

THE INTERNATIONAL MEDICAL CONGRESS.

THE International Medical Congress, held at Rome, came to an end last week. In point of numbers it was a great success, as many as seven thousand members and recognised guests being in attendance, without mentioning the large number of visitors not connected with the Congress.

The Congress was formally closed on April 5, the final proceedings being very enthusiastic.

Prof. Baccelli, the president, in bidding the delegates farewell, said that in attending the Congress they bore testimony to the fact that for enlightened minds the claims of science were paramount. He proposed that the next Congress, which would be the twelfth, should be held in Russia, leaving it to the Government of that country to determine the place of meeting.

M. Danileffsky, in the name of the Russian Government, accepted Signor Baccelli's proposal, the announcement being received with applause. The representatives of all the foreign committees then spoke in turn, and referred in warm terms to the hospitality shown to them by the King and Queen of Italy and the Italian Government.

We hope to give in our next issue an account of the proceedings of some of the sections. In the meantime, however, we reprint from the *British Medical Journal* the abstracts of two addresses of great interest.

Prof. Michael Foster on the Organisation of Science.

One of the most salient features of animals is a division of parts whereby each part does its best to fulfil the work required of it. On the other hand, all the parts of the body are so united that every part works for the common good. Just as in the body politic there are laws and unwritten customs which regulate the actions of the members, so also with the workers in science. Differentiation had proceeded to a great degree amongst scientific workers; each inquirer has now to limit his inquiries not only to one science, but to one part of that science, and there is no doubt that in the future division of labour will have to proceed still further.

So much for division; but what about integration? Is it possible for anything to be done to unite the different scientific workers together? I think that there is, and it seems to me that this International Congress of Medicine—of medicine which is the mother of all sciences—is a suitable opportunity, and Rome is a fitting place to propose the doctrine that human wit may well devise some tie that will bind all the workers of the world together by one indissoluble knot. What is wanted in science is organisation; by this the labours of the individual will be lightened and the progress of science will be furthered. Let me now ask whether organisation can be applied and inquiries carried out by single investigators?

There is, however, a danger which I do not want to understate, for we must bear in mind that an investigator is like a poet, *nascitur non fit*, and there is a danger that by organisation we may tend to nurse the unfit and hamper the fit. There are two main incitements to investigation—one is love of fame and the other love of truth, that curiosity to know the truth which drove Adam and Eve from the garden, and which has ever since stimulated mankind. Ambition will be hampered by organisation, the lover of truth for its own sake will be aided, and the latter is undoubtedly the more important of the two. As I look around me, I see everywhere waste of effort. Every inquirer knows that when he commences an inquiry he is sure to come upon side issues which have to be investigated, and he is obliged either to devote much time to them and partly to solve them, or he has to leave them alone. Every inquirer goes to his rest leaving many of his problems unsolved. There are plenty of young men capable and anxious to solve them, but, owing to the want of organisation, they do not know what to undertake, or they dig wells where there is no water. In all this energy is wasted, and in addition a great deal of work is thrust upon the world which the world were much better without—work which is crude, unfinished, unmastered, a veritable sewage thrown into the pure stream of science, which has to be got rid of before the stream can again become free from impurity. Is there any way by which this waste of energy may be diminished and this increasing flow of useless matter lessened? It is on this point that I wish to make a suggestion to the Congress. In the old times there were guilds by which the workers in any one

branch were united together. Now in science many men have laboratories and no men to work in them, or no men that are fitted to work in them; others, again, have men and no laboratories. Would it not be possible to form a guild, and so unite these workers, so that by the guild the work done might be polished and completed before it is given to the world?

There are many kinds of inquiry which would be much benefited by concerted action. Two of these which merge into each other are statistical inquiry and what we may call skilled inquiry. The chief feature of the former is that the data which are gathered should be homogeneous. There should be no exercise of individual judgment by the inquirer. It is evident that the value of statistics largely depends upon the width of the field covered, and the collection of statistics by many nations at the same time would be of the greatest value. I can especially aver that this is the case in the biological sciences. By this means we might avoid the collection of statistics based on insufficient cases or over so limited an area as to be worthless, couched in percentages, so that they have an apparent value which is most misleading and dangerous. The second kind of inquiry is the skilled inquiry, that kind of inquiry which should only be undertaken by skilled men. As an example, I may mention a solar eclipse. How valuable the knowledge that has resulted from several skilled men observing and discovering the same thing at the same time! The favourable opportunity for an investigation may be a short one, and the advantage gained by concerted action would be in such a case very great. Again, the number of skilled observers living at any one time is not great, and they are spread over many lands. The problems of the future must be faced by the best men, and why should not these men work together? Why should not the best men be selected—now an Italian, now a German, now a Frenchman—because they are best to do the work for which they are best fitted? It is only in this way that we can get the best work done in the future.

