1,252	36·114	65·137
R	202	33·515	65·462
V	456	32·599	65·455
F	332	42·756	66·579
Total ...	2,340	—	—

Mean age in years	36·167
Standard deviation of age ...	13·072
Mean stature in inches	65·448
Standard deviation of stature ...	2·653

TABLE 184.—CORRELATION OF INTELLIGENCE WITH AGE AND STATURE. (Page 76.)

Schedule Records 1 to 1,000.

"D" = intelligent, "C" = unintelligent, "B" = weak minded, "A" = imbecile.

Intelligence.	Totals.	Age in years														Mean age.
		15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–	
D	402	9	70	66	55	50	38	20	22	15	27	17	6	5	2	38·84
C	327	7	67	62	44	42	30	11	7	14	23	9	7	2	2	37·26
B	211	5	38	40	34	33	20	15	7	4	12	2	1	—	—	35·56
A	57	3	11	11	8	11	6	4	2	1	—	—	—	—	—	33·03
Totals ...	997	24	186	179	141	136	94	50	38	34	62	28	14	7	4	

Intelligence.	Totals.	Stature in inches.																						Mean stature.
		48–	54–	55–	56–	58–	59–	60–	61–	62–	63–	64–	65–	66–	67–	68–	69–	70–	71–	72–	73–	74–	77–	
D ...	402	—	1	—	—	—	7	7	16	29	46	49	54	65	38	45	24	12	4	2	1	2	—	65·73
C ...	327	1	—	—	—	—	2	3	19	31	40	47	54	47	34	28	9	7	2	1	1	—	1	65·34
B ...	211	—	—	1	—	1	2	12	15	10	35	28	29	29	22	11	10	4	1	—	1	—	—	64·98
A ...	57	—	—	—	1	1	1	3	—	9	7	6	9	5	5	5	3	1	—	1	—	—	—	64·91
Totals...	997	1	1	1	1	2	12	25	50	79	128	130	146	146	99	89	46	24	7	4	3	2	1	

Mean age in years, 37·29 ; standard deviation of age, 14·19 ; mean stature in inches, 65·395 ; standard deviation of stature, 2·732. Coefficient of correlation of stature with age (table not given), $-\cdot 020 \pm \cdot 021$. Mean intelligence, grouping A with B, and measuring intelligence upon a normal scale in which "unintelligent" may range from 0 to 1, $\cdot 759 \pm \cdot 025$. Standard deviation of intelligence upon the same scale, 1·224. Coefficient of correlation of intelligence with age, $\cdot 131 \pm \cdot 021$; and coefficient of correlation of intelligence with stature, $\cdot 129 \pm \cdot 021$: grouping A with B, and C with D, and using the two-row abridged method.

TABLE 185.—CORRELATION OF NATURE OF CRIME WITH AGE, STATURE AND INTELLIGENCE. (Pages 74, 82.)

Schedule Records 1 to 1,000.

"D" = damage to property, "S" = stealing and burglary, "R" = sexual offences, "V" = violence to the peron, "F" = forgery and fraud.

Crimes.	Totals.	Age in years.														Mean age.
		15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–	
D	64	3	11	7	8	13	10	5	3	1	2	—	1	—	—	36·17
S	433	4	85	95	57	64	29	17	13	15	27	16	6	3	2	37·03
R	112	12	16	19	21	14	7	6	4	4	6	1	2	—	—	34·91
V	234	5	65	45	34	27	21	13	4	7	8	2	1	1	1	33·74
F	154	—	9	13	21	18	27	9	14	7	19	9	4	3	1	45·65
Totals ...	997	24	186	179	141	136	94	50	38	34	62	28	14	7	4	

Table 188.—Correlation of employment in the services (army or navy) with crime, age, and intelligence. (Page 103.)

Schedule Records 2,501 *to* 3,000.

Symbols of Crime and Intelligence Categories as in Tables 186, 187.

Time of service in years.	Totals.	Crimes.					Ages in years.														Intelligence.			
		D	S	R	V	F	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	W	U	F	I
0—	19	2	7	4	4	2	—	7	4	2	1	2	—	—	—	1	1	1	—	—	5	6	6	2
1—	32	4	22	—	3	3	—	5	10	10	3	—	1	—	—	—	1	1	1	—	11	7	12	2
2—	37	4	21	3	5	4	2	11	7	1	6	1	3	1	1	1	1	1	1	—	10	11	12	4
3—	28	3	15	2	6	2	—	9	9	6	2	—	1	—	—	—	1	—	—	—	4	10	9	5
4—	16	1	10	1	3	1	—	3	2	4	2	—	3	—	1	—	—	1	—	—	4	2	9	1
5—	12	2	8	—	—	2	—	1	2	1	5	—	1	—	—	—	2	—	—	—	3	2	2	5
6—	17	2	6	2	6	1	—	3	4	3	1	2	1	1	—	—	2	—	—	—	6	5	5	1
7—	14	1	9	1	3	—	—	2	4	4	3	—	—	1	—	—	—	—	—	—	4	4	3	3
8—	8	1	3	3	1	—	—	1	1	1	1	1	2	—	—	1	—	—	—	—	2	4	2	—
9—	2	—	2	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	2	—
10—	14	1	5	1	5	2	—	1	5	1	2	2	1	2	—	—	1	—	—	—	6	2	4	3
11—	1	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
12—	3	—	1	—	2	—	—	—	—	2	—	1	—	—	—	—	—	—	—	—	—	—	1	2
13—	6	1	2	1	1	1	—	1	—	—	3	1	—	—	—	—	—	—	—	—	—	—	2	3
14—	1	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
15—	3	—	1	—	1	1	—	—	—	—	—	—	—	1	—	1	1	—	—	—	—	—	2	1
17—	2	—	—	2	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	1	—	1
18—	1	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—
19—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—
20—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
25—	1	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—
30—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—
41—	1	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Totals in services	221	22	115	20	43	21	2	44	50	36	30	11	16	7	3	4	11	5	2	—	55	54	76	36
Totals not in services	262	15	90	28	62	67	3	30	46	41	33	29	25	14	13	10	11	5	1	1	39	62	61	100
Totals	483	37	205	48	105	88	5	74	96	77	63	40	41	21	16	14	22	10	3	1	94	116	137	136

Treating "service" as an alternative character (disregarding time served) mean = $-\cdot11 \pm \cdot03$ in terms of s.d. as unit.

In same measure, the deviations, from the mean of all, of the mean of each criminal group in order ... ... ·34, ·26, −·09, −·11, −·56.

Correlation ratio of service with crime ... ... $\cdot313 \pm \cdot028$

Coefficient of correlation with age ... ... $-\cdot156 \pm \cdot030$

Coefficient of correlation with intelligence (grouping U with W, and F with I, as before) ... ... $-\cdot109 \pm \cdot030$

Table 189.—Correlation of Stature with Grade of Criminality. (Pages 123, 188.)

Schedule Records 2,501 *to* 3,000, *and Supplementary.*

Stature in inches.	Totals.	Convictions per year.																Fractions of year imprisoned.									
		0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-
55	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
57	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
58	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
59	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
60	16	6	3	1	—	1	3	1	—	—	—	—	—	—	1	—	—	—	1	—	4	1	1	4	4	1	—
61	35	11	9	5	2	2	3	2	—	—	—	—	—	—	—	—	1	6	3	3	5	1	3	2	2	8	1
62	49	10	14	10	2	5	5	1	—	—	—	1	—	—	—	1	—	6	1	5	5	3	5.	5	4	10	6
63	62	16	22	6	4	3	1	5	3	—	2	—	—	—	—	—	—	6	6	7	8	8	10	3	4	5	5
64	75	22	23	13	8	4	2	1	2	—	—	—	—	—	—	—	—	11	7	9	4	5	9	9	10	8	3
65	63	13	10	17	11	7	2	1	—	—	1	—	—	1	—	—	—	7	9	7	9	4	5	7	7	7	2
66	66	17	21	7	6	4	2	3	4	—	1	—	—	—	1	—	—	7	4	10	9	6	5	8	5	7	3
67	57	12	16	9	9	4	—	2	3	2	—	—	—	—	—	—	—	7	2	4	6	8	6	5	9	9	2
68	40	13	8	8	3	2	2	1	2	—	—	—	1	—	—	—	—	5	6	4	3	3	8	5	3	2	1
69	28	11	3	5	4	2	—	1	—	1	—	1	—	—	—	—	—	8	3	4	1	5	2	1	2	1	1
70	7	5	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	2	—	1	—	2	—	—	1	—	1
71	5	3	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	2	1	—	—	—
72	7	—	3	2	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	2	2	—	1	—	1	—	1
73	2	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—
74	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
Totals ...	517	143	135	85	49	36	20	19	14	4	4	2	1	1	2	1	1	68	43	58	57	46	57	51	53	58	26
					85		69											111		115		103		104		84	
Mean statures. General mean and deviations.	65·35	+·16	−·26	+·11	+·31		−·35											+·17		+·17		+·36		−·24		−·62	
Twice probable errors.	±	·31	·32	·40	·40		·45											·35		·35		·37		·36		·41	
Standard deviation.	2·76	—	—	—	—		—											—		—		—		—		—	

Coefficient of correlation of stature with frequency of conviction $-\cdot025 \pm \cdot030$.

" " " " time of imprisonment $-\cdot095 \pm \cdot029$.

TABLE 190.—CORRELATION OF WEIGHT WITH GRADE OF CRIMINALITY. (Pages 123, 188.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Weight in pounds.	Totals.	Convictions per year.																Fractions of year imprisoned.									
		0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-
90	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
100	7	1	2	2	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	2	1	1	1	—	1	—
110	54	15	18	6	4	2	5	—	2	—	—	1	—	—	—	—	1	7	8	8	5	4	4	8	9	9	8
120	114	21	37	21	14	5	6	6	1	—	2	—	—	—	—	1	—	7	12	12	15	10	16	11	10	15	6
130	121	35	34	23	11	10	4	6	4	2	1	—	1	—	—	—	—	23	10	16	15	11	13	11	14	14	5
140	91	26	19	16	7	8	3	4	3	1	—	1	—	1	—	—	—	11	6	9	8	8	9	18	8	12	6
150	60	19	12	9	10	4	1	—	3	—	1	—	—	—	1	—	—	10	5	1	9	6	11	8	6	3	2
160	34	15	4	6	1	5	1	—	1	1	—	—	—	—	—	—	—	5	4	7	8	3	1	3	8	2	3
170	14	4	4	2	2	1	—	1	—	—	—	—	—	—	—	—	—	1	—	5	—	3	1	—	2	2	—
180	7	1	4	—	—	1	—	1	—	—	—	—	—	—	—	—	—	1	2	—	—	—	1	1	1	—	1
190	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—
200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
[illegible]	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Totals... ...	516	148	124	86	49	36	30	19	14	4	4	2	1	1	2	1	1	53	48	58	57	46	57	51	53	58	26
					85		69											111		115		108		104		84	
Mean weights. General mean and deviations.	137·98	+2·14	−2·53	−·96	+2·10		−3·60											+2·84		−1·08		+·08		+·10		−2·51	
Twice probable errors.	±	1·91	1·97	2·46	2·48		2·75											2·16		2·12		2·24		2·28		2·49	
Standard deviation.	16·08	—	—	—	—		—											—		—		—		—		—	

Coefficient of correlation of weight with frequency of conviction — ·066 ± ·030

" " " time of imprisonment... — ·089 ± ·029

TABLE 191.—CORRELATION OF DISTANCE BETWEEN EYES WITH GRADE OF CRIMINALITY. (Page 123.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Distance between eyes.	Totals.	Convictions per year.																Fractions of year imprisoned.									
		0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-
[illegible]	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
[illegible]	3	1	2	—	—	—	—	—	—	—	—					—	—	1	—	2	—	—	—	—	—	—	—
[illegible]	10	5	2	1	—	—	1	1	—	—	—	—	—	—	—	—	—	1	2	1	1	—	1	1	2	—	—
[illegible]	46	11	12	7	4	2	2	2	—	—	1	—	—	—	—	1	1	6	4	4	3	4	5	5	4	6	2
[illegible]	78	19	24	8	10	7	3	4	2	—	—	—	1	—	—	—	—	10	3	12	13	7	9	6	10	5	3
[illegible]	121	27	37	26	10	5	5	4	5	1	1	1	—	—	—	—	—	15	11	9	14	18	13	15	12	14	5
[illegible]	116	26	27	20	14	11	7	4	3	1	1	—	—	—	2	—	—	13	8	11	10	7	13	15	17	15	7
[illegible]	86	23	10	12	4	8	1	1	3	1	1	1	—	1	—	—	—	15	6	10	8	9	10	4	6	10	6
[illegible]	60	15	7	8	5	1	1	1	1	1	—	—	—	—	—	—	—	5	3	6	6	3	5	3	1	6	2
[illegible]	11	—	4	2	1	2	—	2	—	—	—	—	—	—	—	—	—	1	2	3	—	1	1	1	—	1	1
Totals	509	146	138	85	49	35	20	19	14	4	4	2	1	1	2	1	1	67	41	58	55	44	57	50	58	58	26
					84		69											108		113		101		108		84	
Mean distance between eyes, and deviations.	114·62	+·73	−·36	+·42	+·87		−·29											+·15		−·06		+·14		−·71		+·60	
Twice probable errors.	±	·84	·86	1·00	1·09		1·20											·61		·59		·63		·52		·60	
Standard deviation	7·84	—	—	—	—		—											—		—		—		—		—	

Coefficient of correlation of distance between eyes and frequency of conviction ... ... — ·007 ± ·030

Coefficient of correlation of distance between eyes and time of imprisonment ... ... — ·002 ± ·030

Table 192.—Correlation of Head Circumference with Grade of Criminality. (Page 123.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Head circumference.	Totals.	Convictions per year.																Fractions of year imprisoned.									
		0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-
510	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
520	9	2	1	4	—	—	—	1	1	—	—	—	—	—	—	—	—	1	1	2	1	1	—	1	2	—	—
530	39	8	11	6	3	—	4	4	1	—	1	—	—	—	—	—	1	5	4	3	7	2	7	4	4	2	1
540	111	23	33	17	12	12	3	—	4	1	1	—	—	—	1	1	—	10	12	13	17	6	9	15	13	14	2
550	121	32	36	21	10	8	6	7	1	1	1	1	1	—	—	—	—	17	7	13	12	14	12	14	10	15	8
560	113	34	25	16	12	9	5	4	3	1	1	1	1	—	1	—	—	17	6	13	8	13	15	9	15	10	7
570	69	21	18	11	6	4	2	3	3	—	—	—	—	1	—	—	—	6	7	9	4	6	10	3	9	12	3
580	36	16	6	7	4	1	—	—	1	1	—	—	—	—	—	—	—	7	3	4	6	4	1	3	1	3	3
590	5	2	1	1	—	—	—	—	1	—	—	—	—	—	—	—	—	2	—	—	—	—	1	—	—	1	1
600	3	—	1	—	—	2	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	1
Totals ...	507	139	132	83	47	36	20	19	15	4	4	2	1	1	2	1	1	66	41	58	55	46	55	49	54	57	26
					83		70											107		113		101		103		83	
Means and deviations.	mm. 557·93	+2·54	−1·16	−·78	+·91		−3 00											+1·39		−2·13		+·88		−2·69		+3·37	
Twice prob. errors	±	1·71	1·75	2·21	2·21		2·41											1·94		1·89		2·00		1·9		2·20	
Standard deviation	mm. 14·93	—	—	—	—		—											—		—		—		—		—	

Correlation of head circumference with frequency of conviction $-·061 \pm ·030$·

" " " " time of imprisonment . . $+·018 \pm ·030$·

Table 193.—Correlation of Cephalic Index with Grade of Criminality. (Page 123.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Cephalic index.	Totals.	Convictions per year																Fractions of year imprisoned.									
		0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-	0-	1-	2-	3-	4-	5-	5-	7-	8-	9-
69	1	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
71	6	7	2	2	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	—	1	1	1
73	29	27	9	5	3	3	—	—	2	—	—	—	—	—	—	—	—	4	4	2	3	4	5	2	1	3	1
75	85	33	16	15	9	5	4	2	1	1	3	—	—	—	—	1	1	14	6	11	9	7	9	8	9	11	1
77	129	40	38	20	11	6	4	8	4	1	—	2	1	1	—	—	—	17	7	16	16	15	12	16	12	10	8
79	129	14	25	23	11	13	9	3	3	1	—	—	—	—	1	—	—	13	7	18	10	11	17	16	14	16	7
81	69	9	23	9	8	5	—	4	4	1	1	—	—	—	—	—	—	9	7	3	9	5	8	5	7	9	7
83	37	6	11	6	2	4	1	2	1	—	—	—	—	—	1	—	—	5	6	4	5	2	1	1	8	4	1
85	14	—	5	2	1	—	—	—	—	—	—	—	—	—	—	—	—	1	1	3	3	1	2	1	1	1	—
87	8	—	3	1	2	—	—	—	—	—	—	—	—	—	—	—	—	3	2	—	—	—	1	—	1	1	—
Totals ...	507	139	132	83	47	36	20	19	15	4	4	2	1	1	2	1	1	66	41	58	55	46	55	49	54	57	26
					83		70											107		113		101		103		83	
Mean and deviations.	79·17	+·00	+·28	−·23	+·13		−·42											+·26		+·02		−·37		+·10		−·04	
Twice prob. error	±	·35	·36	·46	·46		·50											·40		·39		·41		·41		·46	
Standard deviation	3·08	—	—	—	—		—											—		—		—		—		—	

Correlation of cephalic index with frequency of conviction ... $-·070 \pm ·030$

" " " " " time of imprisonment ... $-·011 \pm ·030$

Table 196.

Correlation of General Health and Nutrition with Nature of Crime, Hair Shade, and Complexion. (Page 138.)

