

The bacillus is extremely sensitive and the least influence will cause the secretion to cease; however, it may be submitted to the action of the liquid air for three weeks, with scarcely any diminution of the color secretion. It is thus found that low temperatures have quite a different action from those above zero, since +50 deg. will kill cells which can stand -200 degs. without danger. As to magnetic phenomena, these seem to be increased considerably, especially in the case of certain nickel steels studied by Osmond and Le Chatelier, whose magnetism appears at much lower temperatures than others. Thus to render some of these steels magnetic it suffices to place them in liquid air. Of the steels there are two kinds, one which after becoming thus magnetic preserves its magnetism at the ordinary temperature, and a second variety which loses its magnetism. The variation of electric resistance at low temperatures is very great in the case of the pure metals, while with alloys, as usual, it is less. An experiment was shown with a small coil of copper wire connected with a mirror galvanometer, which indicated the value of the current; when the coil is plunged in liquid air the current increases greatly, and in fact its value at -190 degs. is as much as 6 times that at zero. This is shown more clearly by a group of incandescent lamps which have a resistance-coil in series and thus burn at low redness; when the coil is plunged in liquid air the lamps burn with a bright light. According to the last researches of Dewar, the resistance diminishes gradually with the temperature, but on arriving at -250 degs. C. this curve is no longer a straight line, but the diminution becomes less and less, so that the resistance at the absolute zero is still appreciable. At the boiling temperature of liquid hydrogen, Dewar has shown that the resistance of copper becomes 105 times less.

The magnetic properties of liquid oxygen may be clearly shown, and this body attaches itself to the poles of a magnet with a force sufficient to overcome the influence of its weight, and thus oxygen can be separated from the non-magnetic nitrogen by a magnet, like a mixture of copper and iron filings. A still better method is to evaporate the liquid air in vacuo down to the solidifying point of nitrogen, then it suffices to present the jelly-like mass to the poles of a magnet to observe the liquid oxygen come out from the meshes of nitrogen which envelop it and adhere to the magnet. An experiment was shown with the liquid air adhering to the poles of an electro-magnet; when the current is broken the magnet ceases to act and the mass falls. Liquid air is an excellent insulator and thus offers a very high resistance to the passage of the spark. If a spark-coil giving a 20-inch spark has its terminals placed in liquid air, the sparking distance is reduced to 0.2 inches.

It is possible to prepare ozone in a state which renders it almost inoffensive. It is obtained in a liquid form in solution in liquid air. A Berthelot ozonizer working at 15,000 volts sends the ozone into a vessel of liquid air where the ozone condenses in the tube and dissolves in the liquid air, giving to it a more pronounced bluish tint. It is possible to prepare pure liquid ozone, whose boiling point is -118, or higher than liquid air, and so will not decompose when protected by the latter, but if handled at its boiling temperature it detonates on the least shock. It suffices to plunge in a metal point to determine an explosion. By mixing liquid ozone and solid acetylene, M. D'Arsonval has prepared the most powerful explosive known, as it contains two endothermic bodies. It may be asked what is the effect of liquid air when poured on the hand. As was shown, it had scarcely any effect, but if the hand were plunged for a long time in liquid air the result might be dangerous; for a short time only a slight cooling is felt. The absorption spectra of liquid air were shown; they are extremely transparent for all the radiations, as was observed in the case of two characteristic rays in the red and yellow, and another in the violet.

THE SANITARY MEASURES TO BE ADOPTED AFTER FLOODS.*

By GEORGE A. SOPER, Ph.D., of New York.

The following paper is designed to set forth a few suggestions for the guidance of those who may be called upon to assist in safeguarding the health of communities which may be thought to be exposed to epidemic diseases by reason of destructive floods.

It is evident that information which may be useful in averting the consequences of flood has special significance to the people of the United States. Possessing an enormous territory, with a wide range of climatic and geographical features, it is not strange that such catastrophes should occasionally occur. The low, flat valleys of the Mississippi and its tributaries afford an imperfect opportunity for the discharge of the waters sometimes collected upon their immense drainage areas. On such occasions thousands of square miles are inundated. Villages are submerged, and great destruction of property results. The fact that these floods are anticipated has not been capable of reducing their hardship, as witness the almost annual overflows, which caused a loss in 1874 of \$13,000,000, and the destitution in 1882 of 60,000 inhabitants of Mississippi.