Expense is another reason why scientific work should be taken up by nations in common, for every day the pursuit of scientific investigations becomes more costly, and may in any given case be too expensive even for the richest nation.

If such a proposal be a good one, then there must be some international organisation if it is to be possible. No nation waits to prepare for war until the drum beats to arms, so in science we should be ready with our organisation for whatever work may present itself. The chief difficulty of starting such an organisation is the expense at the commencement; when that is once got over, the cost of fuel to keep it going is not great. If once in working order, a permanent organisation could at any time start the machinery which was necessary for any special work. Scientific work is the property of the whole world, and as such the whole world should combine to fight the powers of darkness and ignorance.

The dangers which apply to the individual in such an organisation also apply to the nation. Ambition when applied to a nation is called patriotism; but surely the love of truth is higher even than patriotism. Leaving generalities, every worker knows how much difficulty small things create in his work. For instance, nomenclature. How great a help it would be if there were only an international tribunal before whom every new name had to go, and who would, as it were, stamp the coin of science before it was allowed to pass into circulation. Again, it may happen that some inquiry has to be carried on under special conditions. An example of this is the work done at the zoological station at Naples. This is in reality an international institution, although it has been chiefly originated by one man; such an institution ought to be international, and ought not to depend for its existence upon the energy of one man.

One more instance. The condition of scientific literature can only be described as one of chaos. Think of the literature that a scientific worker has to read through before he can know what has been done by others—journals, weekly, monthly, yearly, in all languages, journals upon all subjects! Whereas, if all the papers on one subject could be collected under one cover, think of the saving of time! Even if this cannot be done, at least it might be possible to have a universal index which should appear at frequent intervals, and which should be re-classified every five, and again in ten years, and so on. Such a list of titles would enormously lessen our labours. I would suggest that this Congress should initiate the work, should set in motion the formation of such an index. If this be done it will be a commencement in organisation, and if this be done successfully we

may then pass on to other international works which may present more danger and greater difficulty.

Prof. V. Babes on the Position of the State in Respect to Modern Bacteriological Research.

The health of the community is under the care of the Department for Internal Administration of the State; and inasmuch as health is essential to the happiness of the individual and the development of human energy, it appears, for most important economic reasons, to have a first claim on the Government. Those learned in such matters are, however, of opinion that, in spite of its immense importance, of all the different departments of internal administration that of hygiene has remained the least developed in Europe. I will first attempt to throw light on this sad circumstance, affecting as it does the most valuable of human possessions—one that gives value to other possessions—and then I will search for means to obtain for sanitation its proper position amongst State institutions.

HISTORICAL SURVEY.

The care of public health does not necessarily advance hand in hand with education; a lively and practical public spirit and a great vitality in the people cause a place to be yielded to the demands of State sanitation. The oldest civilised peoples regarded it as a public duty to protect the health of the individuals. With a view to this, the laws of Sparta, of the ancient Egyptians, and of the Israelites, had more hold than modern legislation on the life of individuals. Still, their rules were not founded on any sure basis, but rested entirely on old traditions and experiences, which the spirit of the period clothed in religious or political dress.

In the laws of these old nations matters were regulated, which, according to our modern feelings are now left to the care of the individual, and sexual disease was more rigorously opposed than it is at present. Leprosy, from which the first civilised nations ran great danger, was opposed by more rational laws than it is thought can be opposed to the just as dangerous or more harmful diseases of to-day. The good results of the working of the Mosaic laws can still be seen even in our days when State sanitation can derive so much aid from modern sanitary science. The Mosaic laws owing to their religious form took deep root in the domestic life of the people, and the vitality of the Jews of to-day bears witness to their wisdom. The Jews thrive where the native population, in spite of special legal protection, is decimated by infant mortality and infectious diseases. The hardening of the constitution, the dress and baths of the people are neglected by modern legislation for the reason, though expressed in various ways, "that the State has only to look after the health of individuals so far as the health of individuals affects the community."

When one contrasts this vaunted principle of individual liberty with the limitation of this liberty which is effected in the interest of religion, of the ruling classes, and even of traditions and conventional ideas, one cannot repress the thought that this magnanimous permission of the State allowing each individual to make himself ill if he likes, to treat himself as he thinks best, and spread his illness, is not merely dependent on the principle of individual liberty.