Schedule Records 2,501 *to* 3,000.

Symbols as in Table 195.

Nutrition Categories.	Crimes.						Hair Shade.			Complexion.			Totals.
	D.	S.	R.	V.	C.	F.	L.	M.	D.	F.	M.	D.	
Stout and strong (S) ...	8	57	15	52	2	17	39	27	85	50	26	75	151
Spare and muscular (T)	14	85	21	40	3	20	44	26	113	41	36	106	183
Weak (F and W) ...	15	77	13	14	8	39	47	29	90	55	26	85	166
Totals	37	219	49	106	13	76	130	82	288	146	88	266	500

Table 197.

Correlations of Good Health and Sickness with Nature of Crime, Hair Shade, and Complexion. (Page 138.)

Schedule Records 2,501 *to* 3,000.

Symbols as in Table 195.

Health.	Crimes.						Hair Shade.			Complexion.			Totals
	D.	S.	R.	V.	C.	F.	L.	M.	D.	F.	M.	D.	
Robust and good health (R and G).	17	144	39	85	9	48	94	57	191	111	60	171	342
Delicate (D)	19	76	11	18	4	29	35	24	99	32	31	94	157
Totals	36	220	50	103	13	77	129	81	290	143	91	265	499

Table 198.

Intercorrelations of Head Length, Head Breadth and Head Height. (Page 149.)

Schedule Records 1 *to* 2,500.

MM.	Head Breadths.														Totals.
	131–	134–	137–	140–	143–	146–	149–	152–	155–	158–	161–	164–	167–	170–	
Head Lengths. 168– ...	—	—	—	1	1	—	—	—	—	—	—	—	—	—	2
172– ...	—	—	1	3	3	1	—	1	—	—	—	—	—	—	9
176– ...	—	—	6	3	4	7	6	2	1	1	1	—	—	—	31
180– ...	—	2	6	17	24	30	23	17	9	2	1	1	—	—	132
184– ...	—	2	5	19	50	82	74	56	23	20	6	2	1	—	340
188– ...	1	—	5	29	56	115	137	107	47	25	7	2	—	—	531
192– ...	—	1	4	19	58	98	138	128	77	41	15	4	1	—	584
196– ...	—	—	2	5	20	41	97	113	73	45	17	6	1	—	420
200– ...	—	—	—	3	5	20	37	34	41	25	22	4	1	—	192
204– ...	—	—	—	—	2	3	12	17	14	13	9	2	2	—	74
208– ...	—	—	—	1	—	1	5	6	1	3	7	1	1	1	27
212– ...	—	—	—	—	—	—	—	1	2	1	1	—	—	—	5
216– ...	—	—	—	—	—	—	—	—	—	—	1	—	1	—	2
Totals ...	1	5	29	100	223	398	529	482	288	176	87	22	8	1	2,349

TABLE 198—*continued.*

MM.	Head Lengths.													Totals.
	168-	172-	176-	180-	184-	188-	192-	196-	200-	204-	208-	212-	216-	
Head Heights. 99-	—	—	—	1	—	—	1	—	—	—	—	—	—	2
103-	—	—	—	—	1	4	2	2	1	—	—	—	—	10
107-	—	—	—	—	—	—	1	1	—	—	—	—	—	2
111-	—	—	1	4	6	—	2	2	1	—	—	—	—	16
115-	—	—	5	8	12	20	9	9	2	—	—	—	—	65
119-	1	2	3	15	30	36	63	11	5	2	1	—	—	130
123-	—	5	7	13	53	63	66	44	19	10	1	—	—	281
127-	—	—	5	34	86	124	124	76	46	10	2	1	—	508
131-	—	1	4	26	64	95	97	84	31	11	4	1	—	418
135-	—	—	5	20	41	92	124	78	28	19	2	1	—	410
139-	1	1	—	10	35	55	75	64	29	15	7	—	—	292
143-	—	—	—	—	7	24	34	30	14	3	3	2	1	118
147-	—	—	1	1	2	13	15	14	8	1	5	—	1	61
151-	—	—	—	—	2	5	7	4	6	1	—	—	—	25
155-	—	—	—	—	1	—	2	1	2	2	1	—	—	9
159-	—	—	—	—	—	—	1	—	—	—	1	—	—	2
Totals ...	2	9	31	132	340	531	584	420	192	74	27	5	2	2,349

MM.	99-	103-	107-	111-	115-	119-	123-	127-	131-	135-	139-	143-	147-	151-	155-	159-	Totals.
Head Breadths. 131-	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
134-	—	—	1	—	—	—	1	2	—	1	—	—	—	—	—	—	5
137-	—	—	—	1	3	5	6	8	4	1	—	—	1	—	—	—	29
140-	—	—	—	3	4	14	15	23	18	16	6	1	—	—	—	—	100
143-	1	—	—	4	10	25	34	57	36	32	19	2	2	1	—	—	223
146-	1	4	—	2	19	22	61	104	65	65	38	9	3	4	1	—	398
149-	—	4	—	2	18	35	59	111	98	102	56	24	14	5	1	—	529
152-	—	—	—	1	2	16	64	95	95	79	76	36	14	2	1	1	482
155-	—	2	1	1	3	5	20	67	55	60	38	18	11	6	1	—	288
158-	—	—	—	2	3	6	15	25	30	34	33	13	5	6	4	—	176
161-	—	—	—	—	3	—	4	12	11	17	20	10	8	1	—	1	87
164-	—	—	—	—	—	1	2	4	5	1	5	2	1	—	1	—	22
167-	—	—	—	—	—	—	—	—	1	1	1	3	2	—	—	—	8
170-	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
Totals	2	10	2	16	65	130	281	508	418	410	292	118	61	25	9	2	2,349

Mean head length ... ... 192·45 ± ·89 mm.
Mean head breadth ... ... 151·03 ± ·76 mm.
Mean head height ... ... 132·30 ± 1·11 mm.
Standard deviation of head length ... ... 6·39 ± ·63 mm.
Standard deviation of head breadth ... ... 5·48 ± ·54 mm.
Standard deviation of head height ... ... 8·00 ± ·79 mm.
Coefficient of correlation of head length with head breadth ... ·386 ± ·012
Coefficient of correlation of head length with head height ... ·241 ± ·013
Coefficient of correlation of head breadth with head height ... ·286 ± ·013

Head Contours. (Page 162.)

Calculated means, and standard deviations, in mm. of head contours. Measurements of 802 criminals, and calculated means of the constituent groups distinguished by differences of (1) Age, (2) Stature, (3) Intelligence, (4) Nature of Crime, together with twice the probable errors of the means due to random sampling.

Table 199.—*Frequencies.*

All Criminals	Ages in years.			Statures in inches.			Grades of intelligence.				Crimes				
	15-	25-	40-	48-	64-	67-	Weak minded and imbecile.	Unintelligent.	Fairly intelligent.	Intelligent.	Malicious damage to property.	Stealing and burglary.	Sexual offences.	Offences against the person.	Forgery and fraud.
802	123	389	290	230	331	241	217	245	161	179	66	326	97	185	128

Table 200.—*Median Contours.*

Measurements.	All Criminals.		Means, and twice probable errors of means, of constituent groups in mm.														
			Ages in years.			Statures in inches.			Grades of intelligence.				Crimes.				
	Means and twice P.E. ±	Standard deviations.	15-	25-	40-	48-	64-	67-	Weak-minded and Imbecile.	Unintelligent.	Fairly intelligent.	Intelligent.	Malicious damage to property.	Stealing and burglary.	Sexual offences.	Offences against the person.	Forgery and fraud.
L	192·24 ·31	6·408	192·17 ·78	191·14 ·44	193·73 ·51	189·98 ·57	192·21 ·47	194·42 ·56	193·75 ·59	191·92 ·55	191·86 ·68	191·18 ·65	191·73 1·06	191·94 ·48	191·02 ·88	192·35 ·64	194·00 ·76
H 1	37·70 ·47	9·775	37·70 1·19	38·06 ·67	37·22 ·77	38·09 ·87	37·86 ·72	37·10 ·85	37·38 ·90	38·10 ·84	36·82 1·04	38·34 ·99	39·07 1·62	37·91 ·73	39·14 1·34	36·61 ·97	36·94 1·17
H 2	50·62 ·40	8·497	51·24 1·03	50·88 ·58	50·00 ·67	50·69 ·76	50·70 ·63	50·43 ·74	50·52 ·78	50·78 ·73	50·08 ·90	51·10 ·86	51·99 1·41	50·60 ·63	51·08 1·16	50·09 ·84	49·97 1·01
H 3	65·68 ·34	7·224	66·24 ·88	65·84 ·49	65·28 ·57	65·17 ·64	65·79 ·54	66·00 ·63	65·57 ·66	65·88 ·62	65·06 ·77	66·02 ·73	66·81 1·20	65·60 ·54	66·20 ·99	65·13 ·72	65·66 ·88
H 4	82·50 ·30	6·323	83·20 ·77	82·48 ·43	82·22 ·50	81·72 ·56	82,69 ·47	82·98 ·55	82·45 ·58	82·88 ·55	81·76 ·67	82·72 ·64	83·22 1·05	82·42 ·47	82·54 ·87	82·28 ·63	82·62 ·75
H 5	91·48 ·30	6·267	92·02 ·76	91·46 ·43	91·26 ·50	90·22 ·56	91·67 ·46	92·40 ·54	91·46 ·57	91·81 ·54	90·64 ·67	91·77 ·63	92·04 1·04	91·36 ·47	91·42 ·86	91·22 ·62	91·94 ·75
H 6	96·14 ·30	6·347	97·02 ·77	96·17 ·43	95·80 ·50	94·83 ·56	96·18 ·47	97·32 ·55	96·14 ·58	96·22 ·55	95·88 ·67	96·25 ·64	96·41 1·05	96·16 ·47	95·67 ·87	96·04 ·63	96·53 ·76
H 7	98·36 ·32	6·673	99·34 ·81	98·36 ·46	97·94 ·53	96·97 ·60	98·34 ·49	99·68 ·58	98·34 ·61	98·58 ·58	98·00 ·71	98·43 ·67	98·74 1·11	98·34 ·50	98·13 ·91	98·11 ·66	98·72 ·80
H 8	98·16 ·32	6·773	99·31 ·82	98·16 ·46	97·66 ·54	96·71 ·60	98·11 ·50	99·60 ·59	98·01 ·62	98·30 ·58	97·91 ·72	98·39 ·68	98·65 1·12	98·04 ·51	97·81 ·93	98·05 ·67	98·62 ·81
H 9	94·23 ·33	6·992	95·18 ·85	94·32 ·48	93·71 ·55	92·90 ·62	94·18 ·52	95·49 ·61	94·13 ·64	94·42 ·60	93·99 ·74	94·33 ·70	94·50 1·16	94·13 ·52	93·78 ·96	94·06 ·69	94·75 ·83
H 10	84·82 ·33	6·969	85·98 ·85	84·92 ·48	84·17 ·55	83·68 ·62	84·88 ·52	85·81 ·61	84·61 ·64	84·97 ·60	84·70 ·74	85·00 ·70	84·98 1·16	84·87 ·52	84·46 ·96	84·70 ·69	85·00 ·83
H 11	66·40 ·34	7·214	67·77 ·88	66·53 ·49	65·64 ·57	65·60 ·64	66·44 ·53	67·10 ·63	66·11 ·66	66·37 ·62	66·60 ·77	66·64 ·73	65·77 1·20	66·67 ·54	66·21 ·99	65·96 ·72	66·78 ·86
H 12	50·68 ·40	8·441	51·95 1·03	50·96 ·58	49·76 ·67	50·04 ·75	50·69 ·63	51·23 ·73	49·95 ·77	50·86 ·72	51·02 ·90	51·01 ·85	49·77 1·40	50·97 ·63	50·50 1·16	50·30 ·84	51·06 1·07
H 13	38·62 ·45	9·419	39·74 1·15	39·10 ·64	37·51 ·75	37·90 ·84	38·51 ·70	39·48 ·82	37·70 ·86	38·65 ·81	39·30 1·00	39·10 ·95	37·86 1·56	38·97 ·70	38·32 1·29	38·24 ·93	38·92 1·12

Table 201.—*Transverse Contours.*

Measurements.	All Criminals.		Means, and twice probable errors of means, of constituent groups in mm.														
			Ages in years.			Statures in inches.			Grades of intelligence.				Crimes.				
	Means and twice P.E. ±	Standard deviations.	15-	25-	40-	48-	64-	67-	Weak-minded and imbecile.	Unintelligent.	Fairly intelligent.	Intelligent.	Malicious damage to property.	Stealing and burglary.	Sexual offences.	Violence against the person.	Forgery and fraud.
C	135·42 ·26	5·481	133·53 ·67	133·13 ·37	133·75 ·43	131·54 ·49	133·63 ·41	134·90 ·47	134·18 ·50	133·04 ·47	132·56 ·58	133·77 ·55	133·68 ·91	133·21 ·41	133·34 ·75	132·40 ·64	135·34 ·65
A	133·82 ·28	5·823	131·65 ·71	132·91 ·40	135·95 ·46	131·92 ·52	134·01 ·43	135·37 ·51	136·04 ·53	133·29 ·50	132·85 ·62	132·72 ·59	133·26 ·97	133·39 ·43	132 55 ·80	134·04 ·58	135·78 ·69
T 1	21·52 ·14	2·852	21·22 ·35	21·40 ·20	21·80 ·23	21·26 ·25	21·53 ·21	21·76 ·25	21·95 ·26	21·18 ·25	21·84 ·30	21·18 ·29	21·44 ·47	21·41 ·21	21·40 ·39	21·51 ·28	21·94 ·34
T′1	21·49 ·13	2·786	21·55 ·34	21·29 ·19	21·74 ·22	21·57 ·25	21·41 ·21	21·53 ·24	21·68 ·26	21·34 ·24	21·46 ·30	21·50 ·28	21·20 ·46	21·49 ·21	21·40 ·38	21·36 ·28	21·91 ·33
T 2	40·69 ·14	2·98	39·86 ·36	40·43 ·20	41·10 ·24	40·28 ·27	40·42 ·22	41·11 ·26	41·47 ·27	40·28 ·26	40·58 ·32	39·99 ·30	40·65 ·50	40·47 ·22	40·46 ·41	40·45 ·30	41·16 ·36
T′2	41·36 ·14	2·96	41·40 ·36	41·12 ·20	41·66 ·23	41·31 ·26	41·35 ·22	41·46 ·25	41·62 ·27	41·33 ·25	41·02 ·31	41·40 ·29	41·92 ·48	41·33 ·22	41·36 ·40	41·04 ·29	41·62 ·35
T 3	54·97 ·15	3-125	54·22 ·38	54·71 ·21	55·64 ·25	54·56 ·28	54·87 ·23	55·49 ·27	55·94 ·29	54·65 ·27	54·93 ·33	54·28 ·32	55·26 ·52	54·86 ·23	54·50 ·43	54·73 ·31	55·81 ·37
T′3	56·24 ·14	3·002	55·97 ·37	56·01 ·21	56·66 ·24	55·88 ·27	56·27 ·22	56·54 ·26	56·89 ·28	56·08 ·26	56·86 ·32	56·00 ·30	56·59 ·50	56·16 ·22	56·10 ·41	55·84 ·30	56·94 ·36
T 4	63·71 ·17	3·576	63·05 ·43	63·55 ·24	64·20 ·28	63·20 ·32	63·72 ·27	64·18 ·31	64·52 ·33	63·47 ·31	63·48 ·38	63·30 ·36	64·05 ·59	63·64 ·27	63·50 ·49	63·35 ·35	64·41 ·43
T′4	65·47 ·11	2·395	65·04 ·28	65·30 ·16	65·89 ·18	65·00 ·20	65·54 ·17	65·84 ·20	66·15 ·21	65·39 ·20	65·04 ·24	65·15 ·23	65·74 ·38	65·37 ·17	65·23 ·32	65·28 ·23	66–03 ·29
T 5	68·57 ·12	2·584	68·05 ·31	68·36 ·18	69·09 ·21	68·00 ·23	68·60 ·19	69·08 ·22	69·43 ·24	68·54 ·22	68·25 ·27	67·88 ·26	68·65 ·43	68·45 ·19	68·16 ·35	68·44 ·26	69·38 ·31
T′5	70·54 ·14	2·866	70·00 ·35	70·38 ·20	70·99 ·23	70·07 ·25	70·72 ·21	70·75 ·25	71·22 ·26	70·54 ·25	69·99 ·30	70·22 ·29	70·89 ·48	70·31 ·21	70·10 ·39	70·41 ·28	71·47 ·34
T 6	70·71 ·14	2·989	69·89 ·24	70·50 ·20	71·35 ·24	70·20 ·27	70·77 ·22	71·13 ·26	71·68 ·27	70·63 ·26	70·19 ·32	70·10 ·30	71·02 ·50	70·55 ·22	70·16 ·41	70·52 ·30	71·66 ·36
T′6	72·25 ·15	3·088	71·58 ·38	72·09 ·21	72·74 ·24	71·79 ·27	72·37 ·23	72·51 ·27	73·12 ·28	72·11 ·27	71·69 ·33	71·87 ·31	72·41 ·51	72·02 ·23	71·73 ·42	72·29 ·31	73–06 ·37
T 7	71·00 ·15	3·01	70·08 ·39	70·76 ·22	71·71 ·25	70·40 ·28	70·99 ·24	71·58 ·28	71·94 ·29	70·90 ·27	70·44 ·34	70·48 ·32	71·56 ·53	70·82 ·24	70·53 ·44	70·82 ·32	71·94 ·38
T′7	72·26 ·15	3·03	71·74 ·37	71·99 ·21	72·82 ·24	71:86 ·27	72·32 ·23	72·54 ·27	73·10 ·28	72·31 ·26	71·51 ·32	71·82 ·31	72·41 ·51	71·90 ·23	71·48 ·42	72·55 ·30	73·25 ·36
T 8	70·25 ·14	3·013	69·31 ·37	69·95 ·21	71·05 ·24	69·61 ·27	70·25 ·22	70·86 ·26	71·34 ·28	70·14 ·26	69·72 ·32	69·54 ·30	70·35 ·50	69·98 ·23	69·88 ·41	70·11 ·30	72·38 ·36
T′8	71·32 ·14	2·920	70·75 ·35	70·93 ·20	72·16 ·23	70·72 ·26	71·49 ·22	71·66 ·25	72·07 ·27	71·38 ·25	70·59 ·31	70·98 ·29	71·68 ·48	70·92 ·22	70·82 ·40	71·51 ·29	72·25 ·35
T 9	69·00 ·13	2·818	68·10 ·34	68·62 ·19	69·90 ·22	68·21 ·25	69·10 ·21	69·22 ·24	70·20 ·26	68·81 ·24	68·33 ·30	68·41 ·28	69·56 ·47	68·69 ·21	68·35 ·39	68·98 ·28	70·03 ·34
T′9	69·80 ·13	2·740	68·83 ·33	69·47 ·19	70·66 ·22	69·01 ·24	69·91 ·20	70·38 ·24	70·78 ·25	69·81 ·24	69·18 ·29	69·17 ·28	70·10 ·45	69·56 ·20	68·96 ·38	69·82 ·27	70·81 ·33
T 10	67·89 ·13	2·796	66·65 ·34	67·50 ·19	68·95 ·22	67·10 ·25	67·91 ·21	68·63 ·24	68·97 ·26	67·86 ·24	67·25 ·30	67·21 ·28	67·98 ·46	67·59 ·21	67·25 ·38	67·98 ·28	68·97 ·33
T′10	68·31 ·13	2·789	67·24 ·34	67·93 ·19	69·29 ·22	67·41 ·25	68·40 ·21	69·04 ·24	69·35 ·26	68·22 ·24	67·60 ·30	67·81 ·28	68·34 ·46	68·02 ·21	67·58 ·38	68·54 ·28	69·34 ·33

TABLE 204.

