Protein Requirements.—In continuation of the former notice of Professor Chittenden’s work on “Physiological Economy in Nutrition” and the criticism which it gave rise to (see this Journal, April, 1907), some allusion must here be made to this author’s book entitled “The Nutrition of Man,” published in 1907. The scope of this is much the same as that of the former book noticed last year. One of the criticisms directed against Chittenden’s low protein diet was based on the injurious effects stated to have been produced in animals fed on this principle. As regards carnivora, Munk, Rosenheim and Jagerroos had stated that a low protein diet resulted in loss of absorptive power in the intestinal tract, due apparently to change in the epithelial cells, and diminished secretion of digestive fluids. Chittenden now examines this criticism and the experimental evidence on which it was based. In regard to the two dogs that were the subject of Jagerroos’s experiment, he shows that Jagerroos himself did not attribute their death to the deficiency of protein, but to the results of infection. They both died suddenly. Both Bacillus coli communis and a streptococcus were found in the blood. There was no pathological alteration or fatty degeneration of the intestinal epithelium. Chittenden believes that, in regard to the other dogs, it was monotony of diet and confinement that led to their loss of health. Accordingly, he has carried out experiments on twenty dogs; the results of six of these experiments are ready, and are detailed in his new volume. The dogs are fed twice daily on a mixed diet, and are kept in a large, airy room, exercise being allowed except for ten days in each month, when they are confined to a “metabolism cage” to determine the nitrogen balance. Full details are given of the dietaries and management of the animals, the experiments lasting over a year or thereabouts; photographs of the dogs are given which entirely bear out the correctness of the author’s contention, expressed as follows: “These experiments on the influence of a low proteid on dogs, as a type of high proteid consumers, taken in their entirety, afford convincing proof that such animals can live and thrive on amounts of proteid and non-nitrogenous food far below the standard set by Munk and Rosenheim. The deleterious results reported by these investigators were not due to the effects of low proteid or to diminished
consumption of non-nitrogenous foods, but are to be ascribed mainly to unhygienic conditions, or to a lack of care and physiological good sense in the prescription of a narrow dietary not suited to the habits and needs of this class of animals. . . . The more or less broad deductions drawn from the experiments of Munk and Rosenheim, especially in their application to mankind, are entirely unwarranted." It must be admitted that Chittenden has legitimately scored a point here; it remains to be seen if the observations of Shutt and of Skinner on hogs, and of Haecker on cows, can be similarly disposed of.

Chittenden relates some dietary experiments by Professor Irving Fisher, of Yale university, on nine students. (Professor Fisher has since published these in detail himself, 1907.) These students, who were all in perfect health, desired to try on themselves the effects of diminution of protein in the dietary, together with thorough mastication, as advocated by Mr. Horace Fletcher. The experiment lasted for five months. At the beginning the average calories of the daily dietaries amounted to 2,830, of which 210 were derived from flesh food; the calories from protein were 1.4 per lb. body-weight. The men were all working and studying hard; there was a slight loss of average total strength, but the endurance increased remarkably in all (except one man, whose reduction in quantity of food, in protein, and in flesh food was less than any one else's), showing an average increase of 140 per cent. ("The Effect of Diet on Endurance," by Irving Fisher, 1907).

Chittenden also quotes the case of Dr. Neumann, of Kiel, who lived for twenty months on a low protein dietary of 66 to 76 grammes, with either constancy or slight increase of body weight, the total calorie value of the diet being from 2000 to 2300; the amount of protein varied between 0.99 and 1.00 gramme per kilogramme body weight.

Allusion is made to a suggestive article by Dr. Herter, on the Character of the Bacterial Flora of Carnivorous and Herbivorous Animals (Science, December, 1906). This author has reported the presence in the intestines of the cat, dog, tiger, lion and wolf, of many spore-bearing bacilli, as well as free spores and vegetative forms of anaerobic organisms; some of which are markedly pathogenic when injected into the subcutaneous connective tissue. With herbivorous animals, on the other hand, such as the goat, buffalo, horse, elephant, &c, the predominating organisms are of a different order from those found in the intestines of carnivora, being practically non-pathogenic, or only slightly so, when injected subcutaneously, and less disposed to produce putrefactive changes or other chemical decompositions. It is easy to imagine that a predominance of animal or of vegetable food may materially modify the bacterial conditions of the intestinal tract in man; and there can be little doubt that from the bacterial, as well as from the chemical, point of view, excess in animal food and excess in the protein constituents are likely to be deleterious.
Enteric Fever due to Oysters.—To the well-known outbreaks that have occurred in Britain and America may now be added an extensive epidemic in France, enquired into by Professor Netter, and traced to consumption of oysters from Cette (Revue d’Hygiène, May, 1907). A total of 262 cases of illness was reported, of which sixty-three were enteric fever; at Cette the oysters was taken from the Etang de Thau, and placed in the canals of the town, in order to fatten; these canals receive sewage; enteric had existed in the town. A. Gautié found in the oyster juice 15,000 to 70,000 germs in the Cette oysters; in those from Marennes only 300 to 5,600; B. coli was found nine times out of ten in the Cette oysters, once only out of ten trials in those from Marennes.

Clams may now be added to the list of shell fish that have caused enteric outbreak.