But also in another direction did the civilised nations of antiquity set us a good example—namely, in the repression of general causes of disease. Aqueducts and canals were made at great expense, marshes were drained; during the plague of Athens great fires were made and excreta burned, dead bodies were cremated, and the principles of public hygiene were also popularised by lectures. In spite of the much greater State incomes and the technical facilities of modern times, most modern States cannot nearly rival those of ancient times in the proportion of their sanitary undertakings to the number of their population.

In respect of public health, Rome advanced still further than Eastern civilisation. Aqueducts and canals were undertaken in early times; owing to the number of public baths in Rome, probably each citizen could have a free bath daily, and similar establishments existed in the smaller towns of the Roman empire. The irruption of barbarian hordes on the Roman empire disturbed the whole organisation of public health, and Christianity to some extent helped in producing this disturbance, especially by its ascetic disregard for corporal welfare, and by

the absolute separation, which it enjoined, of religion from all matters of bodily health.

Epidemics raged and exercised a wholesome influence, in part by reducing the population, and by directing attention to the infectious nature of diseases. People began to notice that contagion was carried about by men and clothing, with the result that quarantine and sanitary police were introduced by some towns of Upper Italy. Venice was particularly active in these matters of hygiene, but the unsettled political state of Italy long prevented the proper development of State sanitation. After the unification of Italy this development soon began to show itself, and the law of 1866 and particularly that of 1888 ("Sulla tutela dell' Igiene e della Sanità pubblica"), were framed, the latter of which might serve as a model to other States of Europe, with the exception perhaps of England. By this law the authorities on hygiene take that position which, as competent authorities, is due to them. As well as a competent upper board of health there are provincial boards of health, all of which of their own initiative can move proposals on hygienic questions, and must be consulted on sanitary ordinances. These boards of health are not dependent on the administrative officers, and all urgent measures recommended by them must be immediately carried out by the prefects.

In England a practical public spirit early developed itself. What was accomplished in hygiene began from below, and took deep root in the customs of the people, before developing into institutions of the State; this insured its usefulness and recognition. The practical independence of the parishes, as well as the Parliamentary system of that country, showed to advantage in this matter; there were water supply committees, and the parishes left to the sanitary authorities the choice of their own methods. As in other countries, infectious diseases first gave occasion for thorough trial of sanitary arrangements. Committees were formed for statistical inquiry into mortality with regard to soil, overcrowding, with regard to the pollution of air, water, &c., and the activity of these committees led to important conclusions regarding the artisan population, which had attained so great an importance owing to the growth of the manufacturing towns.

The Public Health Act of 1848 was formed in accordance with the then existing state of scientific knowledge on a statistical basis, a testimony to the public spirit of the country. Local bodies, under the guidance of a doctor, had executive power, and could levy rates to cover the expense of water supply, canalisation, &c. Unfortunately, as usually happens in such cases, when a better hygienic condition was reached, the means by which it had been obtained were neglected. The Board of Health was abolished, but, on the other hand, the Local Boards gained in power. In 1871-72 a Board was instituted for seeing to the poor, sanitary matters, and Local Government, the whole country being divided up for this purpose into sanitary districts. Each of these districts possesses a medical officer of health, a sanitary inspector, and a public analyst. These officers work in connection with each other, and with the central officers, and possess the power of taking measures to oppose epidemics.

In Prussia the sanitary arrangements have a bureaucratic aspect. There was a College of Medicine and a special College of Hygiene, to which the doctors of towns and districts were subservient. In 1862 officers were appointed to the different provinces, but their power was limited by the central bureau.

In Austria, since 1870, there has been a chief sanitary officer working with the junior ones, who, at all events, have the power to take first steps.

In Roumania, by the law of 1873, the sanitary administration is placed in active communication with the doctors of towns and districts, and controls them by yearly inspection. The latter are, in the same way as the hospital doctors, recommended by the special sanitary adviser to the central administration.

In France, although the medical schools are distinguished, public health is not sufficiently cared for, because the learned scientific bodies have hardly any voice in its administration. The prefect and the mayor do all the administrative work, and an authority on hygiene is only consulted when the prefect thinks fit.

Of late years attempts have been made to include institutions for the furtherance of scientific medicine within the State

organisations for hygiene. We shall see that just the most rational hygienic measures are opposed and partly abolished on the plea of their being inconvenient to commerce and intercourse, and to the influential Government administrators. International arrangements for protection against epidemics have also lately several times been neglected for the sake of the commerce and intercourse of the great nations, and partly at the sacrifice of smaller nations with less complete sanitary arrangements.