Occasionally some of the streams of the Northern and Eastern States cause destructive floods, but their shorter, straighter courses and smaller flood-plains render such widespread damage as is common in the South and West impossible. Nevertheless, there have been destructive floods from such rivers, particularly in connection with the giving way of dams. Of this sort was the Mill River, Mass., disaster of 1874, and the Johnstown, Pa., flood of 1889.

Inundations from the sea have occurred on the low-lying coasts of the United States on several well-remembered occasions. Notable among coast floods have been those at Galveston in 1886, with a loss of thirty-eight lives and \$5,000,000; the storm of 1893 on the Louisiana coast, during which practically all the settlements between New Orleans and the Gulf were destroyed; the Sea Island flood, wherein 2,000 people were killed, 20,000 rendered homeless, \$5,000,-

000 worth of property destroyed; and the Galveston calamity of 1900, in which 8,006 people were killed and \$20,000,000 damage was done to property.

After the first shock of such disasters as those referred to the world is generally appalled by the news that pestilence is liable to break out at the scene of destruction. At Johnstown and Galveston great apprehension was felt that one or more of the acutely infectious diseases would appear among the survivors and rescuers. Rumors that pestilence had actually broken out found their way to the public press, where they threatened to do serious injury to the commercial interests which were already so seriously crippled.

It may not be unprofitable to inquire for a moment what reason existed for the popular apprehension, and to determine if possible wherein lay the danger, if any existed.

There is but brief information available concerning the sanitary aspects of the great floods of antiquity and the middle ages. They are obviously not connected in point of time with the great epidemics which visited the civilized world in those periods; nor do the facts at hand suggest that floods have ever been considered important agents in the generation or spread of infectious diseases. In point of fact, a belief in the cleansing power of floods is strongly implanted in the popular mind. The Bible story of the deluge is not inaptly held as the symbol of a remedy for the evils of corruption rather than a precipitant of disease. Why, then, should pestilence have been so greatly feared at Johnstown and Galveston?

It is probable that the fear of disease grew from a contemplation of the disorder and great destruction of life and property, the demoralization which was everywhere apparent, and particularly the want of sanitary control, which very soon manifested itself. Had an earthquake, for example, produced similar conditions of wreck and confusion, it is not improbable that the same fears of pestilence would have been experienced.

Undoubtedly the active source of infection was supposed to lie in the lifeless and decomposing matters which were associated with the wreckage. To the senses of the survivors and rescuers the odors of decomposition were a constant menace and active source of alarm.

As to the reality of the danger which is popularly supposed to exist in the presence of dead bodies of men and animals, little need be said to those who are familiar with modern views of the etiology of the communicable diseases. By them it is known that a foul odor is only rarely in itself a source of danger, while it is a most unreliable indication that disease-producing conditions are close at hand. According to accepted theory, diseases which are capable of becoming epidemic are incapable of originating in foul or decomposing matters. Every form of infectious disease is produced by a specific agent peculiar to it. This agent or its progenitors has existed for an indefinite period, and is only developed in large proportions and with dangerous virulence within the body of a living host. Thus yellow fever, bubonic plague, typhus, cholera, etc., are bacterial diseases which occur only when the micro-organisms associated with them are carried by some means from one subject to another. Familiar vehicles for the transmission of infectious material in such cases as those which we are considering are water and milk supplies, flies, dust, and impure food.

It follows, if these views be accepted, that those who are compelled to handle the bodies of previously healthy men and animals killed by flood or other violence need have little fear of contracting any of the so-called filth diseases, no matter how far decomposition of the body may have proceeded. Nausea is the worst form of illness to be anticipated. And what is true of the bodies of men and animals is true of vegetable matter as well.