Food Poisoning.—Several outbreaks of food poisoning have been recently recorded, in which the paratyphoid bacillus, type B, has been isolated, either from the food suspected, or from the bodies of the persons affected, or from both. The severity of the symptoms varies greatly. At Greifswald (1904), fifty soldiers were attacked with diarrhoea, vomiting, cramps and fever, lasting eight to twelve days; no death resulted. The food suspected was beef that to all appearances was sound; paratyphoid B was found in the stools, virulent to guinea-pigs (Bulletin Pasteur, 1907, 526). In Berlin (1906) ninety persons were attacked with diarrhoea and vomiting, either choleriform or dysenteric; three deaths occurred. The symptoms were due to beef, eaten uncooked; when cooked, no ill effects were produced. Paratyphoid B was recovered from the stools and (in three cases) urine of patients, very virulent to guinea pigs, even when the cultures were boiled (Jacobson, Berlin. klin. Wochens., 1907). Fromme, of Gottingen, reports thirty-two cases of diarrhoea, vomiting, &c., some mild, others serious, and accompanied by haemorrhagic nephritis, but none fatal, due to raw pork mince; the meat on examination showed presence of a layer of pus next the bone: in this pus, and in animals inoculated with it, was found paratyphoid B, proved to be virulent to animals (C. f. Bakt., Orig., 1907). Krehl, Kayser and Cahn, of Strassburg, report seven cases of sausage poisoning (colic, diarrhoea and fever lasting some days); one case developed remittent fever of eighteen days duration, with diarrhoea and enlarged spleen, but no rose spots. Nothing suspicious was detected in the sausages, but paratyphoid B was found in the stools of all the cases (Deutsche med. Wochens., 1906). At Tempelhoff, Berlin, twenty-four hours after eating a cake made of semolina, milk, vanilla and duck’s eggs, seven persons were taken ill with choleraic symptoms; one case was fatal. Paratyphoid B was isolated from the stools and vomit, and from the organs of the fatal case, very virulent to guinea pigs, and retaining its toxicity after sterilisation in the autoclave. Vagedes considers that infection was due to the ducks’ eggs, in which he had frequently found
numerous germs, though not previously the paratyphoid bacillus \((Klin.\ Jahrbuch, \text{xiv})\). Netter and Ribaud-Dumas report seven persons attacked with choleraic symptoms after eating a galantine; paratyphoid B was found in the urine and stools \((C. R. \ Soc. \ Biol., 1907)\). At Leipzig 250 persons were attacked with colic, diarrhea, shiverings, &c., some hours after eating a conserve of French beans, in which were found \(B. \text{coli}\) and paratyphoid B; the cultures were harmless to guinea-pigs by the mouth, but toxic by injection even after fifteen minutes boiling \((Rolly, \text{Münch. med. Wochens.}, 1906)\). Kutscher reports ninety cases of severe food poisoning in Berlin, with high fever, vomiting, cramps and diarrhea; two deaths occurred. Paratyphoid B was isolated from the suspected meat and from the stools. Kutscher states that the absorption of a large quantity of the microbes causes cholera nostras; if they are less numerous the symptoms are those of typhoid \((Berlin. \text{Militarartz. Gesellschaft}, 1907)\). At Hesse seven persons partook of cooked pork that was apparently sound; diarrhea resulted, and from the stools was isolated \((\text{besides } B. \text{proteus})\) Gaertner's \(B. \text{enteritidis}\), virulent to mice. Also, twenty-two persons were taken ill, five or six hours after having eaten a pudding, with diarrhea and fever; one death occurred; from the cream of the pudding, Curschmann isolated Gaertner's \(B. \text{enteritidis} \ (Z. \text{f. H.}, 1906)\).

The above instances of food poisoning have been found to be connected with either the paratyphoid bacillus, type B; or Gaertner's \(B. \text{enteritidis}\). The term \textit{Salmonelloses} has been proposed by Lignières, of Buenos Ayres (1900) as applicable to the group of microbes presenting morphological and cultural characters resembling those described by Salmon and Theobald Smith in 1886, for the organism that causes hog cholera. Sacquépée \((Bulletin \text{ Pasteur, November, 1907})\) divides this group of organisms into two sub-groups, chiefly on account of their agglutination characters: in the first sub-group are Gaertner's bacillus and the meat bacilli of the Gaertner type (those of the poisoning outbreaks at Morseele, Brussels, &c.); the bacillus of Thomassen and the Danysz virus. The serum specific for any one of these organisms agglutinates with any other of the sub-group in practically equal degree, but does not agglutinate \((\text{or but rarely})\) with the other \textit{Salmonelloses}; nor are the organisms of this first sub-group agglutinated by the specific serums of the other. The members of this second sub-group do not behave so uniformly in regard to their agglutinating characters as those of sub-group 1; but they show an obviously close relationship \textit{inter se}; in this sub-group are included the bacilli of hog cholera, of psittacosis, of mouse typhoid, the paratyphoid bacillus B, and the meat bacilli of the Aertrycke type. The whole group of "\textit{Salmonelloses}" present a homogeneous assemblage in regard to morphology, cultural characters and biological properties; also in regard to their pathogenic action and the lesions they produce; by their agglutinating reactions and the bactericidal
properties of their serums, they are divided into the compact sub-group of the Gaertner type, and the larger sub-group comprising the hog cholera and paratyphoid bacillus B, &c. Sacquépéé calls attention to the possible significance of this near relationship, subsisting between bacteria such as paratyphoid bacillus and those of meat poisoning cases—which are known to be pathogenic to man—and the hog cholera and mouse typhoid bacilli, which have hitherto been considered innocuous.

Improvement in Milk Supplies.—Efforts are now being made in many parts of the country to some purpose, in the direction of securing a clean and wholesome milk supply. An important case was decided at the Tower Bridge Police Court, May 12th, 1905, on the prosecution of the St. Pancras Borough Council, the result of which cannot be too widely known. The milk supplied by the defendant, a farmer, who contracted to furnish pure milk to a firm of wholesale milk distributors, was shown to be obviously dirty milk on naked-eye inspection: it was condemned as unfit for food. The defendant was fined £25 and £5 5s. costs. On further examination the milk was found to contain faecal matter, pus cells and tubercle bacilli. Dr. Collingridge remarks that "the case is notable as being the first of its kind with regard to milk, and should have a good effect in awakening farmers to a sense of their responsibilities, and the importance of cleanliness in handling milk" (British Medical Journal, March 30th and April 20th, 1907).

A street milk vendor in Westminster was sentenced to six month's imprisonment with hard labour (October 16th, 1907), for selling milk that was unwholesome and unfit for food. The milk was being hawked about in a churn and hand-can. It smelt offensively, and at the bottom of the can was found a large quantity of filthy material, consisting of vegetable débris, hairs (human and other), pieces of human skin, tomato skins, and other objectionable matter, apparently coming from a dirty stable, or from the street.

It is evidently the duty of all authorities concerned to exercise careful watch over the condition of the milk that is supplied, and to act vigorously on the lines above indicated, when the impurity is such as has been mentioned. Houston's method of estimating the volume of "apparent filth" in milk, and microscopical examination of the deposit, may be carried out with advantage (see his Report on Bacteriological Examination of Milk, London County Council Reports, No. 933, 1906). Dr. Forman, Chairman of the Public Health Committee of the London County Council, in presenting a report on "Proposals for Legislation in 1908," stated (July 9th, 1907) that the most urgent need was to secure for the inhabitants of London an uncontaminated milk supply: special legislation was not sought for, as the President of the Local Government Board was bringing in a Bill dealing with the matter for the whole country.

A joint committee has been formed, representative of the County Councils of the West and East Ridings of Yorkshire, of the Yorkshire
Council for Agricultural Education, and of the leading County Boroughs, to carry out investigations as to the contaminating influences at work on milk, throughout its progress from the cow to the consumer. The samples are being taken by arrangement with the farmers and milk dealers in each case. Bacteriological examinations are being made; and the report of the investigation, which is being conducted in a most thorough manner, will be awaited with interest.