The Position of Doctors towards the State.—The medical profession in many countries is not permitted to exercise any executive right to protect the country against epidemics. It must be allowed that there is a tendency for the scientific men employed in some State institutions of hygiene to separate themselves from the statesmen who founded these institutions. It must appear to us doctors unintelligible that, though statesmen recognise the immense importance of public health, they will not surrender the executive power of sanitary administration into the hands of those who have made it their special study. Doctors constitute a hard-worked class, possessing neither the time nor the authority to make their claim felt, and it is to be regretted that so few members of the upper classes of society devote themselves to medicine, which offers them such a field for useful work.

Doctors are not much attracted towards State matters of hygiene, because of the smallness of the pay allowed to those who enter the service of public hygiene. The State should pay its sanitary advisers better, since it expects of them a special professional education, and should, at the same time, forbid them the practice of ordinary or legal medicine. Doctors would then be able to devote themselves to finding out and remedying the causes injurious to public health, just as they would those injurious to the health of a family. Finally, every facility should be given them of making themselves familiar with the science of government, especially legislation, political economy, and statistics.

Government Sanitary Institutions.—The best way to improve the quality of the doctors is for the State to afford them the means of attaining the highest essential education. This necessitates State institutions specially designed for the purpose. An attempt of this kind was made in 1876 in Germany, but want of understanding and money caused the institution to fall short of the mark. The Imperial Board of Health at present does not possess, as it was at first intended, the superintendence either of medical and veterinary measures or of medical instruction, neither are the laboratories sufficiently endowed to meet the requirements of proper sanitary research. Nevertheless, with the exception of Roumania, no other country possesses a similar institution, though they possess institutions, privately erected, for the study of infectious diseases, which act more or less in harmony with the State administration.

A few words, therefore, may be said on this institution of Roumania. As Roumania stands on the boundary between East and West, it was peculiarly exposed to infectious diseases, not to mention several imperfectly known diseases of the country itself. In 1887, epidemics amongst the cattle and widespread hydrophobia rendered it advisable to establish such an institution in Roumania; moreover, no sort of institution for pathological anatomy, pathology, or bacteriology existed there at that time. The institution is well endowed, and adapted to meet the requirements of scientific investigation and instruction, but unfortunately possesses no administrative authority.

[Prof. Babes then gave a description of the work carried on in the various departments of the Roumanian Institute, showing in what way a State institution of this nature may, even in spite of special difficulties, render service to hygiene and science. He went on to say that:]—

Such an institute should always be in connection with a hospital for infectious diseases, and the institute itself should be divided into five or six closely-connected parts: (1) For clinical treatment and experimentation; (2) for pathological anatomy, bacteriology, and experimental pathology; (3) for infectious diseases of animals; (4) for chemistry; (5) for statistics, superintendence, and the library; (6) for lecture rooms, museum, and management.

The building should consist of a main edifice and several pavilions. The chief edifice must be for laboratories, and, if outside the town, there must be a dwelling house close by for the director, staff, and servants. There must be a completely

isolated pavilion for inoculation of men, and about three others for examination of animals, and there must be several places for breeding animals.

The staff should consist of director, about four superintendents of departments, eight assistants, officials in charge of statistics, a librarian, a manager, and about eight or ten servants. The total cost of the undertaking would reach about 1,000,000 francs.

The director and his staff should give lectures, &c., with special regard to hygienic administration in its widest sense—for doctors in the public service, for candidates desirous of obtaining medical offices, for architects, engineers, administrative officials, and students. The institute for pathology and bacteriology might be under the control of a "home office" or a "health office," but must have the right of preparing hygienic laws for the State authorities.

Besides this great institution there should be well-endowed professional schools for lower officers of health, and the elements of hygiene should be taught by capable teachers in all schools. No public buildings, aqueducts, or canals should be constructed by persons who have not received proper instruction in hygiene.

Institutions of this kind could systematically investigate the most important hygienic and medical questions. In times of peace the fight should be for the people's health, and only a scheme of this kind will enable hygiene to secure her place as the most important part of statesmanship.

THE ATTITUDE OF STATESMEN TOWARDS THE CLAIMS OF HYGIENE.

The chief reasons advanced why statesmen refuse to give very great power to the hygienic authorities, may be enumerated as follows: That the necessary means are wanting to enable the State to undertake the task demanded; that the personal liberty of the individual would be endangered; that the scientific basis is still not sufficiently sure; that the demands of science are very often hard to carry out; and, lastly, that if they were carried out, other equally necessary State duties might have thereby to be neglected, or the consequences might be injurious to the State (Löhnig).