The conditions are different, however, when we have to deal with the remains of persons ill of, or killed by, disease. During illness and after death the excretions and surfaces of the person are frequently highly dangerous as sources of infection. Here are to be found the bacteria or special agents which are capable of reproducing the disease with which they have been associated. It is obviously important that contact with infectious material be avoided, that it be prevented from disseminating, and that its source should be as soon as possible removed. These ends are accomplished by isolating each case of sickness, disinfecting contaminated objects, and destroying infectious material as near its origin as possible. In the conditions which obtain after floods probably very few people will have been killed excepting those who were in health, while among the large number of persons who remain there may be some sickness. Therefore, as a general rule, it is safe to say that danger of pestilence lies not among those lifeless matters destroyed by the flood, but rather among the living.

After the destruction of their homes many of the flood sufferers of Johnstown and Galveston found shelter in camps. Under such circumstances it was inevitable that overcrowding should now and then have occurred, and that the attention given to such subjects as drainage, the disposal of waste, the procurement of pure food and water, the avoidance or destruction of insects, and careful supervision of the health of the survivors should have been for a time neglected. Nor is it to be wondered at that in the excitements of the hour the usual care for individual safety should have been relaxed. Physical and mental fatigue marked the condition of nearly every individual. We cannot fail to recognize in these conditions important predisposing causes of disease. They were insufficient to produce an epidemic, but were well calculated to spread a pestilence should it break out. There was needed but a spark to kindle the flame of a greater disaster than had been wrought by the elements.

The spark was looked for among the large number of strangers who flocked to the scenes directly after the news of the calamities was spread abroad. The people who visited the wrecks were almost exclusively men of the meanest class—curiosity-seekers, adventurers, thieves, and worse. They were drawn from all points of the compass, and generally came on freight trains or on foot. Their number was very large. They

lived from hand to mouth, subsisting on supplies sent to the flood sufferers, without working and without responsibility of any kind. In view of the circumstances, it is extremely curious that none of the acutely infectious diseases appeared.

From the foregoing considerations the steps which should be taken to safeguard public health in thickly settled flood-stricken communities are fairly indicated. There is need of a strong sanitary organization, with a responsible head, to avoid epidemic, by removing the conditions which favor the spread of infectious diseases and to watch for cases of such sicknesses in their incipency.

Who should be chosen to occupy the position of chief sanitary authority? By all means, the proper person is the health officer of the town, city, or county, if he is present and capable of exercising the onerous and exacting duties of the office. In disasters of so great magnitude as those cited it may be that the city and county health officers are unable to cope with the situation. It then becomes a question as to what other authority should be summoned to the scene. It is essential that a sanitary bureau be established promptly.

In the United States no help is more suitable in this emergency than that which the State health organization should be capable of furnishing, and it is appropriate that the Commonwealth should contribute its services in the event of such an emergency. It is to be regretted that all of our States have not such excellently conducted boards of health as to be capable of affording such prompt and competent services as are demanded under the circumstances which we have under consideration.

When the State is unable to accept control the United States government may be appealed to. There is a fund placed at the disposal of the President and Secretary of the Treasury for use on such occasions as demand unusual protection to prevent the spread of epidemics. In the absence of a national board of health, the United States Marine Hospital Service is prepared to take the field at short notice to avert or put an end to any epidemic which threatens to invade the country. It should be remembered in this connection that the resources of the general government are not available except when the danger is very real and of such a nature that the country at large is liable to be affected through the inability of local authorities to control the situation.

Having settled the question of authority, it will be desirable to establish headquarters for the direction of the sanitary organization. The confidence and co-operation of the flood sufferers should be encouraged from the outset. Much importance is attached to this point and to the desirability of distributing immediately and as widely as possible a knowledge of the purposes and methods as well as the powers of the sanitary bureau. Secrecy with regard to the real condition of the public health, such as has been sometimes practised with regard to the identity or presence of communicable diseases, is not considered a wise policy; cases of illness should be reported by their proper names and announced in an accurate manner. For this purpose it will be advantageous to issue bulletins.