The question of a pure milk supply has also been taken up by the authorities of the principal London Children's Hospitals, who at a representative meeting on April 26th, 1907, passed a series of resolutions requiring that the supply should be pure and genuine; from healthy cows; strained, refrigerated, canned and sealed at the farm; not "Pasteurised" without sanction of the hospital authorities; tested once a week chemically and bacteriologically; and that the farms whence the milk is supplied should be notified, and inspected from time to time.

As an instance of what can be effected by cleanliness, Hempel relates that milk obtained under aseptic conditions from a model dairy near Dresden, can be sent to Bremen (more than 300 miles distant) without ice during the summer, and has afterwards been found to be sweet after crossing the ocean in an ice-box (Münch. med. Wochens., liii., 7).

In New York City a conference on the "Milk Question" was called together in November, 1906. The chief points that were laid down as agreed upon, and necessarily to be carried out, were: That cleanliness is the supreme requisite, from cow to consumer, viz., in all persons concerned, premises, water, utensils, cans and bottles; temperature is the second essential, viz., 50° F., or lower, at the dairy, 43° at the creamery, 45° or less during transportation, not above 50° when delivered; Pasteurisation is not necessary; inspection is required. A system of marks, or "points," has been devised, relating to the cows, stables, milkhouse, milking process, and handling of the milk; out of the total 100 score, a dairy reaching 90 is considered excellent, 80 good, 70 fair, and any below 70 is regarded as "poor."

In opening a discussion on infant mortality and milk supply at the British Medical Association Meeting in July, 1907, Professor Kenwood urged the necessity for veterinary inspection of milch cows (especially for tuberculosis), and for an annual licensing of all premises where milk is sold or collected; this licence depending, of course, on a satisfactory inspection. He thought that the danger for prolonged use of sterilised milk had been much exaggerated, in which opinion the present writer most heartily concurs. The dangers to health of raw milk as at present usually supplied are overwhelmingly greater than the risk of infantile scurvy from sterilised or Pasteurised milk. This risk can only exist in the case of infants, whose diet would be confined to milk, as the only article of food consumed, and may be obviated by appropriate measures.

Dr. W. Collingridge, Medical Officer to the Corporation of London, in
his report, March, 1907, has sounded a note of warning in regard to the opinion that the milk of tuberculous cows is not dangerous unless the udder is affected with the disease. He points out that, though the proportion of cows so affected in this country is only about 2 per cent. (the risk therefore appearing to be small), there are other indirect ways of spreading contamination; the dust of cowsheds in which tuberculous animals are kept must become infected, and this dust gains access to the milk. (Mr. James King, out of 500 carcases of cows examined by him in London, found that only 266, or 52.3 per cent., were entirely free from tuberculous disease.) Klein found tubercle bacilli in 3 out of 39 milk samples examined in 1904; in 2 out of 22 in 1905; and in 2 out of 25 samples in 1906. The risk ratio is certainly higher than 2 per cent. of the cow population.

Alcohol.—The cause of temperance suffers so much from injudicious advocacy, that it behoves all its supporters on scientific grounds to be careful to refrain from the least exaggeration. The evils of alcoholic excess are so obvious and so appalling, from whatever point of view they are considered, that there is not the slightest need to make them out to be greater than they really are; or to deny to alcohol any possible use under any circumstances whatever. The researches of Atwater and Benedict have for most students of the question sufficed to prove that alcohol is not only a poison, but is physiologically, under strictly limited conditions, a food as literally as is the albumen of egg or the sugar of milk. This is, however, frequently denied by the more strenuous advocates of total abstinence. It is to be noted, therefore, that at the Physiological Section of the British Association, in August, 1907, Professor Cushny stated that, "in respect to the food value of alcohol, experiments over many years had shown that over 95 per cent. ingested underwent combustion in the tissues, and was utilised by them as a source of energy for muscular strength and body heat. Alcohol was therein strictly comparable to sugar, which was also an alcohol, though of a more complex nature." But this by no means implied that alcohol was a suitable food either in health or in disease. Dr. Dixon stated, from his own experiments, that the presence of small quantities of alcohol in the blood, up to 0.2 per cent. increased the amount of work and the output of blood from the heart, especially when the heart was beating quickly or failing. The type of action was changed entirely when the amount was increased to 0.5 per cent.; the work of the heart was then not facilitated.

As to its effects under circumstances requiring great exertion, Dr. Schneider examined 1,200 mountain climbers, and found that, as long as continuous efforts and difficulties are to be expected, no alcohol should be taken. Only for a special effort of mind or body (as for overcoming a final obstacle) may a dose be advisable. In descending, when all difficulties have been overcome, many mountaineers find a small dose of brandy a restorative (British Medical Journal, August 24th, 1907.)
In regard to its causative relation to insanity, Dr. Mott considers that alcohol does not, *per se*, produce a permanent mental derangement, such as constitutes our definition of insanity. It does not, or ought not to, occupy the high place given it as a cause of insanity in the Lunacy Commission Reports (*British Medical Journal*, September 28th, 1907). Dr. G. H. Savage also, in his Lumleian lectures, points out that the consumption of alcohol has greatly decreased in recent years, and there has been a great increase in temperance, yet there has also been a fairly steady increase of insanity (*British Medical Journal*, March 30th, 1907). Professor Anderson, of Galway, has noted that the narcotic influence of alcohol, as lowering cerebral function, may produce a temporary rest from strain that is even beneficial, having its physiological counterpart in sleep. The discussion on alcohol and insanity in the Psychological Section of the British Medical Association, in 1907, certainly conveyed the impression that those specially qualified to judge do not consider alcohol as a poison, pure and simple.

**IV.—SEWAGE REMOVAL AND DISPOSAL.**

*Sewer Air and Intercepting Traps.*—The very interesting and important experiments by Major Horrocks on the presence of specific bacteria in the air of drains and sewers have been fully detailed in this Journal (October, 1907), and need not be more than mentioned in this place. Dr. F. W. Andrewes has also found evidence of the presence of sewage organisms in sewer air by obtaining cultures of *Bacillus coli* and sewage streptococci on plates exposed in the sewer (Report to Hampstead Sanitary Authority, 1905, quoted in *Public Health*, July, 1907). Dr. Hurtley has pointed out that the air of sewers being always saturated, or nearly saturated with water vapour, if only a slight lowering of temperature occurs, condensation will take place on any floating particulate matter (*e.g.*, bacteria), and this will be deposited, and the sewer air consequently cleansed; this condensation occurs regularly at night. Some years ago Professor Tichborne, of Dublin, drew attention to the same condition or things, but looked at it from the opposite standpoint. He considered that sewage organisms were carried about, as on a raft, by the droplets of condensed vapour formed during the cold hours of the night, and dissipated when the air becomes warmed; thus leaving the imponderable microbe floating in the air, which might consequently be a medium for spreading specific disease.