CORRELATIONS OF STATURE WITH NATURE OF CRIME AND OCCUPATIONAL CLASS. (Pages 178, 180.)

Schedule Records 1 *to* 3,000.

Symbols of Crimes as in Table 187.

Stature in inches.	Professional classes.					Commercial classes: clerks and shopkeepers.					Selected classes: soldiers, policemen, messengers, servants.					Labourers: agricultural, roads, quarries, railways.					Sailors, fishermen.					Miners: coal, minerals.					Artisans: factory operatives.					Floating traders and no occupations.					Totals.
	D.	S.	R.	V.	F.	D.	S.	R.	V.	F.	D.	S.	R.	V.	F.	D.	S.	R.	V.	F.	D.	S.	R.	V.	F.	D.	S.	R.	V.	F.	D.	S.	R.	V.	F.	D.	S.	R.	V.	F.	
48–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
54–	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
55–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
56–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
57–	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	1	—	—	—	1	1	—	—	—	—	—	—	—	6
58–	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	3
59–	—	—	—	—	—	—	1	1	—	1	—	—	—	—	—	2	5	1	—	—	—	1	—	—	—	—	1	1	—	—	—	5	2	1	1	—	3	—	1	—	27
60–	—	—	—	—	—	—	4	—	—	1	—	1	—	1	—	4	14	1	1	2	—	2	—	1	—	—	3	—	—	—	1	16	5	5	2	—	9	1	2	—	76
61–	—	1	—	—	1	1	12	1	1	4	2	1	1	—	—	4	25	4	13	—	1	4	—	1	—	—	2	2	—	—	2	36	—	6	8	—	8	—	1	—	142
62–	—	1	—	—	3	—	14	1	—	8	—	8	2	—	—	8	46	5	16	3	—	5	3	7	1	1	6	4	—	1	3	58	6	13	13	—	12	4	8	1	261
63–	—	1	—	1	5	—	18	2	6	6	—	12	—	7	1	13	72	10	22	4	—	5	1	4	—	—	5	3	4	1	3	73	4	16	7	1	24	—	4	3	338
64–	—	2	—	—	14	1	32	4	8	13	1	6	4	12	—	8	69	9	24	5	2	3	—	8	2	—	4	2	6	1	3	78	13	23	7	—	25	—	4	6	399
65–	—	4	1	1	10	2	40	—	12	18	—	10	2	9	3	6	60	18	28	5	2	10	1	7	1	1	7	6	7	2	3	80	10	23	10	2	24	—	9	4	438
66–	—	2	1	1	20	1	37	3	6	16	—	12	3	12	2	9	71	10	21	3	—	8	2	4	—	3	8	3	4	1	1	70	14	22	13	—	15	2	5	2	407
67–	—	3	1	2	18	2	20	1	9	19	2	8	2	8	2	7	63	10	20	6	—	6	1	7	1	2	7	8	7	3	1	57	9	21	8	1	13	—	4	1	360
68–	—	2	3	2	19	1	26	1	3	16	—	4	—	3	2	6	30	11	18	2	—	3	—	4	1	2	2	1	4	—	4	42	2	6	4	—	19	—	4	4	251
69–	—	2	—	—	11	—	10	2	4	10	—	4	4	2	2	1	25	9	13	6	2	—	—	4	—	—	—	1	1	—	2	11	2	1	5	1	6	1	3	2	147
70–	—	—	—	1	8	—	6	—	—	7	—	—	—	2	1	2	7	1	4	2	—	—	1	—	—	—	—	—	1	—	3	8	2	4	2	—	2	1	—	2	67
71–	—	1	—	—	9	—	—	—	—	2	—	1	—	1	1	1	1	—	—	2	—	—	—	—	—	—	—	—	—	—	1	3	—	1	1	—	1	—	—	1	27
72–	—	—	—	—	2	—	2	—	—	3	—	—	—	1	1	1	3	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	1	—	—	—	17
73–	—	—	1	—	1	—	1	—	—	—	—	—	—	1	—	1	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	1	—	1	—	—	10
74–	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
77–	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Totals ...	—	20	7	8	122	8	225	16	49	124	5	67	18	59	16	73	492	91	182	41	8	47	9	47	6	10	45	32	35	9	27	540	70	143	83	6	162	10	46	26	2,984

Mean stature	65·47 ± ·04 ins.
Standard deviation of stature	2·66 ± ·03 ins.
Correlation ratio of stature with crime	·175 ± ·012
Correlation ratio of stature with occupation	·197 ± ·012.

Table 205.

Correlations of Weight with Nature of Crime and Occupational Class. (Pages 178, 180.)

Schedule Records 1 *to* 3,000.

Symbols of Crimes as in Table 187.

Weight in lbs.	Professional classes. D	S	R	V	F	Commercial classes: clerks and shopkeepers. D	S	R	V	F
80-	—	—	—	—	—	—	1	—	—	—
90-	—	—	—	—	—	—	—	—	—	—
100-	—	—	—	—	—	—	1	—	—	2
110-	—	1	—	—	3	2	16	—	2	7
120-	—	4	—	—	6	1	26	1	10	13
130-	—	4	2	3	15	1	42	6	8	22
140-	—	5	2	2	29	2	54	4	9	28
150-	—	—	1	2	21	—	46	2	11	20
160-	—	3	1	1	18	1	23	1	5	9
170-	—	1	—	—	11	—	8	1	5	7
180-	—	2	1	—	7	—	4	1	—	8
190-	—	—	—	—	5	1	1	—	1	2
200-	—	—	—	—	4	—	1	—	—	2
210-	—	—	—	—	3	—	—	—	—	—
220-	—	—	—	—	1	—	—	—	—	—
240-	—	—	—	—	1	—	—	—	—	—
Totals ...	—	20	7	8	122	8	225	16	49	124

Weight in lbs.	Selected classes: soldiers, policemen, messengers, servants. D	S	R	V	F	Labourers: agricultural, roads, quarries, railways. D	S	R	V	F
80-	—	—	—	—	—	—	—	—	—	1
90-	—	—	—	—	—	—	—	1	—	—
100-	—	—	—	—	—	6	7	1	1	—
110-	1	4	—	3	1	9	28	6	12	3
120-	2	14	6	4	1	17	39	11	26	1
130-	—	20	4	15	3	18	114	21	34	12
140-	2	16	6	16	5	11	128	26	50	6
150-	—	8	2	10	1	10	73	16	28	10
160-	—	5	—	10	3	4	30	4	15	2
170-	—	1	—	1	2	—	9	4	6	3
180-	—	—	—	—	1	—	4	1	2	1
190-	—	—	—	—	—	—	1	—	1	—
200-	—	—	—	—	—	—	—	—	—	—
210-	—	—	—	—	—	—	—	—	—	—
220-	—	—	—	—	—	—	—	—	—	—
240-	—	—	—	—	—	—	—	—	—	—
Totals ...	5	67	18	59	16	73	492	91	182	41

Weight in lbs.	Sailors, fishermen. D	S	R	V	F	Miners: coal, minerals. D	S	R	V	F
80-	—	—	—	—	—	—	—	—	—	—
90-	—	—	—	—	—	1	—	—	—	—
100-	—	2	—	—	—	1	—	—	1	—
110-	1	2	—	1	—	—	6	2	—	—
120-	—	4	1	3	—	1	8	6	3	—
130-	2	15	1	11	2	1	12	12	8	3
140-	1	11	2	13	3	3	9	7	11	3
150-	2	9	2	10	—	3	8	2	6	1
160-	—	3	2	7	1	—	—	2	1	—
170-	—	1	—	2	—	—	1	1	2	—
180-	—	—	—	—	—	—	—	—	1	—
190-	1	—	—	—	—	—	—	—	2	—
200-	—	—	—	—	—	—	—	—	—	—
210-	—	—	—	—	—	—	—	—	—	2
220-	—	—	—	—	—	—	—	—	—	—
240-	—	—	—	—	—	—	—	—	—	—
Totals ...	8	47	9	47	6	10	45	32	35	9

Weight in lbs.	Artisans, factory operatives. D	S	R	V	F	Floating traders and no occupations. D	S	R	V	F	Totals.
80-	—	1	—	—	—	—	—	—	—	—	3
90-	—	—	—	1	—	—	1	—	—	—	4
100-	1	11	3	1	1	—	3	—	—	—	39
110-	1	37	5	12	8	1	14	—	5	1	189
120-	4	96	17	27	11	1	27	1	8	5	461
130-	9	123	22	35	13	3	25	3	10	3	666
140-	5	139	14	27	21	1	38	4	14	8	780
150-	6	77	4	27	19	—	20	1	1	4	475
160-	—	44	3	11	5	—	16	1	4	1	245
170-	1	13	1	1	4	—	7	—	1	3	95
180-	—	6	—	—	—	—	2	—	2	1	44
190-	—	1	1	—	1	—	—	—	—	—	16
200-	—	—	—	1	—	—	—	—	1	—	9
210-	—	—	—	—	—	—	—	—	—	1	6
220-	—	—	—	—	—	—	—	—	—	—	1
240-	—	—	—	—	—	—	—	—	—	—	1
Totals ...	27	540	70	143	83	6	163	10	46	26	2,984

Mean weight ... ... 142·1 ± 2·1 lbs.
Standard deviation of weight ... ... 17·2 ± 1·5 lbs.
Correlation ratio of weight with crime ... ... ·192 ± ·012
Correlation ratio of weight with occupation ... ... ·203 ± ·012

Table 206.—Correlation of Span of Arms with Nature of Crime. (Pages 178, 180.)

Schedule Records 1 *to* 2,500.

—		Totals.	Nature of crimes.				
			Damage to property.	Stealing and burglary.	Sexual offences.	Violence to the person.	Forgery and fraud.
Span of arms, in inches.	55	1	1	—	—	—	—
	56	1	—	—	—	—	1
	57	7	—	7	—	—	—
	58	7	1	3	1	2	—
	59	14	1	8	2	2	1
	60	41	1	28	2	4	6
	61	81	2	58	7	9	5
	62	111	6	72	3	22	8
	63	147	5	96	4	27	15
	64	216	8	132	17	37	22
	65	318	13	187	29	64	25
	66	291	9	170	21	57	34
	67	314	15	165	26	59	49
	68	292	16	118	28	43	41
	69	233	5	68	20	58	32
	70	169	7	44	23	32	39
	71	95	5	44	13	13	20
	72	85	3	13	5	18	15
	73	40	4	6	7	6	10
	74	14	—	—	1	1	6
	75	4	1	2	—	1	2
	76	4	—	—	—	—	2
	77	1	—	—	—	1	—
	78	2	—	—	—	2	—
	79	2	—	—	—	1	1
	82	1	—	—	1	—	—
Totals		2,492	103	1,385	210	459	335
Means and excesses		66·95	+·07	—·42	+·66	+·19	+1·03
2 P.E.		±	·42	·12	·30	·20	·24
S.D.		3·18	—	—	—	—	—

Correlation ratio of span of arms and nature of crimes ·193·

Table 207.—Correlation of Stature with Span of Arms. (Page 179.)

Schedule Records 1 *to* 2,500.

—	—	48-	54-	55-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	77-
Span of arms, in inches. 56-	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
57-	8	—	—	1	—	1	—	1	1	—	—	—	2	—	2	—	—	—	—	—	—	—	—	—
58-	8	—	—	—	1	—	2	3	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
59-	13	—	—	—	—	—	—	4	6	1	2	—	—	—	—	—	—	—	—	—	—	—	—	—
60-	39	—	—	1	—	3	—	4	9	10	10	1	1	—	—	—	—	—	—	—	—	—	—	—
61-	80	1	—	—	—	—	1	5	13	20	20	8	7	1	4	—	—	—	—	—	—	—	—	—
62-	111	—	—	—	—	—	—	1	11	29	39	18	9	4	—	—	—	—	—	—	—	—	—	—
63-	147	—	—	—	—	—	—	4	7	17	45	36	25	7	3	2	1	—	—	—	—	—	—	—
64-	218	—	1	—	—	—	—	—	7	21	37	63	47	29	9	3	—	—	—	—	—	—	—	—
65-	321	—	—	—	—	—	—	—	1	13	39	76	80	71	23	11	6	—	—	—	1	—	—	—
66-	291	—	—	—	—	—	—	—	1	3	16	38	67	74	54	25	10	3	—	—	—	—	—	—
67-	310	—	—	—	—	—	—	—	1	1	9	29	48	85	60	52	21	4	—	—	—	—	—	—
68-	298	—	—	—	—	—	—	—	2	1	3	9	27	60	75	60	41	15	4	1	—	—	—	—
69-	229	—	—	—	—	—	—	—	1	—	—	3	7	32	67	53	40	19	7	—	—	—	—	—
70-	167	—	—	—	—	—	—	—	—	—	—	1	5	12	35	39	38	21	12	3	1	—	—	—
71-	97	—	—	—	—	—	—	—	—	—	—	1	2	6	7	25	27	20	9	—	—	—	—	—
72-	84	—	—	—	—	—	—	—	—	—	—	—	1	—	6	13	20	21	12	8	3	—	—	—
73-	40	—	—	—	—	—	—	—	—	—	—	—	1	—	1	4	8	10	6	6	3	1	—	—
74-	14	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	3	3	3	2	1	1	—
75-	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	2	—	1
76-	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	1	1	—	—
77-	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
78-	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—
79-	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals...	2,487	1	1	2	1	4	3	22	61	116	220	284	329	383	346	287	212	116	56	22	11	7	2	1

Mean stature ... ... 65·45 Mean span of arms ... ... 66·94
S.D. of „ ... ... 2·64 S.D. of „ „ ... ... 3·14

Coefficient of correlation of stature with span of arms +·793.

Table 210.

Correlation of Stature with Age at time of Crime. (Pages 180, 188, 189.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Stature in inches.	Totals.	Ages. 15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–
57	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—
58	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—
59	3	—	—	1	—	—	—	1	—	—	—	—	—	1	—
60	18	—	2	4	6	2	2	—	—	1	—	—	—	1	—
61	42	—	3	8	10	1	5	2	2	1	7	3	—	—	—
62	66	2	13	9	14	4	2	5	6	—	2	4	5	—	—
63	77	—	7	16	11	8	10	6	9	2	7	1	—	—	—
64	89	1	12	21	12	13	5	5	5	4	3	4	2	—	2
65	88	—	15	20	13	17	5	4	1	2	2	6	3	—	—
66	76	1	21	12	10	14	3	4	2	3	2	1	2	1	—
67	80	—	19	18	11	9	6	5	1	2	3	5	—	1	—
68	51	—	3	12	10	9	7	2	2	—	3	2	1	—	—
69	35	—	10	8	2	7	3	1	1	—	2	1	—	—	—
70	9	—	1	2	1	1	1	1	—	—	1	—	—	—	1
71	5	—	1	1	—	—	3	—	—	—	—	—	—	—	—
72	7	1	1	3	—	1	—	—	—	1	—	—	—	—	—
73	3	—	2	—	—	1	—	—	—	—	—	—	—	—	—
74	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—
77	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Totals...	653	5	110	135	100	89	53	36	29	16	33	27	13	4	3
Means and excesses.	ins. 65·39	+·25	+·55	+·16	−·66	+·68	+·11	−·42	−1·15	−·14	−·31	−·28	−·87	−1·95	+1·05
Twice probable errors.	±	1·65	·35	·32	·37	·39	·51	·61	·68	·92	·64	·71	1·02	1·84	2·12
Standard deviation.	2·73														

Coefficient of correlation of stature with age at time of crime ... −·100

Table 211.