A set of sanitary regulations for the guidance of the people may be issued to advantage, and should contain instructions as to the cleaning of premises, the repair of injured household effects, the disposal of garbage and other wastes, the methods of using deodorants and disinfectants properly, and the need for proper precautions in the matter of diet. With the idea of reducing the number of people to be cared for, as many as possible of those who are not usefully employed in the work of rescue should be advised to leave town for a few weeks' rest.

The scene of the wreck in the districts wherein camps have been established may be advantageously divided into sections, the limits of which, for convenience of reference, should be marked on a map. It is suggested that each one of these sanitary districts be made a unit for the operation of a small force under the direction of a minor sanitary officer, it being an advantage to encourage a spirit of emulation and amiable rivalry in the interest of greater efficiency among the various corps at work. It will be found desirable to keep a business-like record of the operations of the bureau, and for this purpose an office force of clerks will be useful. The operations which it will be necessary to carry on outside of the office can be accomplished through the aid of local help. Physicians and others whose former residence was in the locality will have the advantage of familiarity with the place and people.

One of the most important divisions of the work of the sanitary bureau will be the observation and direction of the flood sufferers in their efforts to look after their own health. A corps of responsible inspectors should be organized to move about among the people in a systematic way, to see that the regulations of the sanitary authority are properly carried out, and to supplement and interpret his directions by sensible counsel and advice. Cases of disease which are capable of becoming epidemic should be watched for by these men with the greatest care, particularly in the cheap lodging houses, camps, and other places where the evils of overcrowding and uncleanness are most liable to occur. When a case of infectious disease is discovered the patient should be isolated and the premises thoroughly disinfected in accordance with the practices commonly observed in large cities with regard to the more dangerous diseases.

The water supply and food provided for the sufferers and helpers should be inspected systematically. Wells believed to be contaminated should be pumped out, and either thoroughly cleaned or closed with an official seal. Unless the water supply is wholly beyond suspicion, that part of it which is to be used for drinking and cooking should be required to be boiled.

In cleaning damaged houses attention should be given to the removal of slime, mould, or silt from floors, walls, and furniture. Carpets should be taken up and dried in the sun and beaten, or else destroyed. Upholstery, especially mattresses and cushions, to be preserved should be opened and sun-dried. Cellars should be pumped out, ventilated, and whitewashed. Fumigation will not be necessary in these operations.

* Extracted from the American Journal of the Medical Sciences.

unless the presence of disease germs is strongly suspected, in which event the use of formaldehyde is recommended.

Of the great variety of so-called disinfectants which will probably be sent to the scene of the wreck the most useful will be quicklime, chloride of lime, and carbolic acid. Although the public is tolerably familiar with the use of these chemicals, instruction should be given in the ways in which they may be employed to the greatest advantage, particular attention being given to the necessity of bringing about an intimate contact between the material to be treated and the agent, the desirability of economy, and the advantages to be gained by avoiding the necessity of using deodorizing and disinfecting materials.

In making a permanent disposition of decomposing or decomposable organic matters as much use as possible should be made of the opportunities afforded for incineration. The bodies of horses, cows and other animals, garbage and excreta may be easily burned if first sprinkled with rosin. Bonfires may then be made over such material with fuel taken from the wreck. Condemned beds, carpets, furniture, etc., may be soaked with tar or oil before burning to insure complete combustion. In disposing of human remains burial is much to be preferred to burning, provided the graves or trenches intended for interment can be decently made and of a depth of at least six feet. All bodies disposed of in this manner should be placed in one locality, which should be at least one hundred yards from any habitation or well. Where insufficient depth of soil is found for burial in the usual way, quicklime may be used to advantage in the bottom and covering of the trenches, a few pailfuls of water being thrown over the top to insure immediate action.

With regard to the removal of debris and cleaning about the scene of the wreck, it will be well to remember that the removal of infectious material or matters which are either actually offensive or liable to become so, does not constitute the whole duty to be fulfilled. An appearance of order and neatness is a condition greatly to be desired, since it makes for cleanliness and wholesomeness, and is in itself an outward evidence of that control and moral support which it is perhaps, after all, one of the highest functions of the sanitary bureau to maintain.

STATISTICS.*

By the Hon. CARROLL D. WRIGHT, Department of Labor.