An important discussion on certain suggested amendments to the Drainage By-laws of London took place at the Royal Sanitary Institute in May and October, 1907 (see *Journal Roy. San. Inst.*, July and November, 1907). Among the points considered was that of the retention of the intercepting trap; the meeting was not unanimous, but it must be admitted that, both in numbers and in weight, the opinions in favour of the trap prevailed. Dr. Louis Parkes, Mr. Patten Barber (Borough Engineer
Major Horrocks' conclusions may here be repeated (see JOURNAL OF
THE ROYAL ARMY MEDICAL CORPS, October, 1907):—

(1) Specific bacteria present in sewage may be ejected into the air of ventilation
pipes, inspection chambers, drains, and sewers by (a) the bursting of bubbles at the
surface of the sewage; (b) the separation of dried particles from the walls of pipes,
chambers, and sewers, and probably (c) by the ejection of minute droplets of flowing
sewage.

(2) A disconnecting trap undoubtedly prevents the passage of bacteria, present in
the air of a sewer, into the house drainage system.

(3) An air inlet, even when provided with a mica valve, may be a source of danger
when it is placed at or about the ground-level.

Sewage Purification.—Dr. George Reid opened a discussion at the
Royal Sanitary Institute in February, 1907, on the question, “To what
extent must authorities purify sewage?” He did not admit that it was
the duty of an authority to take such elaborate measures of purification
as to render their sewage effluent, if discharged into a river, in any way
potable; he considered that it would be cheaper and more effective if
whatever purifying process might be necessary were carried out at the
intake; and he maintained that the water authority should be held solely
responsible for the purity of the water they supply. In regard to shell-
fish layings and watercress beds, he considered that the only remedy
was the removal of the beds to a place of safety. Professor Bostock Hill
agreed; he thought that instead of endeavouring to raise false standards
of security by going to the expense of sterilisation when the principle was
wholly wrong, it was their duty to remove from the list of possible
sources of water supply all streams which received a large quantity of
sewage. As a standard of sufficient purity in a stream that receives
a sewage effluent, he believed there was none better than the existence
of fish-life. If a stream were sufficiently oxygenated, fish would carry
on a healthy existence in it; and that was the only definite, practical,
and regular standard, which from an economic point of view could be
agreed to as common to all localities. Mr. Lowcock, speaking as a water
as well as a sewerage engineer, thought that if a water authority chooses
to take water from a stream into which sewage effluents are discharged
above the intake, this authority ought to be responsible, and pay for all
treatment necessary to render pure the water distributed by it; but if,
on the other hand, any sewage authority discharges an effluent into
a stream already used for purposes of water supply, the sewage authority
should be held absolutely responsible, and pay for all necessary treatment
of the effluent so turned in. He thought that the quality of an effluent
must be considered in connection with the condition of the stream into
which it is discharged; speaking generally, it should not be putrescible,
Review of the Progress of Hygiene in 1907

and should produce no bad effect whatever on the stream. Dr. Barwise agreed with Dr. Reid in the main; the responsibility should be laid on the persons using the water, whether a water company distributing it for drinking, or the owners of a watercress or oyster bed. It would be infinitely cheaper to sterilise the water taken in from the river before it was filtered than to sterilise the whole of the effluents from sewage works. [But this obviously depends on the relative quantities of effluent and intake; it might be much cheaper to sterilise the effluent of a small town than the water supply of a large one; e.g., the Thames water supplied to London.] Dr. Barwise thought in exceptional cases, when a sewage outlet is close to a water intake, that the best means of purification (better than the use of electricity, ozone, or chemicals) would be afforded by passing the effluent through a sand filter before entering the stream. Dr. Fowler also agreed that the proper place to sterilise was not at the sewage works, but, if done at all, at the waterworks; he did not see how pollution could be avoided until storm overflows were abolished. He suggested the use of ozone at the waterworks intake; but wherever possible a pure supply should be obtained. Dr. Rideal quoted Rudolf Hering's short hygienic dictum: "Nothing to be discharged into a stream without purification; nothing to be taken from a stream without purification"; and considered this to be the proper position for the Royal Sanitary Institute to adopt. With this opinion the present writer agrees; but, as was said on another occasion by a well-known authority: "The bearing of this observation lies in the application on it." What is to be done in any individual instance? The drinking water standpoint is the opposite of the sewage effluent standpoint; sometimes one will prevail, sometimes the other. Circumstances alter cases.

V.—CAUSATION AND PREVENTION OF DISEASE.

Diphtheria.—Dr. D. S. Davies, of Bristol, made some suggestive remarks in his address on "Diphtheria" to the Society of Medical Officers of Health (Public Health, March, 1907). "We may accept without hesitation the grouping of diphtheria cases into marked clinical cases, slight ambulant cases, and carrier contact cases; and we must recognise the fact that the potency of a case for spreading the disease is inversely as its severity.

"The marked clinical cases, which are readily notified, should obviously receive early antitoxin treatment and sufficient isolation; if not possible at home, in hospital. To this extent hospital provision for diphtheria is essential; but obviously, from the nature and the number of contact cases showing little or no clinical symptoms, hospital isolation of obvious cases can act only in a very limited sense as a preventive measure. The essential towards prevention is an efficient organisation for the bacterial
examination of throats and noses of all contacts, whether members of an infected household, or class-mates in an infected school. In this way the remaining subjects fall into three classes:—

"A.—Actual mild cases showing some, probably slight, clinical symptoms.

"B.—Cases without obvious clinical symptoms, but yielding organisms classed as true diphtheria bacilli (carriers).

"C.—Cases without clinical symptoms, but yielding organisms classed as pseudo-diphtheria or Hoffmann bacilli (pseudo-carriers).

"With regard to classes A and B, we have always secured isolation in hospital or at home, exactly as in ordinary notified cases. . . . Considerably greater difficulty is felt in dealing with cases who present no clinical symptoms, and yield on examination doubtful forms of diphtheria [bacilli]. If such a case is a close contact of an actual clinical case, and especially if a child of school age, school attendance must certainly, in my opinion, be prohibited. I attach little importance to Hoffmann in nose or throat of children examined at hazard in unaffected schools or institutions, especially after long months of epidemic prevalence, when probably the majority of the population has become leavened with some sort of diphtheria bacillus; but during the early months of diphtheria prevalence, close contacts of actual cases presenting any suspicious forms may, in my opinion, form actual sources of infection. From this it follows that the importance of Hoffmann bacillus varies in the different stages of invasion. In a populous district such cases may accumulate so rapidly that hospital isolation is impossible; and we have met the difficulty by establishing in three infected districts temporary out-patient hospitals, at which such contacts might receive attention from a trained nurse acting under medical supervision."