Correlation of Weight with Age at time of Crime. (Pages 180, 188, 189.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

	Totals.	Ages. 15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–
100	9	—	1	2	4	—	1	1	—	—	—	—	—	—	—
110	64	2	7	13	7	6	3	3	4	3	6	6	3	1	—
120	143	4	25	29	31	16	10	7	5	4	7	2	2	1	—
130	161	—	32	29	25	21	12	11	9	6	7	4	3	1	1
140	126	—	22	32	16	15	8	8	6	4	5	5	3	1	1
150	78	1	14	15	9	18	9	2	2	—	2	4	1	—	1
160	42	—	5	11	4	9	4	1	3	—	2	2	1	—	—
170	17	—	2	4	3	2	2	1	1	—	1	1	—	—	—
180	10	—	1	1	—	—	2	2	—	—	1	2	—	1	—
190	4	—	—	—	1	1	—	1	—	—	—	1	—	—	—
Totals...	654	7	109	136	100	88	51	37	30	17	31	27	13	5	3
Means and excesses.	lbs. 138·35	−12·42	−·55	+·19	−3·15	+3·42	+3·40	+1·28	−·52	+7·38	−2·24	+5·40	−3 85	+2·15	+6·15
Twice probable errors.	±	8·48	2·15	1·93	2·24	2·39	3 14	3 69	4·10	5·44	4·03	4·32	6·22	10·04	12·96
Standard deviation.	16·64														

Coefficient of correlation of weight with age at time of crime ... +·018

TABLE 212.—CORRELATION OF STANDARD OF LIVING (PARENTS) WITH STATURE. (Page 180.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

"A" = destitute poor, "B" = poor (general labourers), "C" = well-to-do poor (artisans, small shopkeepers), "D" = well-to-do (above "C").

Standard of living (parents).	Totals.	Stature in inches.																				Deviations and twice probable errors.
		49-	56-	57-	58-	59-	60-	61-	62-	63-	64-	65-	66-	67-	68-	69-	70-	71-	72-	73-	74-	
A	21	—	—	—	—	—	1	4	2	4	3	1	3	—	—	3	—	—	—	—	—	−1·18±·83
B	243	1	1	—	1	1	10	12	26	23	29	32	43	31	16	14	3	2	1	—	—	− ·24±·24
C	391	—	—	1	3	1	18	20	35	50	52	60	45	50	31	17	3	2	6	2	—	− ·20±·19
D	105	—	—	—	—	—	1	3	2	3	13	15	14	14	17	10	5	4	2	1	1	+1·54±·37
Totals ...	760	1	1	1	4	2	26	39	62	80	97	108	105	95	64	44	11	8	9	3	1	

Mean stature ... ... 65·52 inches.
Standard deviation ... ... 2·79 inches.
Correlation coefficient of standard of living (grouping A B) with stature ... +·372.

TABLE 213.—CORRELATION OF STANDARD OF LIVING (PARENTS) WITH WEIGHT. (Page 180.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Symbols as in Table 212.

Standard of living (parents).	Totals.	Weight in pounds.														Deviations and twice probable errors.
		80-	90-	100-	110-	120-	130-	140-	150-	160-	170-	180-	190-	200-	210-	
A	21	—	—	1	5	2	6	5	1	1	—	—	—	—	—	− 7·83±5·38
B	243	—	—	3	28	63	67	52	29	12	5	1	2	—	1	− 2·08±1·58
C	391	1	1	4	32	102	91	67	45	21	11	6	—	—	—	− 1·94±1·64
D	105	—	—	—	5	6	19	21	22	9	8	5	1	3	3	+13·50±1·66
Totals	760	1	1	8	70	183	183	165	97	53	24	15	3	3	4	

Mean weight... ... ... 139·95 lbs.
Standard deviation ... ... 18·27 lbs.
Correlation coefficient of standard of living (grouping A B) with weight... ... +·463.

TABLE 214.—CORRELATION OF STANDARD OF LIVING (PARENTS) WITH NATURE OF CRIME. (Pages 180, 183, 286.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Standard of living (parents) measured on a scale of increasing wealth, giving a normal distribution.

Symbols as in Tables 187 and 212.

—	Totals.	Nature of Crime.				
		D.	S.	R.	V.	F.
A	21	5	7	3	6	—
B	243	28	87	44	69	15
C	391	28	183	42	99	39
D	105	1	25	5	8	66
Totals	760	62	302	94	182	120

Means and excesses ...	·31	−·35	−·04	−·31	−·19	+·82
Twice probable errors	± —	·12	·06	·10	·07	·09
Standard deviation ...	·73					

Correlation ratio of standard of living (parents) and nature of crime ... ·507

TABLE 215.—CORRELATION OF STANDARD OF LIVING (PARENTS) WITH AGE AT TIME OF CRIME. (Pages 180, 183.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Symbols as in Table 212.

	Totals.	Ages.														Deviations and twice probable errors.
		15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–	
A	21	—	6	7	1	—	1	2	2	—	—	1	1	—	—	−3·00
B	242	2	46	50	39	35	15	18	12	7	8	10	—	—	—	−2·31
C	386	2	56	85	58	44	41	27	15	15	22	10	7	3	1	— ·24
D	106	—	2	10	10	24	14	13	9	8	9	5	1	—	1	+6·40
Totals...	756	4	110	152	108	103	71	60	38	30	39	26	10	3	2	

Mean age ... ... 38·36 years
Standard deviation ... ... 13·58 years

Coefficient of correlation of standard of living (grouping A B) and age at time of crime ... ... = +·297

TABLE 216.—CORRELATION OF GENERAL HEALTH (ROBUSTNESS) WITH NATURE OF CRIME. (Page 183.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Health being measured on a scale of increasing robustness giving a normal distribution, the class "Good" having a range from 0 to 1.

"D" = Damage to property. "S" = Stealing and burglary. "R" = Sexual offences. "V" = Violence to the person. "F" = Forgery and fraud.

Health.	Totals.	Nature of crimes.				
		D	S	R	V	F
R = Robust	172	8	58	18	70	18
G = Good	426	37	162	58	99	70
D = Delicate	210	21	97	22	30	40
Totals	808	66	317	98	199	128
Means and excesses ...	·449	−·16	−·09	+·01	+·28	−·14
Twice probable errors ...	± —	·12	·05	·10	·07	·08
Standard deviation ...	·70	—	—	—	—	—

Correlation of robustness of health with nature of crime. } Ratio η (upon nature of crime grouping R G) ·239

TABLE 217.—CORRELATION OF GENERAL HEALTH WITH RESIDENCE. (Page 183.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Health being measured on a scale of increasing robustness giving a normal distribution, the class "Good" having a range from 0 to 1.

"U" = Urban. "R" = Rural. "N" = Nomadic. "P" = Port. "H" = High seas.

Health.	Totals.	Residence.				
		U	R	N	P	H
R = Robust	172	90	32	20	21	9
G = Good	425	280	70	44	20	11
D = Delicate	210	147	29	22	8	4
Totals	807	517	131	86	49	24
Means and excesses ...	·47	−·09	+·06	+·15	+·38	+·20
Twice probable errors ...	± —	·04	·08	·10	·14	·19
Standard deviation ...	·70	—	—	—	—	—

Correlation of robustness of health with residence (rurality). { Coefficient r (grouping R G, U P, and R N H) − ·085
Ratio η (upon residence) ... ... ·196

TABLE 221.—CORRELATION OF PHYSIQUE (MUSCULARITY) WITH RESIDENCE. (Page 183.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Physique being measured on a scale of increasing muscularity giving a normal distribution. Residence Symbols as in Table 217.

Muscularity.	Totals.	Residence.				
		H	N	P	R	U
S = Stout and strong ...	264	12	29	21	55	147
T = Spare and muscular ...	289	10	30	18	38	193
W = Spare and weak ...	134	1	12	4	23	94
F = Fat	120	1	15	6	15	83
Totals	807	24	86	49	131	517
Means and excesses ...	+·49	+·88	−·01	+·33	+·06	−·09
Twice probable errors ..	± —	·28	·15	·19	·12	·06
Standard deviation ...	1	—	—	—	—	—

Correlation of physique (muscularity) with residence (rurality).
Coefficient r (grouping S T, F W and U P, R N H) ... ... +·090
Ratio η (upon residence) (grouping S T, F W) ... ... ·186

TABLE 222.—CORRELATION OF PHYSIQUE (OBESITY) WITH NATURE OF CRIME. (Page 183.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Physique being measured on a scale of increasing obesity giving a normal distribution. Crime Symbols as in Table 187.

Obesity.	Totals.	Nature of crime.				
		D	S	R	V	F
S = Stout and strong ...	265	15	87	32	103	28
F = Fat	120	9	45	19	11	36
T = Spare and muscular ...	289	25	119	39	68	38
W = Spare and weak ...	134	17	66	8	17	26
Totals	808	66	317	98	199	128
Means and excesses ...	−·06	−·29	−·15	+·11	+·24	+·06
Twice probable errors ...	± —	·17	·08	·14	·10	·12
Standard deviation ...	1	—	—	—	—	—

Correlation of physique (obesity) with nature of crime. Ratio η (upon nature of crime) ... ·177

TABLE 223.—CORRELATION OF PHYSIQUE (OBESITY) WITH STANDARD OF LIVING (PARENTS). (Page 183.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Physique being measured on a scale of increasing obesity giving a normal distribution. Standard of Living Symbols as in Table 218.

Obesity.	Totals.	Standard of living.			
		A	B	C	D
S = Stout and strong	245	8	76	133	28
F = Fat	115	2	33	50	30
T = Spare and muscular ...	269	6	97	137	29
W = Spare and weak	125	5	37	65	18
Totals	754	21	243	385	105
Means and excesses	−·08	+·01	−·06	+·01	+·10
Twice probable errors... ...	± —	·29	·09	·07	·13
Standard deviation	1	—	—	—	—

Correlation of physique (obesity) with standard of living (poor).
Coefficient r (grouping S F, T W and A B C, D)... ... ... +·118
Ratio η upon standard of living (parents) ... ... ·051

Table 224.—Correlation of Physique (Obesity) with Residence. (Page 183.)

Schedule Records 2,501 to 3,000 and Supplementary.

Physique being measured on a scale of increasing obesity giving a normal distribution. Residence symbols as in Table 217.

Obesity.	Totals.	Residence.				
		U	R	N	P	H
S = Stout and strong ...	264	12	29	21	55	147
F = Fat	120	1	15	6	15	83
T = Spare and muscular	289	10	30	18	38	193
W = Spare and weak ...	134	1	12	4	23	94
Totals	807	24	86	49	131	517
Means and excesses ...	−·06	−·08	+·15	+·09	+·19	+·16
Twice probable errors ...	±	·06	·12	·15	·19	·28
Standard deviation ...	1	—	—	—	—	—

Correlation of physique (Obesity) with residence (rurality).
- Coefficient r (grouping S F, T W and U P, R N H) ... ... +·110
- Ratio η (upon residence) ... ... ·096

Table 225.—Correlation of General Health (Robustness) with Age at Time of Crime. (Pages 183, 188.)

Schedule Records 2,501 to 3,000 and Supplementary.

Health.	Totals.	Ages.														Deviations and twice probable errors.
		15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–	
R=Robust ...	170	2	36	39	27	27	14	14	4	2	3	2	—	—	—	−4·45±1·40
G=Good ...	425	1	63	84	64	65	45	30	20	15	19	14	2	1	2	− ·34± ·89
D=Delicate	210	3	24	34	26	21	18	17	14	14	17	11	8	2	1	+4·29±1·26
Totals ...	805	6	123	157	117	113	77	61	38	31	39	27	10	3	3	

Mean age ... ... 38·07 years.
Standard deviation of age ... ... 13·54 „
Coefficient of correlation of general health (robustness) and age ... −·254

Table 226.—Correlation of Physique (Muscularity and Obesity) with Age at Time of Crime. (Pages 183, 188.)

Schedule Records 2,501 to 3,000 and Supplementary.

—	Totals.	Ages.														Deviations ± twice probable error.	Muscularity deviations ± twice probable errors.	Obesity deviations ± twice probable errors.
		15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70–	75–	80–			
S=Stout and strong.	263	2	54	59	45	45	20	21	6	7	2	2	—	—	—	− 4·42±1·13		
F=Fat ...	120	1	14	19	10	9	17	14	11	7	11	6	—	—	1	+ 4·10±1·67	S&T −2·95± ·78	S&F−1·75±·93
T=Spare and muscular.	289	2	47	62	51	48	28	20	12	5	8	5	1	—	—	− 2·69±1·07	F&U+8·24±1·15	T&U+1·59±·89
W=Spare and weak.	134	1	8	17	11	11	12	6	9	12	18	14	9	3	2	+10·90±1·58		
Totals...	806	6	123	157	117	113	77	61	38	31	39	27	10	3	3			

Correlation ratio of physique (muscularity and obesity) with age ... ·412
Coefficient of correlation of muscularity with age ... ... −·502±·021
Coefficient of correlation of obesity with age ... ... −·155±·023

Table 227.—Correlation of General Health with Grade of Criminality.
(Page 188.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Health being measured on a scale of increasing robustness giving a normal distribution, the class "Good" having a range from 0 to 1.

Health.	Totals.	Convictions per year 0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-	Mean convictions. Deviations ± twice probable errors.
Robust	95	32	22	11	7	8	4	5	4	—	—	—	—	1	1	—	—	+·03±·34
Good	266	76	74	43	19	18	12	11	5	2	2	1	—	—	1	1	1	−·06±·20
Delicate	152	32	41	30	22	10	4	2	5	2	2	1	1	—	—	—	—	+·08±·27
					48	36	20	18	14	4	4	2	1	1	2	1	1	General mean
Totals ...	513	140	137	84	84		68											2·59
Means and deviations	·37	+·13	−·02	−·14	−·12		+·10											(standard deviation of convictions, 2·44.)
Twice probable errors	± —	·08	·08	·10	·10		·12											
Standard deviations	·70	·67	·66	·67	·82		·69											

Health.	Totals.	Fractions of year imprisoned. 0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	Mean imprisonment. Deviations ± twice probable errors.
Robust...	95	17	11	10	10	7	12	9	7	7	5	−·50±·39
Good	266	40	20	31	29	27	27	25	28	28	13	−·12±·23
Delicate	152	10	12	17	16	12	18	17	18	23	8	+·52±·31
		67	43	58	55	46	57	51	53	58	26	General mean
Totals	513	110		113		103		104		84		4·72.
Means and deviations ...	·37	+·18		−·00		+·00		−·08		−·14		(standard deviation of imprisonment, 2·79.)
Twice probable errors ...	± —	·09		·09		·09		·09		·10		
Standard deviations ...	·70	·67		·68		·69		·69		·71		

Correlation of robustness of health with frequency of conviction	Coefficient r (grouping R G) ...	·01±·03
	(grouping G D) ...	−·03±·03
	Ratio η (upon convictions) ...	·15
Correlation of robustness of health with time of imprisonment	Coefficient r (grouping R G) ...	−·12±·03
	(grouping G D) ...	−·16±·03
	Ratio η (upon imprisonment) ...	·16

Table 228.—Correlation of Physique with Grade of Criminality. (Page 188.)

Schedule Records 2,501 to 3,000 *and Supplementary.*

Physique	Totals.	Convictions per year. 0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-	Mean convictions. Deviations ± twice probable errors.
S=Stout and strong...	150	43	35	21	13	12	7	9	7	1	—	—	—	1	1	—	—	+·15±·27
F=Fat	72	24	19	15	6	4	1	2	—	1	—	—	—	—	—	—	—	−·60±·39
T=Spare and muscular	191	49	57	31	14	13	10	6	3	1	2	2	—	—	1	1	1	+·06±·24
W=Spare and weak...	101	24	26	17	15	7	2	2	4	1	2	—	1	—	—	—	—	+·09±·33
Totals ...	514	140	137	84	48	36	20	19	14	4	4	2	1	1	2	1	1	General mean 2·60

Standard deviation of convictions ... ... 2·45

Physique.	Totals.	Fractions of year imprisoned. 0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	Mean imprisonment. Deviations ± twice probable errors.
S=Stout and strong	150	25	12	13	16	13	19	15	15	10	8	− ·24±·31
F=Fat...	72	12	6	12	6	6	8	8	5	8	3	− ·34±·44
T=Spare and muscular ...	191	23	20	26	23	19	19	17	19	18	7	− ·26±·27
U=Spare and weak	101	7	5	7	10	8	11	11	14	22	7	+1·08±·37
Totals	514	67	43	58	55	46	57	51	53	58	25	General mean 4·71.