GOTTFRIED ACHENWALL, who was born in 1719 and died in 1772, and was a professor of philosophy at Göttingen in 1750, is reported to have originated the modern statistical method. Undoubtedly others used it before Prof. Achenwall, but it is as well to attribute the first specific use of the method in the modern sense to him as to any other.

The word "statistics" is from the French "statistique," from the Greek "statos," meaning fixed or settled, from the stem "sta," to stand. Hence statistics means a method by which fixed or settled conditions can be determined. According to definition, statistics is first a collection of facts relating to a part or the whole of a country or people, or of facts relating to a class of individuals or interests and different countries, especially those facts which illustrate physical, social, moral, intellectual, political, industrial and economic condition or changes of condition, and which admit of numerical statement and arrangement in tabular or graphic form. Second, it is that department of political science which classifies, arranges and discusses statistical data.

As we understand it, one of the most essential primary objects of statistics is to secure a simple, concrete statement of a mass of facts the essence of which could not otherwise be expressed except by means of long and tedious descriptive language, and even by the use of such language no concrete and clearly-defined conclusion could be reached. There is no method of expressing certain things except through the statistical method. This is true when we understand that statistics belongs to the historical or comparative method of study. The German historian, Schlosser, said that history is statistics ever advancing, and statistics is stationary history. Looking beneath the words of Schlosser, one must conclude that he meant that the constant accumulation of statistical data from period to period or from epoch to epoch—that is, statistics ever in motion—creates history, history being made up of the ever-advancing events of life which are shown through statistical methods, but that statistics of one epoch constitutes the permanent history thereof.

So the statistician, in the truest historical and comparative sense, writes history, but he writes it in the most crystallized form which can be adopted. He uses symbols, but with them he unlocks the facts of his own period so that they may be made plain to all students coming after him. He tells the story of our present state in such a way that when the age we live in becomes the past that story shall be found to exist in true and just proportions. The word "statistics," illustrating fixed and settled conditions, indicates the soundness of the German writer's thought and the true spirit in which the statistician should work.

The use of the statistical method in a scientific way is practically modern. In ancient times there were counts of the people, but no scientific use of the results that would warrant the application of the name statistics. These "counts" were largely to ascertain military strength and divisions of geographical sections. David, you will remember, undertook to number the people. This effort on his part caused him a great deal of difficulty, and, so far as the history of the world is concerned, every man since David's time who has undertaken to number the people has met more or less opposition and had more or less trouble. All through history we read of counts or, as we say now, enumerations, but they were crude in the extreme and cannot be considered as statistical efforts.

Under our modern systems there are three kinds of statistics—I mean by "kinds" methods which involve different systems to secure results. These are, first, statistics secured by the continuous record of official acts, as, for instance, the returns from the custom houses; those returns relating to imports and exports,

immigration and other affairs are the results of a continuous record of events and are reported to a central office, tabulated and classified. School statistics, the returns of births, deaths and marriages—these come under this classification. They belong more clearly to the domain of bookkeeping, although statistical genius is essential in the classification and analysis of the entries.

The second class of statistics are those secured by actual enumeration, like census statistics, where aggregates are essential to the integrity of results. We must know the number of all the people, the total value of products and of capital, the aggregate wages paid in manufactures, and various other data where there would be little or no value unless all were included in the results. This class of statistics demands higher statistical qualifications, both in preparing for the enumeration and in the tabulation, classification and analysis of the results.

The third kind of statistics are those secured through a special investigation of certain representative facts. For instance, if it is desired to learn the cost of producing iron and steel, it is not necessary, as in the previous case, to secure data for all the establishments engaged in such production. A few representative works offer ample information for determining cost of production. So, in endeavoring to ascertain the course of wages and prices, it is not essential to secure aggregates or data relating to all prices or to the wages paid to all the people employed.

The practical work of official statistical offices is divided into three parts also—first, the collection of data, which involves the preparation of schedules and instructions; second, the tabulation and the presentation of the results obtained, and third, the analysis. No statistical table should ever be used without consulting carefully all textual treatment thereof, the accompanying notes and the analysis.