In regard to school closure, Dr. Davies agrees with Dr. Kerr : it is rarely necessary; it would only be resorted to as a confession of failure, either from want of time or want of staff; bacteriological examination of suspects, and exclusion, are efficacious in immediately arresting spread in 95 per cent. of the outbreaks. This high efficacy is, however, only to be looked for when the district has already been fully leavened by diphtheria prevalence.

In regard to carrier cases, Dr. Davies accepts the two conclusions of the Massachusetts Committee (1903) : "(1) It is impracticable to isolate well persons infected with diphtheria bacilli, if such persons have not, so far as is known, been recently exposed to the disease"; the issue of precautionary instructions to such persons is advocated. "(2) It is not advisable, as a matter of routine, to isolate from the public all the well persons in infected families, schools and institutions." Wage-earners, business and professional men may be excepted; but children in infected families should be kept from school and from public places; teachers and nurses, and milkmen should not be allowed to continue at work. In
schools and institutions all infected persons, sick or well, should, if the infection be not too widespread, be separated from the others. "When diphtheria appears in a community which has for some time been free from it, it is advisable to isolate all persons who have been brought into contact with the patient until it shall have been shown that they are free from diphtheria bacilli."

Dr. Davies considers that the phenomena of recent diphtheria outbreaks suggests that owing to the extremely widespread occurrence of atypical forms, especially Hoffmann, among persons not clinically recognised as suffering from diphtheria, an acquired immunity is in time developed in large numbers of young persons, and that the modified phenomena of the later stages of the epidemic may be ascribed to this.

Von Sholley has found virulent diphtheria to be present in the throats of persons, free from any throat or other illness, in 18 out of 1,000 cases examined; in only one of these was there a possible history of exposure to infection several weeks before. Among 202 persons belonging to families in which diphtheria had broken out, and who were not themselves attacked, virulent bacilli were found in only 14 cases (Journal of Infectious Diseases, June, 1907).

Enteric Fever.—Dr. W. G. Savage has contributed a practical paper on "Recent Work on Typhoid Fever Bacteriology in Relation to Preventive Measures" (Public Health, October, 1907). He draws attention to four points: (1) Typhoid bacilli are frequently excreted in the urine in about 20 per cent. of cases; this is well established, and familiar to most, but he suggests that the obvious practical measures resulting from this knowledge are not habitually followed out. (2) Typhoid bacilli may persist in the body, and be found in the faeces and gall-bladder, long after all clinical symptoms have ceased. It appears that women form a large percentage of "chronic bacilli carriers;" sixteen out of twenty-two cases (Leutz), and nine out of twelve cases (Klinger). (3) Typhoid bacilli may be found in the excretions of healthy persons who apparently have never suffered from typhoid fever; they have been in contact with cases of typhoid, and are analogous to the contact cases of diphtheria outbreaks. (4) A certain proportion of cases, clinically diagnosed as typhoid fever, are due to another organism, the paratyphoid bacillus; according to Boycott (1906) about 3 per cent.; according to Zupnik, 7 per cent. of "typhoids" are really paratyphoid cases; Wells, of Chicago, estimates the proportion as 10 per cent. in that city; and Kolle reckons the proportion in Germany (1905) to be about the same.

Drs. D. S. Davies and Walker Hall have reported an instructive instance of "carrier infection" at the Bremtry Reformatory, Bristol (Epidemiological Section, Royal Society of Medicine, April, 1908).
had been free from typhoid for some years until 1906, when a case occurred in September, and three others in November; one case occurred in May, 1907, and in July to November there were twenty-two cases. These fell ill at irregular intervals, and in batches of three, four, or five, sickening at about the same time, indicating more or less simultaneous infection. After enquiry in various directions, it appeared that the infection was conveyed by milk; and that, as this was sterilised, infection must have been brought about after sterilisation, in which event the infecting agent might be a "carrier" case. On further enquiry it was found that six of the female inmates had previously suffered from typhoid, and that one of these was employed as cook and dairymaid. She was removed from the dairy on November 13th; no cases of enteric occurred after November 25th. On examination, this woman was found (though not until December 20th) to be passing typical typhoid bacilli in the stools; this occurrence of these bacilli in the stools was found to be intermittent. None of the other persons who had previously suffered from typhoid were found to be "carriers." It appeared, therefore, that the Brentry epidemic was due to infection from this particular "carrier," though she was at the time apparently in perfect health. That this was the case was proved beyond reasonable doubt when it was ascertained that, while this woman was employed at another institution at Brislington in 1904, there had been an outbreak of twenty-five cases of enteric fever, prevailing during the time when she was employed in the kitchen, and ceasing twenty days after she had left this occupation. Here also the milk had been boiled, but infection doubtless occurred subsequently. The authors say that "there is apparently little doubt that the transference of infection by carrier cases may be defined as 'gross,' and that definite though minute amounts of infective material are conveyed into the food or milk by the hands of the carrier, through carelessness and neglect to wash the hands after attending to the calls of Nature."

A patient in a Strassburg lunatic asylum suffered from typhoid in 1903; she recovered, and after she began to mix with the other patients occasional small typhoid outbreaks occurred, and in 1905 the infection was traced to this woman. Her stools were examined, and found to contain B. typhosus. She was then isolated and no further cases occurred. She continued to pass motions containing the bacilli from time to time, and died from typhoid sepsis in 1906. At the post-mortem examination typhoid bacilli were found passim, in spleen, liver, bile, wall of gall-bladder and inside of gall-stone. As she had been isolated for a whole year, she must have re-infected herself from the gall-bladder or bile-ducts (Levy and Kayser, Munch. med. Woche., December, 1906).

Levy and Wieber (C. f. Bakt., 1907) relate that a woman, having been confined on October 1st, was completely restored to health twelve days later. On October 21st she fell ill, and kept to her bed for some weeks with "fever"; her blood agglutinated at 1 in 200; the typhoid
bacillus was recovered from the stools twice. How did she become infected when there was no case of the disease in the house or in the neighbourhood? Her mother had recently arrived to be present at her accouchement; she lived in a village where many cases of typhoid had occurred in the preceding spring, she had herself been ill for six weeks with "influenza." It was thought that this might have been a typhoid attack; the blood was examined and found to agglutinate at 1 in 50, and typhoid bacilli were found in the stools. The mother, therefore, infected her daughter with typhoid bacilli that she had retained in her intestine, though she was herself in excellent health; the daughter was especially prone to receive infection, being debilitated after her accouchement.