Standard deviation of imprisonment	2·78
Coefficient of correlation of fatness with frequency of conviction (grouping SF and T W)	−·04±·03
Coefficient of correlation of muscularity with frequency of conviction (grouping ST and F W)	+·07±·03
Coefficient of correlation of fatness with time of imprisonment	−·11±·03
Coefficient of correlation of muscularity with time of imprisonment ...	−·16±·03

Table 231.—Correlation of Weight with Number of Years Imprisoned. (Page 189.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Weight, in pounds.	Totals.	Number of years imprisoned. 0–	2–	4–	6–	8–	10–	12–	14–	16–	18–	20–	22–	24–	26–	28–	30–	32–	34–	36–	38–	40–	42–	46–
100–	9	2	—	3	—	2	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—
110–	64	15	12	8	5	3	1	1	2	1	1	3	—	3	1	1	—	1	2	2	—	—	1	1
120–	143	39	26	24	13	8	4	7	4	1	—	3	—	4	4	1	—	2	—	1	1	1	—	—
130–	160	53	29	20	11	7	3	5	1	5	3	2	7	2	3	7	1	1	—	—	—	—	—	—
140–	125	34	18	20	12	11	7	5	2	3	—	3	2	—	1	3	2	—	1	—	—	—	—	1
150–	78	25	11	9	12	3	5	4	1	—	2	—	1	1	—	1	1	—	—	—	1	1	—	—
160–	42	12	7	6	6	1	—	2	2	2	—	1	2	—	—	—	—	1	—	—	—	—	—	—
170–	17	3	7	1	1	—	1	1	2	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
180–	10	3	1	2	1	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
190–	4	2	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals ...	652	188	112	93	61	35	23	26	14	14	6	13	13	10	9	13	4	5	3	3	2	2	1	2
					96		83					80												
Means and excesses	138·35	+·62	+·62	−1·59	+·32		+4·83					−5·85												
Twice prob. errors	±	1·64	2·12	2 33	2·29		2·47					2·51												
Standard deviation	16·66	—	—	—	—		—					—												

Coefficient of correlation of stature with number of years imprisoned −·091·

Table 232.—Correlation of Weight with Stature. (Page 189.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Stature, in inches.	Totals.	Weight. 100	110	120	130	140	150	160	170	180	190
57	1	—	1	—	—	—	—	—	—	—	—
58	1	—	1	—	—	—	—	—	—	—	—
59	2	1	1	—	—	—	—	—	—	—	—
60	16	2	5	6	2	—	1	—	—	—	—
61	41	3	13	10	11	3	—	1	—	—	—
62	66	3	14	25	14	9	1	—	—	—	—
63	76	—	8	29	26	7	5	1	—	—	—
64	92	—	13	27	33	12	5	1	1	—	—
65	87	—	4	24	24	17	9	5	3	1	—
66	79	—	3	13	16	32	6	7	—	1	1
67	76	—	1	5	17	22	20	5	2	3	1
68	53	—	—	3	10	16	13	8	2	1	—
69	36	—	—	1	8	2	12	8	4	1	—
70	8	—	—	—	—	1	2	2	2	1	—
71	5	—	—	—	—	—	1	2	2	—	—
72	8	—	—	—	—	1	2	2	1	2	—
73	3	—	—	—	—	2	1	—	—	—	—
74	1	—	—	—	—	—	—	—	—	—	1
77	1	—	—	—	—	—	—	—	—	—	1
Totals ...	652	9	64	143	161	124	78	42	17	10	4

Mean stature	65·43 years.
Standard deviation of stature	2·71 ,,
Mean weight	138·33 lbs.
Standard deviation of weight	16·66 ,,

Coefficient of correlation of stature with weight +·630·

Table 233.

Frequencies and Percentages of Marriage and Stature for several Occupational Classes. (Pages 197, 200.)

Schedule Records 1 *to* 3,000.

—	Professional classes.					Commercial classes: clerks and shopkeepers.					Selected classes: soldiers, policemen, messengers, servants.					Labourers: agricultural, roads, quarries, railways.				
Stature in inches.	48-	61-	64-	67-	70-	48-	61-	64-	67-	70-	48-	61-	64-	67-	70-	48-	61-	64-	67-	70-
M = Married	—	11	48	47	20	6	40	111	63	15	2	12	25	11	4	15	83	106	76	10
U = Unmarried ...	1	2	8	16	4	4	32	85	57	8	—	24	50	32	5	21	160	241	148	17
Totals	1	13	56	63	24	10	72	196	120	23	2	36	75	43	9	36	243	347	224	27
% Married	·0	84·6	85·7	74·6	80·0	60·0	55·6	56·6	52·5	65·2	100·0	33·3	33·3	25·6	44·4	41·7	34·2	30·6	33·9	37·0

Marriage.	Sailors and fishermen.					Miners: coal and minerals.					Artisans and factory operatives.					Floating traders and no occupation.					Totals.
Stature in inches.	48-	61-	64-	67-	70-	48-	61-	64-	67-	70-	48-	61-	64-	67-	70-	48-	61-	64-	67-	70-	—
M = Married ...	—	11	23	9	—	3	7	18	16	2	19	107	176	89	16	4	19	41	28	5	1,294
U = Unmarried...	4	20	29	19	2	4	20	35	22	—	22	138	198	88	14	13	44	57	32	5	1,680
Totals ...	4	31	52	28	2	7	27	53	38	2	41	245	374	177	30	17	63	98	60	10	2,974
% Married ...	·0	35·5	43·1	32·1	·0	42·9	25·9	34·0	42·1	100·0	46·3	43·7	47·1	50·3	53·3	23·5	30·2	42·3	46·7	50·0	43·5

Table 234.

Cause of Death and Crime. (Pages 222, 227, 229.)

Causes of death.	Deaths in Prison and released on medical grounds, England and Wales, Males, 1886-7 to 1908-9, 23 years. Ages. 15–	20–	25–	35–	45–	55–	65–	75–	85–	Total.	Released on medical grounds.	Deaths in the general population of Males, aged 15 years and upwards, England and Wales, 1886-1907, 22 years. Ages. 15–	20–	25–	35–	45–	55–	65–	75–	85–	Totals.
Accidental negligence	1	2	10	6	5	7	1	1	—	33	17	16,112	15,867	30,536	31,419	29,695	24,073	16,237	7,185	1,551	172,975
Suicide	16	31	54	56	35	23	6	1	—	222	1	1,137	2,521	7,280	9,459	10,458	9,000	5,135	1,359	131	46,480
Contagious fevers*	1	4	13	8	3	8	1	—	—	38	102	6,574	4,438	8,209	7,949	6,480	5,310	4,099	2,008	309	45,376
Enteric fever	7	11	12	6	2	3	—	—	—	41	30	8,039	8,739	12,931	7,791	4,390	2,325	806	136	3	45,160
Intestinal obstruction, peritonitis ...	4	8	15	20	9	13	4	—	—	73	12	2,575	1,914	3,106	3,383	4,339	5,745	6,239	3,342	424	31,067
Profound anæmias†	—	2	4	1	1	3	3	—	—	14	8	413	429	997	1,692	2,440	2,994	2,060	433	25	11,483
Diabetes mellitus	—	1	6	3	1	3	1	—	—	15	10	1,058	1,263	2,993	3,268	4,533	6,825	6,079	1,865	119	28,003
Alcoholism	—	2	24	24	39	8	5	—	—	102	1	31	406	4,883	8,911	8,411	4,856	1,711	246	7	29,462
Syphilis and aneurism	—	1	9	8	10	5	2	1	—	36	17	140	450	2,897	5,228	5,833	4,245	1,861	430	36	21,120
Apoplexy, &c ‡	3	13	28	41	57	33	20	2	—	197	24	764	970	4,597	13,039	30,535	60,953	90,149	57,230	8,169	266,406
Diseases of the urinary system	6	10	33	38	38	48	20	8	—	201	42	2,665	3,536	10,428	18,459	28,333	39,561	46,274	27,427	4,120	180,803
Cirrhosis of liver	—	—	7	15	13	6	4	—	—	45	13	75	121	2,075	7,750	13,161	13,929	7,978	1,602	66	46,757
Cancer	1	—	3	16	23	28	16	1	—	88	36	1,019	1,464	5,049	15,156	38,788	61,082	56,823	21,429	2,088	202,898
Bronchitis and emphysema	—	—	3	15	30	31	30	13	—	122	24	1,116	1,451	5,921	15,559	39,392	78,211	106,813	72,104	13,862	334,429
Other diseases of the heart and blood vessels	7	7	60	98	88	76	41	12	—	389	57	10,350	9,223	25,782	47,650	84,018	136,034	165,354	89,392	11,938	579,741
Old age	—	—	—	—	—	7	23	20	—	50	42	—	—	—	—	11	5,688	62,602	147,610	59,258	275,169
Pneumonia and influenza	17	44	94	101	75	71	37	8	—	447	10	10,750	13,922	36,511	53,113	61,009	61,895	52,385	25,531	4,073	319,189
Tuberculous diseases§	25	119	183	142	85	69	28	1	—	652	349	40,290	61,360	128,136	124,348	94,915	52,150	18,110	2,428	125	521,862
Insanity‖	—	—	2	16	6	4	—	—	—	28	36	356	539	4,839	2,820	9,985	6,780	6,498	3,651	584	36,062
Epilepsy	1	8	27	32	18	6	1	—	—	93	11	2,292	2,474	4,935	4,931	4,248	3,733	3,078	1,475	202	27,418
Other causes	8	19	32	29	33	18	17	6	—	162	78	17,306	15,057	31,055	51,549	48,327	57,739	54,416	28,398	4,830	308,677
Deaths from all causes	97	282	619	675	571	470	260	74	—	3,048	920	123,062	146,144	333,160	433,524	529,301	643,128	714,707	495,591	111,920	3,530,537

* Small-pox, measles, scarlet fever, typhus, erysipelas, septicæmia, pyæmia and phagedæna, rheumatic fever diphtheria.
† Pernicious anæmia, lymphadenoma, leucocythæmia, Hodgkin's disease, &c.
‡ Cerebral hæmorrhage, cerebral embolism and hemiplegia.
§ Pulmonary tuberculosis, phthisis, tuberculous meningitis, tuberculous peritonitis, tabes mesenterica, tubercle of other organs and general tuberculosis.
‖ Including general paralysis of the insane.

Tables 237.

Correlation of Number of Reports with Nature of Crime. (Page 239.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Reports.	Crimes.					Totals.
	Damage to property.	Stealing and burglary.	Sexual offences.	Violence to person.	Forgery and fraud.	
0	23	97	33	90	71	314
1	17	68	25	38	27	175
2	4	30	11	19	7	71
3	2	21	7	16	7	53
4	3	22	8	7	3	43
5	4	10	3	4	2	23
6	1	19	1	9	6	36
7	3	5	3	1	1	13
8	4	8	—	2	1	15
9	2	6	1	—	1	10
10	—	4	1	1	1	7
12	1	8	—	1	—	10
13	—	1	1	—	—	2
15	—	2	—	—	—	2
16	—	—	—	1	—	1
18	—	1	—	—	—	1
19	—	—	—	1	—	1
20	—	3	—	—	—	3
24	—	1	—	—	—	1
28	—	1	—	—	—	1
30	—	1	—	—	—	1
36	—	—	—	1	—	1
38	1	—	—	—	—	1
—	65	308	94	191	127	785

Correlation of Number of Reports with Mental Grade. (Page 239.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Reports.	Mental grades.					Totals.
	Intelligent.	Fairly intelligent.	Unintelligent.	Weakminded.	Imbecile.	
0	119	100	61	27	7	314
1	53	59	36	18	8	174
2	10	27	16	18	1	72
3	13	18	14	7	1	53
4	12	12	8	10	1	43
5	2	3	5	10	3	23
6	4	11	8	11	2	36
7	—	1	3	7	2	13
8	—	2	3	8	2	15
9	1	2	—	5	2	10
10	1	1	2	2	1	7
12	—	4	3	3	—	10
13	1	1	—	—	—	2
15	—	—	—	2	—	2
16	—	—	—	1	—	1
18	—	—	—	1	—	1
19	—	—	—	1	—	1
20	—	1	—	2	—	3
24	—	—	1	—	—	1
28	—	—	—	1	—	1
30	—	—	—	1	—	1
36	—	1	—	—	—	1
38	—	—	—	—	1	1
—	216	243	160	135	31	785

Table 238.—Correlation of Weakmindedness with Suspiciousness (grouping I with F, and U with W and Imb.). (Page 250.)

Schedule Records 2,501 *to* 3,000.

Character.	Mental grades.					Totals.
	Intelligent.	Fairly intelligent.	Unintelligent.	Weakminded.	Imbecile.	
Suspicious	34	48	60	55	13	210
Not suspicious	109	90	60	24	5	288
Totals	143	138	120	79	18	498
Means	—·63	—·35	·00	·46	·52	—·20

Coefficient of correlation of weakmindedness with suspiciousness ... ·457

Table 239.—Correlation of Weakmindedness with Discontent, grouping I and F, U W and Imb. (Page 250.)

Frequencies and means.

Character.	Mental grades.					Totals.
	Intelligent.	Fairly intelligent.	Unintelligent.	Weakminded.	Imbecile.	
Discontented	23	41	44	32	10	150
Not discontented ...	120	97	76	47	8	348
Totals	143	138	120	79	18	498
Means	—·94	—·51	—·32	—·23	·13	—·52

Coefficient of correlation of weakmindedness with discontentment ... ·296

TABLE 240.

CORRELATION OF WEAKMINDEDNESS WITH FACILITY (GROUPING I WITH F, AND U WITH W AND IMB.). (Page 250.)

Schedule Records 2,501 *to* 3,000.

"I" = Intelligent. "F" = Fairly intelligent. "U" = Unintelligent. "W" = Weakminded. "Imb." = Imbecile.

Characters.	Mental grades.					Totals.
	I	F	U	W	Imb.	
Facile	19	28	47	42	12	148
Not facile	123	110	72	37	6	348
Totals	142	138	119	79	18	496
Means	-·95	-·71	-·23	·07	·37	-·53

Coefficient of correlation of weakmindedness with facility ... ... ·510

TABLE 241.

CORRELATION OF WEAKMINDEDNESS WITH EGOTISM (GROUPING I WITH F, AND U WITH W AND IMB.). (Page 250.)

Schedule Records 2,501 *to* 3,000.

Characters.	Mental grades.					Totals.
	Intelligent.	Fairly intelligent.	Unintelligent.	Weak-minded.	Imbecile.	
Egotistic	50	31	22	24	2	129
Not egotistic	93	107	98	55	16	369
Totals	143	138	120	79	18	498
Means	-·88	-·75	-·90	-·51	-1·21	-·65

Coefficient of correlation of weakmindedness with egotism ... -·130

TABLE 242.

CORRELATION OF WEAKMINDEDNESS WITH BAD TEMPER (GROUPING I WITH F, AND U WITH W AND IMB.). (Page 243.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

"I" = Intelligent. "F" = Fairly intelligent. "U" = Unintelligent. "W" = Weakminded. "Imb." = Imbecile.

Characters.	Mental grades.					Totals.
	I	F	U	W	Imb.	
Bad temper	88	154	101	86	18	447
Not bad temper	129	94	64	54	15	356
Totals	217	248	165	140	33	803
Means	-·24	·31	·29	·29	·12	·14

Coefficient of correlation of weakmindedness with bad temper ... ... ·136.

TABLE 243.

CORRELATION OF WEAKMINDEDNESS WITH HOT TEMPER (GROUPING I WITH F, AND U WITH W AND IMB.). (Page 243.)

Schedule Records 2,501 to 3,000 and Supplementary.

"I" = Intelligent. "F" = Fairly intelligent. "U" = Unintelligent.
"W" = Weakminded. "Imb." = Imbecile.

Character.	Mental grades.					Totals.
	I	F	U	W	Imb.	
Hot tempered	37	53	26	21	5	142
Not hot tempered ...	180	195	139	119	28	661
Totals	217	248	165	140	33	803
Means	·95	·79	1·01	1·04	1·04	·93

Coefficient of correlation of weakmindedness with hot temper ... ... −·096·

TABLE 244.

CORRELATION OF WEAKMINDEDNESS WITH SULLEN TEMPER (GROUPING I WITH F, AND U WITH W AND IMB.). (Page 243.)

Schedule Records 2,501 to 3,000 and Supplementary.

"I" = Intelligent. "F" = Fairly intelligent. "U" = Unintelligent.
"W" = Weakmindedness. "Imb." = Imbecile.

Character.	Mental grades.					Totals.
	I	F	U	W	Imb.	
Sullen tempered	38	72	64	46	10	230
Not sullen tempered ...	179	176	101	94	23	573
Totals	217	248	165	140	33	803
Means	·93	·53	·29	·44	·52	·57

Coefficient of correlation of weakmindedness with sullen temper ... ... +·212·

TABLE 245.

CORRELATION OF WEAKMINDEDNESS WITH VIOLENT TEMPER (GROUPING I WITH F, AND U WITH W AND IMB.). (Page 243.)

Schedule Records 2,501 to 3,000 and Supplementary.

"I" = Intelligent. "F" = Fairly intelligent. "U" = Unintelligent.
"W" = Weakminded. "Imb." = Imbecile.

Character.	Mental grades.					Totals.
	I	F	U	W	Imb.	
Violent tempered ...	13	29	10	19	3	75
Not violent tempered ...	204	219	154	121	30	728
Totals	217	248	164	140	33	803
Means	1·56	1·19	1·50	1·10	1·34	1·32

Coefficient of correlation of weakmindedness with violent temper ... +·048

Table 249.

Correlation of Weakmindedness with Insanity (grouping I with F, and U with W and Imb.). (Page 250.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

"I" = Intelligent. "F" = Fairly intelligent. "U" = Unintelligent.
"W" = Weakminded. "Imb." = Imbecile.

Character.	Mental grades.					Totals.
	I	F	U	W	Imb.	
Insane	6	16	9	45	12	88
Not Insane	208	225	154	92	20	699
Totals	214	241	163	137	32	787
Means	−1·68	−1·33	−1·41	−·39	−·28	−1·22

Coefficient of correlation of weakmindedness with insanity ... ... ·472.

Table 250.

Correlation of Suspiciousness with Grade of Criminality. (Page 245.)

Schedule Records 2,501 *to* 3,000.

Character.	Totals.	Convictions per year.														Mean Convictions. Dev'ns ± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	18–	
T. Trustful	73	26	17	10	5	4	4	4	2	—	—	—	—	—	1	−·14 ± ·38
I. Intermediate... ...	126	40	27	23	11	10	2	3	3	2	2	1	1	1	—	−·01 ± ·29
S. Suspicious	148	33	41	23	18	13	6	6	3	2	2	1	—	—	—	+·08 ± ·27
Totals	347	99	85	56	34	27	12	13	8	4	4	2	1	1	1	General mean 2·61

Character.	Totals.	Fractions of year imprisoned										Mean Imprisonment. Dev'ns ± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	
T. Trustful	73	9	10	8	6	4	12	6	8	7	3	−·05 ± ·44
I. Intermediate... ...	126	16	7	17	14	13	11	12	14	15	6	+·18 ± ·33
S. Suspicious	148	20	13	22	15	18	11	17	10	16	7	−·12 ± ·31
Totals	347	45	30	47	35	35	34	35	32	38	16	General mean 2·60

Standard deviation of convictions ... ... 2·43
Standard deviation of imprisonment ... ... 2·76
Coefficient of correlation of suspiciousness with frequency of conviction (grouping I S) ... ... +·04 ± ·04
(Grouping T I) ... +·04 ± ·04
Coefficient of correlation of suspiciousness with time of imprisonment (grouping I S) ... ... +·01 ± ·04
(Grouping T I) ... −·05 ± ·04

Table 251.