Facts may be presented in two ways—in tables, comparative and otherwise, and by the graphical method. The latter is popular and very effective in displaying proportions. The difficulty with it is that one cannot in a speech or in an article quote the diagrams, but it has a very important place in scientific statistics. The graphical method is carried to an absurd degree at times, but it nevertheless offers to a certain class of minds the very best method of determining results. In the final reflections upon statistics, however, one is drawn to the figures themselves.

With these preliminary statements, the general subject for discussion to-night brings us to the question: Is statistics a science or a method? It is not a matter of much consequence whether statistics constitutes a science or is simply a method. English writers on statistics generally consider it a method; continental writers, a science. American students often lean to the continental view. It is true that statistical research can be called a scientific method of determining facts and for studying various phenomena from which laws relating to life, production, distribution, consumption, etc., can be drawn; and the method must be considered scientific, because by it the facts can be clearly stated, classified and analyzed, elements which make science in every department.

We speak of the science of botany, for one reason because all the facts relating to botany can be classified, and so, as to other departments of human knowledge, classification or the lack of it may determine the scientific character of the knowledge. Science demands a classification of facts so rigid that all men will consent to its use and to the conclusions to which it may point.

Notwithstanding statistics is a science or a scientific method, its use is often empirical, deceptive, illusory and dishonest, and because of these things the method itself is often condemned. No one thinks, however, of condemning anesthetics because the burglar chloroforms his victim, or the elementary features of arithmetic, the means by which all honest accounts are kept, simply because dishonest accounts are made possible by the same means. So many instances of the lying use of honest statistics meet one's observations that it is not remarkable that many make surprising denunciation of statistics and the assertion that anything can be proved by it is made to belittle the importance and value of the method.

It is true that one so disposed can, by dropping an essential element of a table, show the exact reverse of the truth, just as the foolish man said he could prove by the Bible itself there was no God, referring to the statement "there is no God," leaving out part of the whole statement, which is "The fool hath said in his heart, there is no God." So writers and speakers who have a particular economic theory to sustain will drop out of the statistical presentation of the facts the elements which work against them, using the others as the whole truth. This is seen very often in political speeches. The attempt to make comparison between the percentage of growth of population and the percentage of growth in the expenditures of the Federal government, using no facts relative to the great increase in mechanical production and of wealth, is a vicious use of statistical data. Such showings are the results of the work of the statistical mechanic, the man who constructs statistical tables to order.

Statistics really take the place of observation. The latter is not trustworthy. Enumerations, counts, or records of continuous events are essential to establish accurate knowledge. But statistical science in this direction differs from the exact sciences. A few experiments may establish the fact that water freezes at a certain point or that the intermingling of two chemical agents will produce certain results, and the conclusion is that the same results will always be secured when the same elements are brought in contact; but the phenomena of life conditions and productions may not so easily be ascertained. Statistical work is full of fallacious details. Fallacies are found in the ordinary practice of striking averages. These things add to the disturbing influences resulting from any great enumeration, to perplexing differences among international trade accounts and to miscalculation by individual inquirers.

M. Quetelet, who was the first to use statistics in moral directions, explained the principles which ought to guide us in the matter of averages. He pointed out that an average may indicate two different things. For instance, one measures Nelson's monument ten times,

and always with a slightly different result, and then adds the measurements together and divides the same by ten, the quotient, it is alleged, being an average or mean. So one may accurately measure the Duke of York's Pillar, the Parisian Obelisk and the Column Vendome, add the measurements together, divide the sum by three, and declare the quotient to be the average or mean height of those monuments. Quetelet contended, and very properly, that the results in the two instances are of such different significance as to require two separate names. He would limit the average or mean to cases represented by the first illustration—repeated measurements of one monument—and he would apply the term "arithmetical mean" to cases represented by the second illustration—the measurement of several monuments. The repeated measurements of one monument result in a mean approximation to something actually existing, and this is an excellent definition of an average. The measurements and calculations having reference to a number of monuments result in no knowledge of anything existing; they simply and only indicate a relation among things actually existing.