Kirchner, of Berlin, in a pamphlet (1907) supporting Koch's views as to typhoid transmission in opposition to the Pettenkofer theory, quotes the case of a company of musicians who travelled from Trier (Treves) to Bergen in Norway; shortly after their arrival an outbreak of enteric occurred in the hotel where they were staying; this was found to be attributable to one of the musicians, who had brought the bacilli with him from an infected locality in Trier.

The significance of the paratyphoid group of bacilli was discussed at the Berlin Hygienic Congress in 1907, the subject being introduced by Loeffler. From the reports at present available it does not appear that any definite conclusion was arrived at.

Malaria was discussed at the British Medical Association meeting in July, 1907. Professor Simpson, pointing out that different conditions demand different methods of applying anti-malarial sanitation, adduced as examples: (1) Such tracts of country as the Roman Campagna, where large works of drainage and reclamation are required; pending these, the community is best protected by mosquito-proof houses, mosquito curtains, destruction of breeding places in and around the immediate premises, veils and gloves in the evening, and quinine as a prophylactic in the unhealthy season. (2) In localities subject to tidal floodings: Port Swettenham, in the Malay Peninsula, is a small town, built on raised land reclaimed from a swamp, and adjoining swampy land covered with mango trees; it was so unhealthy from malarial fever that its abandonment was contemplated. On Dr. Watson's recommendation, it was decided to construct a bund, so as to prevent the tidal waters from the marsh overflowing on to the low land close to the town; this low land was cleared, and drained by ditches, which passed through the bund with small wooden sluices at their outlets; any low-lying places that could not be drained were filled up. As a result, Port Swettenham had been freed from malaria. Professor Simpson considers that "the success which has been achieved shows that no place with similar conditions, however malarious, should be considered to be beyond remedial measures." (3) Small marshes at the foot of hills, with a water-logged soil, are best dealt with by constructing catchwater drains, which intercept the flow of water
coming from the high lands, and carry it away to the lower natural waterways, without permitting it to lodge in, and waterlog the low lands at the hill-foot. The method is much used in Italy, and has been employed with excellent results by Dr. Watson at Klang; it can be easily carried out by a few coolies cutting ditches to a proper gradient under supervision. The cost is small, the results in drying the ground and removing mosquito breeding grounds are remarkably good. (4) Pools in water-courses, or nullahs, that are formed at certain seasons, not uncommonly are a cause of malaria. A few coolies, by cutting channels from the pools into the main stream remove the stagnancy of the water and dry up the pools. Hong Kong is an instance of good results from this practice, also Ellichpur Cantonment in the Berars, about three miles from the Satpura range. Here, Colonel Swain, by cutting channels from the stagnant pools in the river to the central streamlet, thus draining them, and by filling up, or treating with kerosene, the pools that could not be drained, eradicated malaria. Major Nott, I.M.S., quoted the instance of Burhampur, Lower Bengal, where the expenditure of about £70 on coolie labour for draining and the application of kerosene oil, checked the breeding of Anopheles in a very short time. Work on similar lines has been carried out in various other parts of India. It is desirable that medical officers should give accounts of any such measures within their own personal experience for publication in this Journal, or elsewhere.

Ed. and Ed. Sergent, describing the fifth anti-malarial campaign in Algeria (Annales Pasteur, 1907), state that 2,000 persons (natives) were treated with small daily prophylactic doses of quinine; 439 of these were examined before and after the treatment; in 38·8 per cent. the enlargement of the spleen was diminished or cured; in 8·2 per cent. it persisted. Of 567 control cases not treated with quinine, in 6·2 per cent. the spleens were ameliorated; in 32·6 per cent. they were enlarged.

Plague.—Two further series of reports have been published by the committee appointed by the Secretary of State for India, the Royal Society and the Lister Institute, forming two numbers of the Journal of Hygiene (July and December, 1907). The researches have been most minute and laborious, and the number of facts detailed is enormous. These have been admirably gathered and digested into summaries, at the ends of the various sections.

Report XI.—As to the diagnosis of plague in rats, it is stated that naked eye examination by a competent observer is more satisfactory than microscopical examination alone. The most important post-mortem features are: typical bubo (submaxillary, axillary, and inguinal); “granular” liver (small necrotic foci scattered over the surface and through the substance); haemorrhages, especially subcutaneous ones; abundant clear pleural effusion. Microscopic examination for B. pestis is best directed to the buboes, where the bacillus is most likely to be recognised in large numbers; the characteristic involution forms are present in at least
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50 per cent. of the cases. Cutaneous inoculation of guinea-pigs, by shaving the abdomen (no soap or water being used), with partial removal of epidermis so as to produce a slightly bleeding surface, and rubbing in a piece of an organ (such as a bubo) of the suspected animal, is of great value for diagnosis.

As to transmission of the disease in rats (Reports XIII., XIV.), feeding experiments were carried out, which showed that Bombay rats (Mus decumanus) fed on the viscera of dead plague rats were susceptible (89 out of 415 became infected, i.e., 21.4 per cent.), but to a less extent than rats caught on board ship (18 out of 41, i.e., 43.9 per cent.), the Bombay rats possessing a high degree of immunity owing to the long continuance of the epizootic. Rats caught in Punjab villages (M. rattus) were also found to be highly susceptible to feeding (19 out of 28 cases, i.e., 67.9 per cent., a larger dose being given them than in the case of the other rats). The lesions found are the same as in rats naturally infected, with two striking differences: (a) With naturally infected rats the primary bubo is most often in the neck, with the fed rats in the mesentery; (b) in the former, the stomach and intestines show no marked pathological change; in the latter, there are marked lesions in the intestines. Intestinal infection in rats, therefore, appears to be rare, they do not become infected by eating the carcases of their comrades. A large number were fed on the urine of human plague cases; no infection resulted.