Correlation of Temperament with Grade of Criminality. (Page 245.)

Schedule Records 2,501 *to* 3,000.

Character.	Totals.	Convictions per year														Mean convictions Dev'ns ± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	18–	
S. Sanguine	90	36	16	13	5	8	4	5	1	1	—	—	—	—	1	−·20 ± ·35
I. Intermediate ...	71	24	17	12	8	4	2	—	1	1	2	—	—	—	—	−·36 ± ·39
M. Melancholic ...	186	39	52	31	21	15	6	8	6	2	2	2	1	1	—	+·23 ± ·24
Totals	347	99	85	56	34	27	12	13	8	4	4	2	1	1	1	General mean 2·61

TABLE 251—*continued.*

Character.		Totals.	Fractions of year imprisoned.										Mean imprisonment Dev'ns ± 2 p.e.
			0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	
S. Sanguine ...	...	90	13	8	11	10	4	7	9	10	12	6	+ 18 ± ·39
I. Intermediate	...	71	11	6	10	13	7	7	5	2	9	1	− ·53 ± ·44
M. Melancholic	...	186	21	16	26	12	24	20	21	20	17	9	+ ·11 ± ·27
Totals ...	...	347	45	30	47	35	35	34	35	32	38	16	General mean 4·60

Standard deviation of convictions ... ... 2·43
Standard deviation of imprisonment ... ... 2·76
Coefficient of correlation of melancholic temperament with frequency of conviction (grouping I M) ... ... + ·07 ± ·04
(Grouping S I) ... + ·13 ± ·03
Coefficient of correlation of melancholic temperament with time of imprisonment (grouping I M) ... ... − ·05 ± ·04
(Grouping (S I) ... + ·06 ± ·04

TABLE 252.—CORRELATION OF DISCONTENTMENT WITH GRADE OF CRIMINALITY.
(Page 245.)
Schedule Records 2,501 *to* 3,000.

Character.		Totals.	Convictions per year.														Mean convictions Dev'ns ± 2 p.e.
			0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	18–	
H. Contented ...	...	73	33	12	11	2	5	3	4	1	1	—	—	—	—	1	− ·30 ± ·38
I. Intermediate	...	116	21	35	20	17	9	5	3	3	2	1	—	—	—	—	+ ·05 ± ·30
D. Discontented	...	158	45	38	25	15	13	4	6	4	1	3	2	1	1	—	+ ·10 ± ·26
Totals ...	...	347	99	85	56	34	27	12	13	8	4	4	2	1	1	1	General mean 2·61

Character.		Totals.	Fractions of year imprisoned.										Mean imprisonment Dev'ns ± 2 p.e.
			0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	
H. Contented ...	...	73	15	7	5	10	4	6	4	9	8	5	− ·14 ± ·44
I. Intermediate	...	116	8	9	24	10	17	6	9	10	16	7	+ ·23 ± ·35
D. Discontented	...	158	22	14	18	15	14	22	23	13	14	4	− ·10 ± ·30
Totals ...	...	347	45	30	47	35	35	34	36	32	38	16	General mean 4·60

Standard deviation of convictions ... ... 2·43
Standard deviation of imprisonment ... ... 2·76
Coefficient of correlation of discontentment with frequency of conviction (grouping I D) ... ... + ·17 ± ·04
(Grouping H I) ... + ·05 ± ·04
Coefficient of correlation of discontentment with time of imprisonment (grouping I D) ... ... + ·07 ± ·04
(Grouping H I) ... − ·04 ± ·04

TABLE 253.—CORRELATION OF EGOTISTIC TEMPERAMENT WITH GRADE OF CRIMINALITY.
(Page 245.)
Schedule Records 2,501 *to* 3,000.

Character.		Totals.	Convictions per year.														Mean convictions. Dev'ns ± 2 p.e.
			0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	18–	
S. Sympathetic	...	13	6	2	1	1	1	1	—	1	—	—	—	—	—	—	− ·34 ± ·91
I. Intermediate	...	250	72	60	46	23	18	8	8	6	3	3	1	1	1	—	− ·07 ± ·21
E. Egotistic ...	...	84	21	23	9	10	8	3	5	1	1	1	1	—	—	1	+ ·27 ± ·36
Totals ...	...	347	99	85	56	34	27	12	13	8	4	4	2	1	1	1	General mean. 2·61

TABLE 253—*continued.*

Character.	Totals.	Fractions of year imprisoned										Mean imprisonment. Dev'ns ± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	
S. Sympathetic ...	13	1	2	2	2	—	1	2	1	2	—	−·10 ± 1·03
I. Intermediate ...	250	37	19	29	28	28	28	22	23	23	12	−·09 ± ·24
E. Egotistic	84	7	9	16	5	7	5	11	8	13	4	+·27 ± ·40
Totals	347	45	30	47	35	35	34	35	32	38	16	General mean. 4·60

Standard deviation of convictions ... ... 2·43
Standard deviation of imprisonment ... ... 2·76
Coefficient of correlation of egotism with frequency of conviction (grouping S I) ... ... + ·09 ± ·04
Coefficient of correlation of egotism with time of imprisonment (grouping S I) ... ... + ·04 ± ·04

TABLE 254.—CORRELATION OF TEMPER WITH GRADE OF CRIMINALITY. (Page 245.)
Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Temper.	Totals.	Convictions per year.																Mean convictions. Dev'ns ± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	14–	15–	18–	
Hot	112	33	22	17	12	7	5	7	5	1	1	—	—	1	—	—	1	+ ·31 ± ·31
Sullen	178	36	59	30	21	12	7	4	4	1	1	1	—	—	1	1	—	− ·00 ± ·25
Serene...	224	71	56	37	15	17	8	8	5	2	2	1	1	—	1	—	—	− ·15 ± ·22
Totals	514	140	137	84	48	36	20	19	14	4	4	2	1	1	2	1	1	General mean 2·60

Temper.	Totals.	Fractions of year imprisoned.										Mean imprisonment. Dev'ns ± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	
Hot	112	16	9	14	11	13	12	9	15	11	2	− ·23 ± ·35
Sullen	178	24	16	26	12	19	21	20	14	19	8	− ·16 ± ·28
Serene	224	27	18	18	32	14	24	22	24	28	16	+ ·24 ± ·25
Totals	514	67	43	58	55	46	57	51	53	58	26	General mean 4·72

Standard deviation of convictions ... ... 2·45
Standard deviation of imprisonment ... ... 2·78

Coefficient of correlation of hot temper with frequency of conviction (grouping sullen with serene) ... ... + ·09 ± ·03
Coefficient of correlation of hot temper with frequency of conviction (grouping sullen with hot) ... ... + ·07 ± ·03
Coefficient of correlation of hot temper with time of imprisonment (grouping sullen with serene) ... ... − ·06 ± ·03
Coefficient of correlation of hot temper with time of imprisonment (grouping sullen with hot) ... ... − ·10 ± ·03

TABLE 255.—CORRELATION OF OBSTINATE TEMPERAMENT WITH GRADE OF CRIMINALITY.
(Page 245.)
Schedule Records 2,501 *to* 3,000.

Character.	Totals.	Convictions per year.														Mean convictions. Devn's ± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	18–	
F. Facile	113	27	30	18	12	8	5	5	2	2	1	2	—	—	1	+·24 ± ·31
I. Intermediate ...	144	52	32	25	8	11	3	7	2	1	2	—	1	—	—	−·31 ± ·27
O. Obstinate	90	20	23	13	14	8	4	1	4	1	1	—	—	1	—	+·19 ± ·35
Totals	347	99	85	56	34	27	12	13	8	4	4	2	1	1	1	General mean 2·61

Table 257.

Present Offences of 948 Convicts, and Distributions, adjusted to a 10% total of Mental Defectives, in Three Mental Grades. (Pages 257, 258.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Nature of Crime.	Totals.	Mental grades.			Percentage of Mental Defectives.
		Intelligent and fairly intelligent.	Intermediate or Unintelligent.	Mentally Defective.	
Murder and murderous intent ...	74	52	15	7	9·46
Manslaughter	40	35	3	2	5·00
Wounding and intent to wound ... / Striking superior officer	69	53	14	2	2·90
Robbery with violence ... ... / Burglary with violence	32	19	8	5	15·63
Stealing	156	78	61	17	10·90
Burglary	190	113	58	19	10·00
Receiving	59	42	14	3	5·08
Poaching	5	4	0	1	20·00
Coining	30	24	5	1	3·33
Arson	12	8	2	2	16·67
Firing of stack	34	7	9	18	52·94
Maiming (animals)	4	2	1	1	25·00
Wilful damage	5	4	0	1	20·00
Rape (child)	57	26	22	9	15·79
Rape (adult)	30	17	11	2	6·67
Unnatural (sexual) offences	14	6	6	2	14·29
Fraud	78	72	5	1	12·82
Embezzlement	8	8	0	0	0·00
Forgery	19	17	2	0	0·00
Fraudulence as trustee	7	7	0	0	0·00
Bigamy	5	5	0	0	0·00
Performing illegal operation ...	6	6	0	0	0·00
Blackmail	14	10	2	2	14·29
Totals	948	615	238	95	10·00
General population	—	—	—	—	0·46

Table 258.

Correlation of Nationality with Grade of Criminality. (Page 272.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Nationality.	Totals.	Convictions per year.																Mean convictions. Devs. ± 2 p.e.	
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	14–	15–	18–		
English, Welsh, Scotch	422	109	115	69	41	32	16	17	10	4	2	2	1	—	2	1	1	+·03	·16
Irish, or Irish and preceding ...	53	14	11	14	4	3	2	1	1	—	2	—	—	1	—	—	—	+·11	·45
Foreign, or foreign and preceding	31	14	9	1	2	—	2	1	2	—	—	—	—	—	—	—	—	—·58	·59
Jew, or Jew and preceding ...	8	3	2	—	1	1	—	—	1	—	—	—	—	—	—	—	—	—·10	1·17
Totals	514	140	137	84	48	36	20	19	14	4	4	2	1	1	2	1	1	General mean 2·60	

Nationality.	Totals.	Fractions of year imprisoned.										Mean imprisonment. Devs. ± 2 p.e.	
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–		
English, Welsh, Scotch	422	59	32	51	47	31	43	41	42	51	25	+·02	·18
Irish, or Irish and preceding ...	53	5	7	4	3	7	11	5	6	3	1	—·14	·52
Foreign, or foreign and preceding	31	3	2	3	5	6	3	3	5	2	—	—·12	·66
Jew, or Jew and preceding ...	8	—	2	—	—	2	—	2	—	2	—	+·53	1·33
Totals	514	67	43	53	55	46	57	51	53	58	26	General mean 4·72	

TABLE 259.—CORRELATION OF REGULARITY OF EMPLOYMENT WITH GRADE OF CRIMINALITY.
(Page 272.)

Schedule Records 2,501 to 3,000 and Supplementary.

Irregularity of employment being measured on a normal scale in which O has a range from O to I.
R = worked regularly. O = worked occasionally. N = voluntarily unemployed.
W = Unemployable.

Regularity of employment.	Totals.	Convictions per year. 0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12-	13–	14–	15–	18–	Mean convictions. Deviations ± 2 p.e.
R	91	57	11	9	5	3	3	3	—	—	—	—	—	—	—	—	—	− 1·13 ± ·35
O	148	32	42	28	12	10	5	4	4	1	1	—	1	—	1	1	1	+ ·19 ± ·26
N	154	32	47	24	18	12	4	6	3	2	2	1	—	1	—	—	—	+ ·14 ± ·27
W	126	19	37	28	13	11	8	6	5	1	1	1	—	—	1	—	—	+ ·42 ± ·29
Totals	514	140	137	84	48	36	20	19	14	4	4	2	1	1	2	1	1	General mean
					84		69											2.60
General mean of irregularity and deviations of means ...	1·06	− ·64	+ ·23	+ ·10	+ ·25		+ ·31											Standard deviation of convictions
Twice probable errors	±	·15	·15	·19	·19		·21											
Standard deviations...	1·26	1·72	·90	·92	1·06		·99											2·45

Regularity of employment.	Totals.	Fractions of year imprisoned. 0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	Mean convictions. Deviations ± 2 p.e.
R	91	23	10	10	11	6	5	7	7	2	1	− 1·71 ± ·39
O	148	15	8	19	27	19	27	15	14	13	6	+ ·01 ± ·31
N	154	9	13	14	11	12	28	19	18	20	11	+ ·87 ± ·30
W	126	11	12	15	16	9	17	10	14	14	6	+ ·17 ± ·34
Total	514	67	42	58	55	46	57	51	53	58	26	General mean
		110		113		103		104		84		4·72
General mean of irregularity and deviations of means ...	1·06	− ·50		− ·06		+ ·06		+ ·18		+ ·48		Standard deviation of imprisonment
Twice probable errors	±	·17		·16		·17		·17		·19		
Standard deviations...	1·26	1·64		1·11		·93		1·13		·86		2·79

Correlation of irregularity of employment with frequency of conviction. Coefficient r (grouping R O and N W) ... ·15 ± ·03. Ratio η (upon convictions) ... ·31.
Correlation of irregularity of employment with time of imprisonment. Coefficient r (grouping R O and N W) ... ·27 ± ·03. Ratio η (upon imprisonment) ... ·24.

TABLE 260.—CORRELATION OF REGULARITY OF EMPLOYMENT WITH MENTAL GRADE.
(Page 272.)

Schedule Records 2,501 to 3,000 and Supplementary.

Intelligence being measured on a normal scale in which *unintelligent* has a range from O to I.
Symbols of Intelligence Categories as in Table 249.
Symbols of Employment Categories as in Table 259.

Regularity of employment.	Totals	Mental grades. I	F	U	W	Imb.	Mean intelligence. Deviations ± 2 p.e.
R	90	35	33	13	8	1	+ 1·14 ± ·17
O	144	20	46	41	33	4	− ·17 ± ·14
N	154	50	56	30	16	2	+ ·67 ± ·13
W	124	2	16	29	55	22	− 1·45 ± ·15
Totals	512	107	151	113	112	29	General mean ·04
							Standard deviation of intelligence 1·71

Coefficient of correlation of irregularity of employment with intelligence. Coefficient r (grouping R O and N W, and I F and U W Imb.) ... − ·20.

Table 261.

Correlation of School with Grade of Criminality. (Page 274.)

Schedule Records 2,501 to 3,000 and Supplementary.

School.	Totals.	Convictions per year.																Mean Convictions. Deviations ± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	14–	15–	18–	
Elementary	322	78	92	54	28	26	10	13	10	3	3	1	1	—	2	—	1	+·09±·18
Secondary	44	22	6	5	5	2	1	2	—	—	1	—	—	—	—	—	—	−·63±·50
Industrial	24	7	6	4	1	1	3	1	1	—	—	—	—	—	—	—	—	−·06±·67
Reformatory... ...	49	7	12	12	6	5	2	2	1	—	—	1	—	—	—	1	—	+·50±·47
Nil	74	25	21	9	8	2	4	1	2	1	—	—	—	1	—	—	—	−·32±·38
Totals ...	513	139	137	84	48	36	20	19	14	4	4	2	1	1	2	1	1	General mean 2·60

School.	Totals.	Fractions of year imprisoned.										Mean Imprisonment Deviations ± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	
Elementary	322	43	30	36	32	28	28	31	36	37	19	·01±·21
Secondary	44	5	3	7	2	2	7	7	4	5	2	·18±·57
Industrial	24	—	2	1	4	1	5	5	3	1	2	·86±·77
Reformatory	49	3	2	7	6	3	6	5	7	8	2	·61±·54
Nil...	74	15	6	7	11	12	11	3	3	7	1	−·80±·43
Totals	513	66	43	58	55	46	57	51	53	58	26	General mean 4·73

Standard deviation of convictions... ... ... 2·45

Standard deviation of imprisonment ... ... 2·78

Correlation ratio of frequency of conviction with school... ... ... ·114

Correlation ratio of time of imprisonment with school ... ... ·148

Table 262.

Correlation of School with Mental Grade. (Page 274.)

Schedule Records 2,501 to 3,000 and Supplementary.

Measuring intelligence as in Table 260.

Symbols of Intelligence as in Table 249.

School	Totals.	Mental grades.					Mean Intelligence Deviations ± 2 p.e.
		I.	F.	U.	W.	Imb.	
Elementary	316	60	104	64	73	15	− ·16±·01
Secondary	45	32	9	2	2	—	+3·46±·35
Industrial	24	1	5	9	6	3	− ·93±·48
Reformatory	48	6	14	14	9	5	− ·52±·34
Nil	78	8	19	24	21	6	− ·75±·27
Totals	511	107	151	113	111	29	General mean 1·25

Correlation ratio of intelligence with school ... ... ·523

TABLE 264.

CORRELATIONS OF STANDARD ON LEAVING SCHOOL WITH GRADE OF CRIMINALITY, AND WITH MENTAL GRADE. (Page 276.)

Schedule Records 2,501 *to* 3,000.

Symbols of Mental Categories as in Table 249.