This difficulty often appears in reporting average wages. Take, for instance, a works employing 20 men at \$1 per day, 40 men at \$2 per day, and 60 men at \$3 per day. The ordinary bookkeeper in a counting room would add these rates together—\$1, \$2 and \$3—making a total of \$6 as the result of the different rates. He would divide 6 by 3, the number of rates, and declare that the average wages in his works was \$2 per day. This is an arithmetical mean. The true average is to be obtained by a more elaborate calculation. Twenty men at \$1 earn \$20, 40 men at \$2 earn \$80 and 60 men at \$3 earn \$180 per day. Thus, 120 men earn \$280 per day. Dividing \$280 by 120, we have the true average, which is \$2.33 instead of \$2, the arithmetical mean. So also there are many fallacious calculations drawn from the use of percentage.

Some amusing incidents happen from this method. A writer recently declared that 300 per cent of the Turks in the city of Washington were criminals. On investigation it appeared that there was one Turk in the city, and he had been convicted three times. So of the young student who took for his thesis the assertion that women in co-educational colleges more frequently married during their college course than men in the same institution. He found a college in which there were 100 men and 2 women. One of the men married one of the women. Hence he sustained his conclusion that 1 per cent of the men married, while 50 per cent of the women married. Thorold Rogers' work "Six Centuries of Work and Wages" contains several instances of this pernicious use of percentages. So, also, many are constantly using the unscientific conclusions drawn from concomitants—because one thing exists another logically exists contemporaneously.

These illustrations show the necessity of making statistics, the statistical method, thoroughly scientific in all directions, but this scientific conception of statistics does not warrant statisticians in using algebraic formula or in resorting to the calculus to secure results. The results under such methods rarely vary from those secured by the simple common-sense method of statistics; on the other hand, they disturb the reader and the common mind cannot understand them. All statistics should be simple, straightforward and clear, and any confusing element which disturbs this clearness is detrimental to the real purpose of the statistical method. While there are very many illustrations going to show the misuse of the method, nevertheless all right-minded men understand that, in economic questions especially, the comparative and historical method of study is the correct one, and the concrete, historical and comparative method is best carried on through the scientific use of statistics.

THE ROMANCE OF PEMMICAN.*

FIFTY years ago pemmican was, to the shifting and scant population of the Northwest, what flour is in the present day to English-speaking peoples in most civilized portions of the globe—the staple and most common food of the country. Then it was always made from the buffalo which covered the western plains. The great fur corporation known as the Hudson's Bay Company bought hundreds of bags of the dark, nutritious compound annually from the Indians, for use at its trading posts scattered over the vast wilderness stretching from Red River and Hudson Bay to the Rocky Mountains and from the two Saskatchewan to the Arctic Sea, a region then designated Prince Rupert's Land. Pemmican (or, more properly, pimeekon) is a Cree word, meaning a mixture, or something made with fat. It was composed of buffalo meat dried in the sun and pounded fine, mixed with melted fat; and was sewn up in sacks made from the raw hide of the buffalo, with the hair outside. It did not look inviting, but was in fact wholesome, strong food, which would keep for years. . . . But if the buffalo was important to the fur trader, the ungainly animal was life itself to the red man; for it furnished him with everything his heart could desire or with the means of procuring it. And as, owing to the migratory instincts of the herds, which took them first into the recognized territory of one tribe and next into that of an enemy, fresh meat was not always obtainable, pemmican was the form in which the Indian preserved and laid away his store of provisions against the day of scarcity.

Omitting the excitement of the hunt and substituting domestic herds for the wild ones of the plains, a description of pemmican-making by the Indians a quarter of a century ago will give an idea of what might have been witnessed at Duck Lake in the summer of 1899. Intelligence that a band of buffalo was in the vicinity threw the Indian camp at once into a state of violent excitement. Men rushed from the lodges buckling on quivers of arrows and belts of cartridges, women talked and gesticulated, boys raced wildly about shouting shrilly to one another, the horse herd was driven in, and in a few minutes the bucks, mounted on their "buffalo-runners" and under the direction of the chief of the hunt, moved in a silent body

* Popular Science Monthly.

* Bleasdel Cameron, in the Canadian Magazine.