Experiments as to transmission by fleas from animal to animal (in continuation of those in the previous Report, No. I. of 1906) showed that rat-fleas (Pulex cheopis), fed on septicemic rats' blood could remain infective for at least ten days, and more likely fifteen days, during the epidemic plague season; in the non-epidemic season they remained infective for only seven days. Experiments (27 in number) with cat-fleas (P. felis) were not successful; and with human-fleas (P. irritans) were only successful in 3 out of 38 cases. It was found that multiplication of plague bacilli occurs in the flea's stomach (more often in the epidemic than in the non-epidemic season); and that the bacilli are present and infective in the rectum and faces of fleas taken from plague rats; but they have not been found in the body cavity, or salivary glands. "No evidence has been obtained in favour of infection by contaminated mouthparts or regurgitation from the stomach, but the possibility of infection by such means cannot be excluded" (Report XV.).

In continuation of experiments recorded in the 1906 Report, the conclusions then arrived at were corroborated that in the epizootics studied fleas, and fleas alone, were the transmitting agents of infection (Report XVI.).

Report XVII. confirms and amplifies the conclusions of the 1906 Report (No. I, Part iv.) that, in a plague-infected house, the infection is due to the presence therein of infected rat-fleas, which are capable of transmitting the disease to animals.
Other reports deal with the characters of the Indian rat-flea (P. cheopis); with the fact that under certain circumstances this flea will make use of man as a host, and will readily bite and feed on him; and with the phenomena of chronic rat plague.

The third series of reports, forming a bulky volume of 300 pages, consists chiefly of detailed accounts of observations on plague in Bombay city, in some neighbouring villages, and in some villages in the Punjab. There is also a digest of recent observations on the epidemiology of the disease (Report XXI.); the opinions of a large number of observers and writers are noted, but no general conclusions are drawn, either from the observations summarised or from the Committee's own laborious investigations.

As a practically successful "disinfectant," or prophylactic against plague, Dr. J. C. Turner, Health Officer to the Bombay Municipality, recommends "pesterine" the residue of the distillation of crude petroleum (huile de schiste). It readily destroys fleas. When a room is to be disinfected this substance should be sprinkled on the floor, before the furniture is cleared out, in order to catch any fleas that may be dislodged during its removal: after the room has been emptied, pesterine is spread over the ceiling and upper part of the walls; then all over the walls, in nooks and cracks and on ledges, then on the floor, then it is poured into every rat-hole. The room is left for twenty-four hours undisturbed, and is then fit for re-occupation. Pesterine is not readily inflammable, and is cheap (2 annas per gallon); it may be used for disinfecting excreta.

Small-pox and Vaccination.—A new General Order was issued by the Local Government Board in September, 1907, amending the Vaccination Order of 1898, in accordance with the Vaccination Act, 1907. The object of this Act is to effect an alteration in the legal method of obtaining exemption from penalties for neglecting to have a child vaccinated, but without otherwise interfering with the provisions of the Vaccination Acts, 1867 to 1898. Hitherto, the "conscientious objector" has had to satisfy two justices, or a stipendiary, or Metropolitan police magistrate, in petty sessions, that he conscientiously believes that vaccination would be prejudicial to the health of his child; by the new Act all he has to do is to make a statutory declaration of his conscientious belief.

Dr. Myer Coplans, in a paper on "Medical Inspection of Schools" (Epidemiological Section, Royal Society of Medicine, 1907), gave statistics of vaccination amongst the school children at Stroud, Gloucestershire: of 4,716 children in the "big school," 35·9 per cent. were found to be unvaccinated; and of 1,932 in the infant school, 53·6 per cent. were similarly found to have no vaccination marks. He draws attention to the remarkable falling off in vaccination among the children born in 1896 to 1902. In the latest Report of the Medical Officer to the Local Government Board (for 1905-1906, published in 1907), the percentage of children born in 1904, and remaining unvaccinated, in the whole county of Gloucester, is given as
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26; in the Stroud Union, 44; this percentage is exceeded in three other unions in the same county. It is perhaps not generally realised that there are districts in this country where a very large unvaccinated population is growing up, to the danger of themselves and their neighbours.

Tuberculosis.—The International Hygiene Congress at Berlin, in September, 1907, discussed the question of etiology, especially with regard to the relative importance of the alimentary and the pulmonary avenues of infection. Ravenel, of Philadelphia, considered that the alimentary tract was a frequent portal of entry, especially in children, the milk of tuberculous cows being a source of infection in many cases; he believes that the bacilli can pass through the intestinal mucous membrane by the lacteals into the blood and so to the lungs, where they are largely retained. On the other hand, von Schwetter, of Vienna, believed the lungs to be primarily affected in by far the greater number of cases. Flugge allowed that infection might occur from the presence of tubercle bacilli in the food; but maintained that while pulmonary tuberculosis can be produced experimentally by inhalation of droplets floating in the air, containing only a few bacilli, if these are given in the food, the number present must be millions more, in order to produce infection; and the symptoms and the fatal result occur much later. Although, experimentally, inhalation is the more dangerous, one must not necessarily conclude that it is the more important mode of infection. It depends on the opportunities afforded. If intestinal infection is frequent, and pulmonary inhalation rare, the latter loses its relative importance. For pigs and calves fed on tuberculous milk this mode of infection predominates; cattle may become infected by inhalation, through living with coughing tuberculous cows. For man the relative infection frequency varies; with children, consumption of tuberculous milk and butter is a danger, but Flugge considers that by far the largest number of cases of human tuberculosis are the result of the inhalation of tubercle bacilli ejected in the form of droplets by tuberculous patients.

Ribbert, of Bonn, concludes that from post-mortem examination it is the fact that in the great majority of cases of tuberculosis the disease is localised in the bronchial glands and in the lungs, that the bronchial glands are the only glands involved, and therefore that the tuberculosis can only be of aerogetic origin. Calmette and Guerin, however, have recorded feeding experiments on adult bovines, with bovine tubercle bacilli; and state that adult, as well as young animals, readily contract tuberculosis by the intestinal route; that the so-called primary pulmonary tuberculosis of the adult is most frequently of intestinal origin; and that this is the most effective of all modes of infection. Calmette, indeed, says that the most usual mode of tuberculous infection is by the ingestion by the alimentary tract of fresh virulent bacilli, in a state of fine emulsion, such as one finds in milk or in spuata (Bulletin Pasteur, 1907, 739). It must be remembered that Chauveau, as far back as 1868, had said that
the digestive tract, both in man and in cattle, constitutes an avenue of infection just as favourable, and as likely, for the propagation of tuberculosis as the pulmonary.