Standard on leaving school.	Totals.	Convictions per year. 0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	14–	15–	18–
1	12	3	1	5	1	1	—	—	—	—	1	—	—	—	—	—	—
2	40	15	7	5	5	1	3	1	3	—	—	—	—	—	—	—	—
3	58	16	12	12	6	5	1	4	—	—	—	—	—	1	1	—	—
4	114	22	35	19	10	10	6	2	6	—	1	1	1	—	—	1	—
5	60	13	19	12	7	4	2	3	—	—	—	—	—	—	—	—	—
6	71	15	19	12	7	8	2	5	2	2	2	—	—	—	—	—	—
7	73	27	20	7	3	4	2	3	1	1	—	1	—	1	—	—	—
Totals	428	111	113	72	39	33	16	18	12	3	4	2	1	2	1	1	—
					72							60					
Mean standard on leaving school: general mean and deviations.	5·08	+·05	+·21	−·29	−·11		−·00										
Twice probable errors...	±	·21	·21	·26	·26		·28										
Standard deviation	1·64	—	—	—	—												

Standard on leaving school.	Totals.	Fractions of year imprisoned. 0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	Totals.	Mental grades. I	F	U	W	Imb.
1	12	1	—	3	2	1	—	2	2	1	—	12	—	2	7	3	—
2	40	8	3	9	3	1	5	4	—	4	3	41	1	9	10	14	7
3	58	9	7	6	7	6	5	5	7	2	4	57	5	18	14	15	5
4	114	16	8	13	8	9	12	11	18	18	1	114	18	28	34	26	8
5	60	3	5	3	10	7	10	4	7	6	5	58	11	26	9	11	1
6	71	2	6	6	10	2	9	12	7	11	6	70	19	27	10	13	1
7	73	11	6	10	4	8	4	9	9	8	4	73	45	18	4	6	—
Totals	428	50	35	50	44	34	45	47	50	50	23	425	99	128	88	88	22
		85		94		79		97		73		—	—	—	—	—	—
Mean standard on leaving school. general mean and deviations.	5 08	−·18		−·20		+·04		+·15		+·22		4·57	+1·22	+·15	−·73	−·52	−1·30
Twice probable errors ...	±	·24		·23		·25		·22		·26		±	·48	1·96	·24	·24	·47
Standard deviation ...	1·64	—		—		—		—		—		1·65	—	—	—	—	—

Coefficient of correlation of standard on leaving school with frequency of conviction ... ... −·026 ± ·033

Coefficient of correlation of standard on leaving school with time of imprisonment ... ... +·104 ± ·032

Coefficient of correlation of standard on leaving school with intelligence +·479 ± ·032

TABLE 265.

CORRELATIONS OF PRESENT DEGREE OF EDUCATION WITH GRADE OF CRIMINALITY, AND WITH MENTAL GRADE. (Page 276.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Symbols of Mental Categories as in Table 249.

Present degree of education.	Totals.	Convictions per year. 0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	14–	15–	18–
0	32	12	6	6	3	—	2	—	3	—	—	—	—	—	—	—	—
1, 2, 3	70	21	20	12	6	2	4	2	—	1	1	—	—	1	—	—	—
4, 5, 6	85	23	20	20	5	9	3	3	2	—	—	—	—	—	—	—	—
7, 8, 9	114	32	32	13	10	11	4	5	2	2	1	1	—	—	1	—	—
10, 11, 12	161	33	47	28	17	9	6	8	7	1	2	1	—	—	—	1	1
13, 14, 15	10	2	4	1	2	1	—	—	—	—	—	—	—	—	—	—	—
16, 17, 18	17	5	4	2	2	1	1	—	—	—	—	—	1	—	1	—	—
19, 20, 21	13	8	1	1	1	1	—	1	—	—	—	—	—	—	—	—	—
Totals	502	136	134	83	46	34	20	19	14	4	4	2	1	1	2	1	1
					80							69					
Mean present degree of education: general mean and deviations.	7·78	−·15	+·06	−·57	+·60		+·18										
Twice probable errors...	±	·53	·53	·68	·69		·74										
Standard deviation	4·58	—	—	—	—		—										

TABLE 265—*continued.*

Present degree of education.	Totals.	Fractions of year imprisoned.										Totals	Mental grades.				
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–		I	F	U	W	Imb.
0	32	6	4	7	3	1	5	2	1	2	1	32	3	6	8	5	10
1, 2, 3	70	14	5	6	10	9	5	10	—	7	3	70	3	22	18	24	3
4, 5, 6	85	19	6	10	12	8	5	3	13	5	3	84	4	23	33	18	6
7, 8, 9	114	13	10	16	9	7	14	12	10	14	8	111	22	30	29	19	11
10, 11, 12	161	8	12	16	17	19	17	18	24	26	6	162	47	56	24	32	3
13, 14, 15	10	2	2	—	2	—	1	1	1	2	1	10	2	5	—	2	1
16, 17, 18	17	—	2	1	1	1	6	2	1	1	1	18	10	5	1	2	—
19, 20, 21	13	5	—	—	—	—	—	—	—	—	—	15	12	3	—	—	—
Totals	502	67	42	58	54	45	54	49	51	57	25	502	103	150	113	102	34
		109		112		99		100		82							
Mean present degree of education: general mean and deviations.	7·78	−·78		−·70		+·31		+·73		+·73		7·86	+3·35	+·30	−1·61	−1·00	−3·12
Twice probable errors ...	±	·59		·58		·62		·63		·68		±	·69	·51	·59	·62	1·08
Standard deviation ...	4·58	—		—		—		—		—		4·66	—	—	—	—	—

Coefficient of correlation of present degree of education with frequency of conviction ... ... = +·059 ± ·030

Coefficient of correlation of present degree of education with time of imprisonment ... ... = +·152 ± ·029

Coefficient of correlation of present degree of education with intelligence = +·418 ± ·030.

TABLE 266.

CORRELATION OF ALCOHOLISM WITH GRADE OF CRIMINALITY. (Page 277.)

Schedule Records **2,501** *to* **3,000,** *and Supplementary.*

Alcoholism being measured on a scale giving a normal distribution with alcoholic +, temperate −, and where s.d. = unity.

Character.	Totals.	Convictions per year.																Mean convictions. Dev's ± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	13–	14–	15–	18–	
Alcoholic	332	88	88	53	35	25	11	10	10	2	4	1	1	1	1	1	1	+·07 ± ·18
Temperate	156	50	36	29	11	9	7	8	3	2	—	—	—	—	1	—	—	−·19 ± ·26
Abstinent	29	5	11	3	3	2	2	1	1	—	—	1	—	—	—	—	—	+·22 ± ·61
Totals	517	143	135	85	49	36	20	19	14	4	4	2	1	1	2	1	1	General mean. 2·59
					85							69						
Means and deviations	·37	−·07	+·02	−·05	+·18		−·03											
Twice probable errors	±	·11	·12	·15	·15		·16											

Character.	Totals.	Fractions of year imprisoned.										imprisonment Dev's ± 2 p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	
Alcoholic	332	44	28	33	41	32	44	31	29	32	19	−·06 ± ·21
Temperate	156	19	13	22	14	13	12	14	18	23	7	+·10 ± ·30
Abstinent	29	5	2	3	2	1	1	6	6	3	—	+·11 ± ·70
Totals	517	68	43	58	57	46	57	51	53	58	26	General mean. 4·70
		111		115		103		104		84		
Means and deviations ...	·37	+·01		−·01		+·26		−·18		−·10		
Twice probable errors ...	±	·13		·13		·13		·13		·15		

Standard deviation of convictions ... ... 2·44

Standard deviation of imprisonment ... ... 2·79

Correlation of alcoholism with frequency of conviction. Coefficient r (grouping T and Abs.) ... ... ·049 ± ·030

Ratio η (upon convictions) ·086

Correlation of alcoholism with time of imprisonment. Coefficient r (grouping T and Abs.) ... ... −·036 ± ·030

Ratio η (upon imprisonment) ·147

TABLE 267.—CORRELATION OF ALCOHOLISM WITH MENTAL GRADE. (Page 277.)
Schedule Records 2,501 *to* 3,000.
Measuring intelligence as in Table 260. Measuring alcoholism as in Table 266.
Symbols of Mental Categories as in Table 249.

Character.	Totals.	Mental grades					Mean intelligence. Dev's ±2 p.e.	
		I	F	U	W	Imb.		
Alcoholic ...	228	44	63	62	51	8	−·13	±·11
Temperate ...	97	29	29	21	11	7	+·35	±·16
Abstinent ...	22	6	4	6	5	1	−·19	±·35
Totals ...	347	79	96	89	67	16	General mean. 1·03	

Coefficient of correlation of alcoholism with intelligence (grouping I with F, and U with W and Imb., and T with Abs.) ... ... −·143

TABLE 268.—CORRELATION OF ORDER IN FAMILY WITH GRADE OF CRIMINALITY. (Page 280.)
Schedule Records 2,501 *to* 3,000.

Order in family.	Totals.	Convictions per year.																Fractions of year imprisoned.									
		0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-
1	136	41	34	23	11	8	3	5	6	—	2	2	—	1	—	—	—	15	14	8	16	11	16	14	15	20	7
2	108	27	28	17	11	5	8	4	3	3	—	—	—	—	—	1	1	16	10	13	10	6	13	11	9	10	10
3	66	19	22	9	6	6	1	—	2	—	1	—	—	—	—	—	—	8	6	8	7	9	9	7	8	2	2
4	44	11	11	10	5	6	—	1	—	—	—	—	—	—	—	—	—	9	1	6	6	3	3	4	7	3	2
5	49	15	9	10	5	4	2	2	1	—	—	—	—	—	1	—	—	6	2	6	5	6	4	7	5	7	2
6	27	6	10	1	3	—	1	5	—	—	1	—	—	—	—	—	—	2	5	3	2	2	3	3	2	3	1
7	17	4	6	2	—	3	—	1	1	—	—	—	—	—	—	—	—	4	2	3	—	—	1	2	2	2	1
8	14	3	4	3	2	—	1	—	1	—	—	—	—	—	—	—	—	2	1	—	4	1	2	2	1	1	—
9	12	2	3	4	1	1	—	—	—	—	—	—	1	—	—	—	—	1	1	1	3	2	2	—	—	2	—
10	5	1	2	1	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	1	1	—	—	—	1	—
11	2	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—
12	3	—	—	1	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	1
13	7	1	—	1	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	1	—	—	3	—
14	5	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2	—	—	1	—	—	—	—
15	2	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—
18	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
23	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—
	499	136	130	85	48	35	17	19	14	3	4	2	1	1	1	1	1	66	42	55	55	44	55	51	50	55	26
					83		65											108		110		99		101		81	
Means and deviations	3·61	−·04	−·18	+·25	+.26		−·22											−·24		+·42		+·18		−·33		−·05	
Twice prob errors ..	±	·36	·37	·45	.46		·52											·41		·40		·43		·42		·46	
Standard deviation .	3·10	—	—	—	—		—											—		—		—		—		—	

Coefficient of correlation of frequency of conviction with order in family ... −·008±·030.
Coefficient of correlation of time of imprisonment with order in family ... −·032±·030.

TABLE 269.—CORRELATION OF NUMBER IN FAMILY WITH GRADE OF CRIMINALITY.
(Page 280.)
Schedule Records 2,501 *to* 3,000.

Number in family.	Totals.	Convictions per year.																Fractions of year imprisoned.									
		0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-
1	15	6	5	1	—	1	—	—	—	—	2	—	—	—	—	—	—	2	1	1	2	1	1	1	—	6	—
2	27	9	5	3	2	2	2	2	1	1	—	—	—	—	—	1	1	3	4	—	3	1	4	3	4	5	2
3	41	9	11	8	4	4	—	1	1	—	—	1	—	—	—	—	—	4	4	5	2	2	7	5	3	4	2
4	38	6	13	8	5	2	1	2	1	—	—	—	—	—	—	—	—	4	2	5	4	2	2	5	7	5	2
5	62	17	13	14	6	3	3	2	1	1	1	—	—	1	—	—	—	7	4	11	5	6	8	7	5	5	6
6	57	16	17	11	5	3	4	1	—	—	—	—	—	—	—	—	—	9	8	4	5	4	5	5	6	5	4
7	50	10	14	9	4	3	2	5	—	1	1	1	—	—	—	—	—	7	5	4	5	5	6	4	6	6	3
8	39	12	7	5	8	3	3	—	1	—	—	—	—	—	—	—	—	8	3	3	6	4	6	6	2	—	1
9	29	12	10	1	1	2	—	1	2	—	—	—	—	—	—	—	—	4	4	4	6	4	2	1	1	3	—
10	31	7	6	6	5	2	1	2	1	—	—	—	1	—	—	—	—	3	1	2	4	4	3	3	5	6	—
11	22	4	6	4	2	2	1	—	3	—	—	—	—	—	—	—	—	4	—	5	2	3	—	2	3	—	3
12	17	4	4	3	1	3	—	—	1	—	—	—	—	—	1	—	—	1	3	3	1	—	3	2	2	—	2
13	19	3	7	3	2	2	—	1	—	1	—	—	—	—	—	—	—	2	1	1	2	4	1	1	2	4	1
14	23	11	5	3	1	2	—	—	1	—	—	—	—	—	—	—	—	6	1	4	4	1	2	2	1	2	—
15	11	5	3	2	1	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	1	2	3	2	—	—	—
16	8	2	2	2	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	1	—	2	1	2	2	—
17	2	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
18	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—
19	2	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—
21	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
23	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
Totals ..	497	135	130	85	48	35	17	19	13	4	4	2	1	1	1	1	1	66	42	51	55	44	55	51	50	55	26
					83		64											108		109		99		101		81	
Means and deviations	7·44	+·18	−·04	−·02	+·19		−·54											−·20		+·41		+·27		−·07		−·53	
Twice probable errors	±	·47	·48	·59	·60		·68											·53		·53		·56		·55		·62	
Standard deviation..	4·09																										

Coefficient of correlation of frequency of conviction with number in family −·053 ± ·033
Coefficient of correlation of time of imprisonment with number in family −·038 ± ·034

Table 272.

Correlation of Age of Subject at Death of Mother with Grade of Criminality. (Page 281.)

Schedule Records 2,501 *to* 3,000.

Age in years.	Totals.	Convictions per year.														Mean convictions. Dev's ± p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	10–	12–	15–	18–	
0–	19	6	4	—	4	2	2	—	—	—	—	—	—	—	1	+·69 ± ·75
5–	32	10	9	4	5	—	1	—	2	—	—	—	—	1	—	+·02 ± ·58
10–	32	5	12	7	1	1	3	1	1	—	1	—	—	—	—	+·14 ± ·58
15–	28	2	8	6	7	1	—	3	—	—	1	—	—	—	—	+·53 ± ·62
20–	30	13	6	7	1	1	2	—	—	—	—	—	—	—	—	−·81 ± ·60
25–	28	10	5	7	—	3	—	1	—	2	—	—	—	—	—	−·15 ± ·62
30 and over	109	30	32	13	11	12	2	4	2	—	1	1	1	—	—	−·04 ± ·31
Totals	278	76	76	44	29	20	10	9	5	2	3	1	1	1	1	General mean, 2·54

Age in years.	Totals.	Fractions of year imprisoned.										Mean imprisonment. Dev's ± p.e.
		0–	1–	2–	3–	4–	5–	6–	7–	8–	9–	
0–	19	2	2	2	1	—	3	3	2	4	1	+·26 ± ·85
5–	32	7	4	3	2	3	5	2	1	3	2	−1·03 ± ·67
10–	32	4	2	7	2	3	1	3	7	2	1	−·50 ± ·67
15–	28	1	2	2	3	4	4	2	4	4	2	+·44 ± ·70
20– ... ... —	30	3	2	2	8	3	4	2	3	3	—	−·62 ± ·75
25–	28	4	2	3	2	3	3	3	2	4	—	−·55 ± ·75
30 and over	109	12	5	6	8	11	15	9	15	15	15	+·58 ± ·36
Totals	278	33	19	25	26	27	35	24	34	35	21	General mean, 5·10

Correlation ratio of age of subject at death of mother with frequency of conviction ... ... ·153.

Correlation ratio of age of subject at death of mother with time of imprisonment ... ... ·217

Table 273.

Correlation of Age at Death of Mother with Mental Grade. (Page 281.)

Schedule Records 2,501 *to* 3,000.

Symbols of Mental Categories as in Table 249.

Age in years.	Totals.	Mental grades.					Mean intelligence. Dev's ± 2 pe.
		I	F	U	W	Imb.	
0–	20	5	5	3	6	1	−·39 ± ·62
5–	32	2	11	7	9	3	−·81 ± ·49
10–	33	7	13	5	6	2	+·24 ± ·48
15–	28	5	9	6	8	—	−·39 ± ·52
20–	30	7	9	7	7	—	−·26 ± ·50
25–	27	5	4	12	5	1	−·75 ± ·53
30 and over ...	109	40	34	16	15	4	+·59 ± ·26
Totals ...	279	71	85	56	56	11	General mean, 1·39

Correlation ratio of intelligence with age at death of mother ... ... ·271

Table 274.

Correlations of Age at First Conviction with Grade of Criminality, and with Mental Grade. (Page 282.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*
Symbols of Mental Categories as in Table 249.