Pfeiffer and Friedberger (Deutsche med. Wochens., September, 1907), have described experiments on guinea-pigs, both by feeding and inhalation, minimal doses of bacilli being used, to approximate natural conditions of infection. To 28 animals 9 cc. of dilute emulsion (estimated to contain three million bacilli) were administered by the mouth; while 29 others were made to inhale the same quantity in the form of droplets. After fifty days the animals were killed and examined. Of the 29 infected by the respiratory tract, 22 presented tuberculous lesions of the lungs, 15 having also lesions in the spleen; in none were the intestines or mesenteric glands affected. Of the 28 to which tubercle bacilli were administered through the stomach, 4 showed lesions of pulmonary tuberculosis, 3 others showed lesions of the mesenteric glands, 21 were free from any sign of tuberculous infection. The authors conclude, therefore, that the principal danger lies in inhalation.

With regard to the relation between avian and bovine tubercle bacilli, and the infectivity of the former in bovine animals, A. E. Mettam (Proc. Roy. Irish Academy, 1907) inoculated a heifer with avian bacilli in broth culture, originally obtained from a turkey; after thirty-six days tubercles were found in spleen, liver, and various glands; also there were the lesions of tuberculous broncho-pneumonia. A similar culture was given to a young bull by the stomach pump; after seventy-seven days tuberculous lesions were found in the mesenteric glands, but inoculation of these into a rabbit proved negative. Shattock and others have described (Pathological Section, Royal Society of Medicine, 1907) feeding and inoculation experiments on birds at the Zoological Gardens. In contradiction to the common belief that avian tuberculosis is contracted from a human source, i.e., ingestion of phthisical sputum, they found that pigeons could not be experimentally infected by feeding them with phthisical sputum; infection, however, did take place when they were fed with tuberculous material derived from other birds; the authors conclude, therefore, that the organisms of avian and human tuberculosis are distinct. Comparative observations were made on the amount of phagocytosis that occurred when human tuberculous serum was saturated with human and with avian tubercle bacilli; the opsonin was removed in one case as markedly as in the other; but the authors do not regard this negative evidence as so important as the positive differentiating results obtained by feeding and inoculation.

A few observations of immediate practical importance may be mentioned. Mr. J. A. Gilruth, Chief Veterinarian and Bacteriologist to the New Zealand Department of Agriculture, in his report for 1906, stated that during the three years ending March, 1905, out of nearly 240,000 fat bullocks and heifers examined, 3.7 per cent. were found to be tuberculous,
though all were apparently healthy and in good condition; of nearly 46,000 milk cows, about 10 per cent. were tuberculous; out of nearly 125,000 pigs nearly 4 per cent. were tuberculous, the situation of the lesions clearly showing that in most cases infection was due to contaminated food, probably tuberculous milk. Schröder and Cotton (Washington Bureau of Animal Industry, 1906) reported that pigs showed lesions of the submaxillary glands in every case observed, pointing to the channel of infection; Mr. James King, of the Central Cattle Market, Islington, has made the same observation.

At a conference of representatives of twenty-eight out of the twenty-nine City and Metropolitan Borough Councils, held in June, 1907, it was resolved that notification of pulmonary tuberculosis should be made compulsory; and that this disease should be included amongst the "dangerous infectious diseases" in regard to which provision is made in the Public Health (London) Act, 1891, for disinfection of premises, bedding, clothing, &c.; and special regulations are laid down as to letting lodgings or houses in which such cases have occurred. The Local Government Board were also asked to make the Dairies, Cowsheds, and Milkshops Order of 1885, with its amendments, compulsory on local authorities, and to make tuberculosis a "dangerous infectious disease" in connection with milking of cows and distribution of milk (i.e., persons while so suffering must not engage in these occupations). The provision of sanatorium treatment for the poor in the early stages of the disease was declared to be necessary.

Notification and sanatorium treatment, the latter for the training of patients in the proper management of their own cases, are two essential measures for prevention of the spread of tuberculosis. Dr. Newsholme gives the following advice to patients leaving the sanatorium (Journ. Roy. San. Inst., February, 1907): (1) The spit bottle should always be carried in the pocket, and daily washed out with boiling water after emptying its contents down the w.c.; at home if the bottle is not used, spit into paper or rag, and burn this at once. (2) Be careful not to cough directly opposite to any other person; always hold a handkerchief to your mouth when coughing. Change your handkerchief every day, and put the soiled one into water. (3) In order to maintain a condition of good nourishment, take a glass of milk with each of the three chief meals, in addition to the ordinary food. (4) Keep on taking cod-liver oil each day until you have no cough, unless otherwise ordered by your doctor. (5) Do not take beer or other alcoholic drinks. Money thus spent is wasted. (6) Keep up the practice of sleeping with your bedroom door and window wide open; one of these without the other does not suffice. To keep warm, wear plenty of woollen clothes. (7) It is imperative that you should sleep in a separate bed; and if possible have a separate bedroom. (8) Do not run the risk of inhaling dust if you can avoid it, either in the house or when at work, or in the street. Always insist on the "wet cleansing" of rooms instead of dry dusting or sweeping.
Reference must be made to a very valuable Report on "Sanatoria for Consumption, and Certain Other Aspects of the Tuberculosis Question," by Dr. H. T. Bulstrode (1908), forming a supplement to the Report of the Medical Officer to the Local Government Board for 1905-06. Not only is there a detailed account of the various sanatoria in the kingdom; but there is also a most interesting description of the working of the System of Compulsory Insurance against Sickness in the German Empire, demonstrating the great importance of this movement in the campaign against tuberculosis. Dr. Bulstrode also discusses generally the various modes of causation of the disease, and the influences of notification and sanatorium treatment on its prevention.

Reprint.

THE EYE IN SPORT.1

[The blocks illustrating this article were very kindly lent by Mr. C. B. Fry, editor of Fry's Magazine.—Ed.]

BY CAPTAIN W. B. FRY.
Royal Army Medical Corps.

The physiology of games, especially with regard to eyesight, brings to light so many facts, both interesting and useful, that the study is well worth the while of the practical sportsman whose object is to take up a game and waste as little time as possible in learning to play it.

The attainment of this end is certainly accelerated by understanding those parts of the body that must be employed in playing these games, namely, the eyes, the brain, and the voluntary muscles.

Just as a man who drives a car, and, understanding the engines of it, knows what they can do and how they go wrong, is in a far better position than the man who can merely drive; so the man has the advantage who, in playing games, knows the functions, the capabilities, and the shortcomings of these same eyes, muscles, nerves, and brain. The knowledgable man always gets there first.

To start with the eyes. What are they? They are two small cameras set in our faces with the centres of their lenses about 2½ ins. apart, the centres of these lenses corresponding, of course, to the centres of the pupils. Now, with two cameras two images are formed, and at first sight it would seem that we must see double, a condition that actually does occur in certain morbid states, and is occasionally experienced by

1 Reprinted, by kind permission, from Fry's Magazine, March, 1908.