Age at first conviction.	Totals.	Convictions per year. 0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-
10	81	18	19	18	7	8	4	3	2	—	—	1	—	—	—	1	—
15	198	39	56	35	21	15	10	8	6	1	—	—	—	—	2	—	—
20	88	21	20	18	5	5	2	3	3	2	2	—	—	1	—	—	1
25	54	24	9	5	8	4	1	3	—	—	—	—	—	—	—	—	—
30	38	12	13	3	2	1	2	—	1	1	1	1	1	—	—	—	—
35	24	6	8	2	3	2	1	1	1	—	—	—	—	—	—	—	—
40	19	10	4	2	1	1	—	—	—	—	1	—	—	—	—	—	—
45	10	5	3	—	—	—	—	1	1	—	—	—	—	—	—	—	—
50	5	2	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—
55	3	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
60	3	1	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
65	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals	514	140	137	84	48	36	20	19	14	4	4	2	1	1	2	1	1
					84							69					
Means and deviations	23·05	+2·66	+.65	−2·88	−1·69							−1·13					
Twice prob. errors	±	1·14	1·15	1·47	1·47							1·62					
Standard deviation	9·97	—	—	—	—												

Age at first conviction.	Totals.	Fractions of year imprisoned. 0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	Totals.	Mental grades. I	F	U	W	Imb.
10	81	6	4	12	13	6	10	9	8	10	3	81	11	13	25	28	4
15	198	33	17	30	21	24	26	20	29	14	6	198	16	61	54	48	14
20	88	7	9	8	8	8	6	8	10	11	8	81	22	24	15	15	5
25	54	7	4	8	7	4	4	3	5	11	1	54	20	21	6	6	1
30	38	5	3	4	4	2	5	6	4	3	2	36	8	13	6	6	3
35	24	2	2	4	—	2	3	2	1	6	2	24	13	7	1	3	—
40	19	8	1	1	1	—	1	3	3	—	2	19	7	6	3	2	1
45	10	4	2	1	—	—	1	—	—	2	—	12	4	2	1	4	1
50	5	3	—	—	—	—	1	—	—	1	—	5	3	1	1	—	—
55	3	1	1	—	1	—	—	—	—	—	—	3	1	2	—	—	—
60	3	1	1	—	—	—	1	—	—	—	—	3	2	—	1	—	—
65	1	—	—	—	—	—	—	1	—	—	—	1	—	1	—	—	—
Totals	514	67	43	55	63	46	57	51	53	58	26	512	107	151	113	112	29
		110		118		103		104		84							
Means and deviations ...	23·05	+3·56		−1·79		−1·77		−1·04		+1·17		23·12	+5·28	+ ·84	−2·92	−2·80	−1·55
Twice prob. errors ...	±	1·26		1·27		1·33		1·22		1·47		±	1·32	1·11	1·28	1·29	2·53
Standard deviation ...	9·97	—		—		—		—		—		10·09	—	—	—	—	—

Table 275.

Correlations of First Sentence with Grade of Criminality, and with Mental Grade. (Page 283.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*
Symbols of Mental Categories as in Table 249.

First sentence.	Totals.	Convictions per year. 0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-	Mean convictions. Dev'ns ± 2 p.e.
Less than 3 months	169	36	49	34	18	11	8	6	4	—	1	—	—	1	1	—	1	+ ·15 ± ·28
3 months and less than 6 months	56	15	12	10	3	5	2	3	2	—	2	1	—	—	1	—	—	+ ·54 ± ·43
6 months and less than 1 year ...	75	24	20	6	10	8	2	3	1	—	—	—	1	—	—	—	—	− ·13 ± ·37
1 year and less than 5 years ...	56	24	13	5	4	1	1	3	4	1	—	—	—	—	—	—	—	− ·28 ± ·43
5 years and over	23	9	5	3	2	1	—	—	1	1	1	—	—	—	—	—	—	− ·06 ± ·67
Birch	13	4	4	1	3	1	—	—	—	—	—	—	—	—	—	—	—	− ·62 ± ·89
Reformatory school	52	11	15	11	8	4	5	2	—	—	—	—	—	—	—	1	—	+ ·12 ± ·45
Birch and school	12	1	3	2	3	1	—	2	—	—	—	—	—	—	—	—	—	+ ·60 ± ·98
Fine	30	13	9	7	—	—	1	—	—	—	—	—	—	—	—	—	—	−1·09 ± ·60
Nil	26	4	8	5	2	4	3	—	—	—	—	—	—	—	—	—	—	− ·01 ± ·63
Totals	512	141	137	84	48	36	22	19	12	2	4	1	1	1	2	1	1	General mean 2·53 (s.d. of convictions 2·86).

Table 275—*continued.*

First sentence.	Totals.	Fractions of year imprisoned. 0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	Mean imprisonment. Dev'ns ± 2 p.e.	Totals.	Mental grades. I	F	U	W	Imb.	Mean intelligence. Dev'ns ± 2 p.e.
Less than 3 months ...	169	29	17	23	17	20	20	17	15	5	6	− ·70 ± 29	173	22	44	49	46	12	− ·80 ± ·17
3 months and less than 6 months.	56	6	3	8	7	3	4	8	5	9	3	+ ·32 ± 50	56	16	16	8	13	3	+ ·08 ± ·31
6 months and less than 1 year.	75	3	5	7	6	6	11	5	12	15	5	+1·05 ± ·43	76	26	27	9	14	—	+ ·97 ± ·26
1 year and less than 5 years.	56	4	3	3	4	4	7	9	7	11	3	+1·05 ± ·51	59	27	19	5	6	2	+2·25 ± 25 (for this row and the next)
5 years and over ...	23	4	—	—	—	2	—	1	3	7	5	+1·96 ± ·80	23	8	7	1	7	—	
Birch	13	1	2	2	2	1	2	1	1	1	—	− ·60 ± 1·04	13	—	3	8	1	1	− ·80 ± ·64
Reformatory school...	52	3	2	6	8	2	9	4	7	9	2	+ ·67 ± ·52	36	6	8	11	9	2	− ·74 ± ·38
Birch and school ...	12	—	2	3	—	2	1	2	2	—	1	+ ·09 ± 1·04	25	—	7	8	7	3	−1·08 ± ·46
Fine	30	11	4	5	5	3	2	—	1	—	—	−2·35 ± ·67	30	1	13	10	3	3	−1·29 ± ·42
Nil	26	5	5	1	6	3	1	4	—	—	1	−1·33 ± ·74	20	—	7	4	6	3	−1·14 ± ·52
Totals... ...	512	66	43	58	55	46	57	51	53	57	26	General mean 4·72 (s.d. of imprisonment 2·78).	511	106	151	113	112	29	General mean 1·38

Table 276.

Correlation of Frequency of Conviction with Fractional Time spent in Prison, and Correlations of each Measure of Criminality with Age at Present Conviction. (Pages 188, 282, 283.)

Schedule Records 2,501 *to* 3,000 *and Supplementary.*

Fractions of year imprisoned.	Totals.	Convictions per year. 0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-
0-	69	47	12	4	3	2	—	1	—	—	—	—	—	—	—	—	—
1-	43	16	18	3	2	1	2	1	—	—	—	—	—	—	—	—	—
2-	57	23	20	9	3	2	—	—	—	—	—	—	—	—	—	—	—
3-	56	19	15	10	5	2	2	1	—	2	—	—	—	—	—	—	—
4-	46	9	21	10	4	1	—	1	—	—	—	—	—	—	—	—	—
5-	57	11	17	15	5	1	1	2	2	—	—	—	1	1	1	—	—
6-	50	7	9	11	10	5	3	2	1	—	1	1	—	—	—	—	—
7-	54	7	8	10	8	8	5	4	4	—	—	—	—	—	—	—	—
8-	58	3	11	10	7	6	5	6	3	—	3	1	—	—	1	1	1
9-	26	1	4	2	2	8	2	1	4	2	—	—	—	—	—	—	—
Totals ...	516	143	135	84	49	36	20	19	14	4	4	2	1	1	2	1	1

Age at time of crime.	Totals.	Convictions per year. 0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	12-	13-	14-	15-	18-	Fractions of year imprisoned. 0-	1-	2-	3-	4-	5-	6-	7-	8-	9-
15	7	—	3	4	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	—	—	4	—	—	—	—
20	74	15	16	13	7	7	5	5	2	2	—	1	—	—	1	—	—	13	6	7	13	9	4	8	9	5	—
25	109	28	21	24	12	8	6	4	3	—	—	—	—	1	—	1	1	12	10	16	17	13	9	15	10	5	2
30	79	22	23	10	9	3	2	7	1	—	1	—	—	—	1	—	—	8	8	10	10	9	8	8	8	8	2
35	71	22	22	9	7	3	4	—	3	—	—	1	—	—	—	—	—	14	9	9	6	5	4	5	8	7	4
40	39	7	16	9	4	1	—	—	1	—	1	—	—	—	—	—	—	2	3	5	4	4	8	2	6	5	—
45	36	9	6	5	3	8	1	2	—	1	1	—	—	—	—	—	—	7	2	—	2	1	6	2	2	9	5
50	22	12	4	2	3	—	—	—	1	—	—	—	—	—	—	—	—	6	—	4	—	2	4	—	3	3	—
55	16	5	4	3	—	2	—	—	—	1	1	—	—	—	—	—	—	3	2	—	—	—	1	—	—	6	4
60	24	9	8	2	2	2	—	1	—	—	—	—	—	—	—	—	—	2	—	1	—	3	3	6	4	2	3
65	22	7	6	3	—	1	2	—	3	—	—	—	—	—	—	—	—	1	1	3	2	—	4	—	2	5	4
70	11	2	5	—	2	1	—	—	—	—	—	—	1	—	—	—	—	—	1	1	2	—	1	1	—	3	2
75	4	3	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	1	—	—
80	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—
Totals ...	516	143	135	84	49	36	20	19	14	4	4	2	1	1	2	1	1	69	43	57	56	46	57	50	54	58	26

Mean age	38·30 yrs.	Standard deviation of age	14·30 yrs.
Mean convictions ...	2·59 yrs.	Standard deviation of convictions ...	2·45 yrs.
Mean imprisonment	4·71 yrs.	Standard deviation of imprisonment	2·80 yrs.

Coefficient of correlation of age at time of crime with frequency of conviction, − ·105 ± ·029

Coefficient of correlation of age at time of crime with time of imprisonment + ·237 ± ·028

Coefficient of correlation of frequency of conviction with time of imprisonment + ·465 ± ·023

TABLE 280.

CORRELATION OF NUMBER IN FAMILY WITH NATURE OF CRIME. (Page 285.)

Schedule Records 2,501 *to* 3,000.

Number in family.	Totals.	Nature of crimes.				
		Damage to property.	Stealing and burglary.	Sexual offences.	Violence to the person.	Forgery and fraud.
1	13	—	1	2	4	6
2	18	2	3	—	7	6
3	26	1	1	10	9	5
4	28	4	2	8	9	5
5	33	1	—	11	16	5
6	38	3	4	6	13	12
7	24	2	5	5	9	3
8	27	1	2	5	16	3
9	22	—	—	7	9	6
10	17	2	1	3	9	2
11	9	—	2	3	4	—
12	13	1	—	2	7	3
13	9	—	—	4	4	1
14	6	—	—	4	2	—
15	1	—	—	—	1	—
16	2	—	—	—	1	1
17	2	—	—	—	2	—
18	1	—	—	—	1	—
19	1	—	—	—	1	—
20	1	—	—	—	1	—
21	2	—	—	1	1	—
Totals	293	17	21	71	126	58
Means and excesses	6·89	−1·01	−·94	+·27	+·66	−1·14
Twice probable errors	±	1·26	1·13	·62	·46	·68
Standard deviation	3·85	—	—	—	—	—

Correlation ratio of number in family with nature of crime ... ... ·100 ± ·038·

TABLE 281.

CORRELATION OF AGE OF SUBJECT AT DEATH OF MOTHER WITH NATURE OF CRIME. (Page 285.)

Schedule Records 2,501 *to* 3,000.

Age of subject at death of parent.	Totals.	Nature of crimes.				
		Damage to property.	Stealing and burglary.	Sexual offences.	Violence to the person.	Forgery and fraud.
0–	12	1	—	3	8	—
5–	12	—	1	6	3	2
10–	15	3	—	2	6	4
15–	16	—	—	3	11	2
20–	16	—	—	5	8	3
25–	18	1	2	3	7	5
30–	18	—	1	5	7	5
35–	16	2	2	1	6	5
40–	10	—	4	—	4	2
45–	12	1	—	4	2	5
50–	6	1	—	2	2	1
55–	4	—	—	—	4	—
Totals	155	9	10	34	68	34
	Years.					
Means and excesses	26·89	+·06	+7·11	−2·77	−1·37	+3·41
Twice probable errors	±	1·33	1·26	·68	·48	·68
Standard deviation	2·95					

Correlation ratio of age of subject at death of parent and nature of crime... ·079±·054

Table 282.

Correlation of Alcoholism (Intemperate, Temperate, Abstinent) with Nature of Crime. (Page 285.)

Nature of crimes.	Complete data.				Data of one observer.			
	I	T	A	Total.	I	T	A	Total.
Damage to property ...	75	54	9	138	57	40	6	103
Stealing and burglary ...	728	754	121	1,603	360	255	38	653
Sexual offences	142	99	16	257	90	57	13	160
Violence to the person ...	340	205	23	568	196	127	17	340
Forgery and fraud ...	143	255	31	429	86	137	17	240
Totals	1,428	1,367	200	2,995	789	616	91	1,496

Table 283.

Correlation of Alcoholism with Intelligence. (Pages 285, 286.)

Schedule Records 1 *to* 1,500.

—	Intemperate.	Temperate and abstainers.	Totals.
Intelligent, fairly intelligent	304	378	682
Unintelligent, weakminded and imbecile ...	485	329	814
Totals	789	707	1,496

Table 284.

Correlation of Present Age with Age at First Conviction. (Page 368.)

Schedule Records 1 *to* 2,500.

Age at first conviction.	Present age														Totals.
	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	
10-	14	90	82	58	42	16	12	5	4	7	3	—	1	1	335
15-	23	249	248	139	86	46	26	18	5	16	1	1	1	—	859
20-	—	56	129	70	58	42	34	16	13	6	7	3	—	1	435
25-	—	—	37	65	46	28	15	13	9	7	11	5	—	—	236
30-	—	—	—	15	38	33	17	14	7	14	9	3	2	1	153
35-	—	—	—	—	11	21	9	8	4	11	6	1	—	—	71
40-	—	—	—	—	—	6	15	10	3	15	4	3	2	—	58
45-	—	—	—	—	—	—	4	9	5	9	2	2	1	1	33
50-	—	—	—	—	—	—	—	4	1	10	5	—	—	—	20
55-	—	—	—	—	—	—	—	—	1	3	5	2	1	—	12
60-	—	—	—	—	—	—	—	—	—	1	2	2	2	—	7
65-	—	—	—	—	—	—	—	—	—	—	—	3	—	—	3
70-	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
75-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
80-	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals ...	37	395	496	347	281	192	132	97	52	99	55	25	11	4	2,223

Mean age at first conviction ... ... 22·321 years.

Mean age at present age ... ... 36·167 years.

Standard deviation of age at first conviction ... ... 8·976 years.

Standard deviation of present age ... ... 13·103 years.

Coefficient of correlation between present age and age at first conviction ·6275.

Table 285.

Correlation of Number of Previous Convictions with Age at First Conviction. (Page 368.)

Schedule Records 1 *to* 2,500.

Number of previous convictions.	Age at first conviction.													Totals.
	10–	15–	20–	25–	30–	35–	40–	45–	50–	55–	60–	65–	70	
1 and 2	17	84	80	76	50	21	14	12	7	7	3	2	1	374
3 „ 4	16	101	90	44	24	18	18	9	3	3	—	1	—	327
5 „ 6	37	137	59	32	21	13	10	2	3	3	—	—	—	317
7 „ 8	42	106	56	28	16	5	4	6	3	—	1	—	—	267
9 „ 10	35	118	34	13	15	3	1	1	3	1	1	—	—	225
11 „ 12	45	80	35	12.	8	2	2	1	—	1	1	—	—	187
13 „ 14	35	48	24	8	4	2	4	1	—	—	—	—	—	126
15 „ 16	24	37	18	7	11	5	1	—	—	—	1	—	—	104
17 „ 18	20	36	9	2	—	—	2	—	—	—	—	—	—	69
19 „ 20	23	21	7	6	2	1	2	—	—	—	—	—	—	62
21 „ 22	4	11	4	3	1	1	—	—	—	—	—	—	—	24
23 „ 24	3	14	5	—	—	—	—	—	—	—	—	—	—	22
25 „ 26	10	12	2	—	1	—	—	—	—	—	—	—	—	25
27 „ 28	6	7	4	1	—	—	—	—	—	—	—	—	—	18
29 „ 30	4	4	1	—	2	—	—	—	—	—	—	—	—	11
31 „ 32	6	6	1	1	1	—	1	—	—	—	—	—	—	16
33 „ 34	1	3	2	—	—	—	—	—	—	—	—	—	—	6
35 „ 36	2	6	—	—	1	—	—	—	—	—	—	—	—	9
37 „ 38	1	5	—	1	—	—	—	—	—	—	—	—	—	7
39 „ 40	2	5	2	—	—	1	—	—	—	—	—	—	—	10
41 „ 42	—	3	—	1	—	—	—	—	—	—	—	—	—	4
43 „ 44	1	1	1	—	—	—	—	—	—	—	—	—	—	3
45 „ 46	—	1	—	—	—	—	—	—	—	—	—	—	—	1
47 „ 48	—	1	—	—	—	—	—	—	—	—	—	—	—	1
49 „ 50	—	2	—	—	2	—	—	—	—	—	—	—	—	4
51 „ 52	2	2	—	—	—	—	—	—	—	—	—	—	—	4
74	—	1	—	—	—	—	—	—	—	—	—	—	—	1
78	1	—	—	—	—	—	—	—	—	—	—	—	—	1
Totals ...	337	852	434	235	159	72	59	32	19	15	7	3	1	2,225

Mean number of previous convictions ... ... 9·252

Mean age at first conviction ... ... 22·39

Standard deviation of number of previous convictions ... ... 8·121

Standard deviation of age at first conviction ... ... 9·172

Coefficient of correlation between number of previous convictions and age at first conviction ... ... −·2589

INDEX.