(a) *Liberty of the Individual.*—Different countries and schools are not agreed on its proper bounds. One opinion is that the State has not the right to exercise restraint on a man, provided that he hurts himself only. Stein, on the other hand, considers that the health of the individual affects the community just as much as it does the individual himself; and, indeed, so many diseases have turned out to be more or less of infectious nature, that the ground is now removed on which the former opinion was founded. Some hold up as their model English principles of individual liberty, whereas it is exactly in England that the sanitary authorities have most control over this individual liberty. It is obviously not logical to argue that because it is not right to compel a man to undergo an ordinary amputation, therefore one should have no power over a man when he has an infectious disease. Again, if the State is compelled to control the liberty of a criminal, why should it not also control that of persons affected with syphilis or tuberculosis, who may spread their diseases and thus harm others? Another reason (less frequently mentioned) against the right of restricting individual liberty is that this power might be misused for the sake of party politics, &c. This affords an additional argument in favour of having a sanitary administration quite independent of party politics.

(b) *The Disposal of Public Funds.*—A more difficult question is whether the State possesses money enough at her disposal both for looking after public health and the health of individuals. Emergency measures adopted during epidemics such as cholera, can often not be carried out owing to want of previous organisation in the hygienic department. A bureaucratic paper regiment is nowhere so unpractical as in battle against the powers of nature. The administrations for war and religion in most large nations are best endowed, whilst the condition of the other administrations depends greatly on the energy and influence of the Minister at the time, and since hygiene is usually included in the department of the Minister for the Interior, who is no professional man, but often influenced by party interests, the prospect in this direction is not very hopeful. An independent Ministry of Hygiene, with a professional man at its head, could do much more.

Under the present state of "armed peace" in Europe, the

maintenance of such large armies is very costly to the different Governments. Part of the army might possibly be made use of for sanitary purposes without impairing its power in case of war. But besides the army, other departments (religion and law) are richly supplied in comparison with hygiene. On the whole, it seems that hygiene is neglected because the State funds are employed for other and less necessary purposes.

(c) *The Importance of Hygiene in comparison with other State Expenses.*—It must be allowed that quarantine is hurtful to commerce, but modern quarantine methods are much less so than the older ones. Quarantine is also a hindrance to intercourse, but in this respect affects the ruling and wealthy classes rather than the lower ones, to which latter, on the other hand, epidemics are more baneful. If the money gained by neglecting quarantine arrangements were spent for other sanitary purposes or for the lower classes, one could not object so strongly; but it is spent on the army, and therefore against the direct interests of the lower classes.

It is objected that quarantine is unpractical. I cannot enter on that question here, but perhaps the failure of quarantine measures on the frontier depends not so much on the nature of the infectious disease as on insufficient knowledge or want of exactness in carrying out the measures. At any rate no international arrangement has the right to withdraw rational quarantine from a State which has hitherto been protected by it, and whose internal arrangements are not sufficiently organised to suppress an epidemic should one arise. The Hamburg cholera epidemic was more injurious to the town than a rational quarantine would have been. However important school instruction may be to the State, schools should be closed immediately on the outbreak of an epidemic. The danger in institutions for small children is especially great on account of their peculiar susceptibility to disease and mortality from it.

POSITION OF MODERN BACTERIOLOGY WITH RESPECT TO ITS USEFULNESS TO THE STATE.

One reason given for the State neglecting the care of health is the belief that medical science and hygiene cannot on sure ground fight against and keep off disease. This cannot be altogether denied, and must be discussed as regards the various diseases, but the belief arises in part from the means employed by the State against the diseases being insufficient, and therefore failing to produce the required effect.

(a) *Precautions about Water and Soil.*—Modern science has demonstrated the important part played by drinking water in the production of some diseases. Cholera bacilli have been found in bad drinking water, so also saprogenic bacilli, which, according to my investigation, play an important part in infantile diarrhoea, enteric fever, and dysentery. The bacteria of suppuration have likewise been found in drinking water; and, according to my latest investigations, it appears that the parasites of malaria pass through one stage of their development in water. It is therefore clear that one urgent duty of the State is to provide good drinking water. This may be obtained from deep wells or from springs direct from the rocks, or (under careful management) by filtration through sand. Our discovery that by small quantities of alum, water may not only be clarified, but also sterilised, may in time be made of some practical use. On the whole, one must doubt whether water obtained by sand filtration is sufficiently good to be used as drinking water, and the various household filters must be rejected.

The soil must be purified by drainage, but the canalisation of towns is still an open question. The drains of a town can only be carried into a river when the river is of large size. In last year's cholera epidemic in Roumania, I found that the water from the centre of the Danube was almost sterile at only a small distance below the infected towns, although the cholera bacillus could be repeatedly found in the water of the immediate neighbourhood of the towns. Therefore, although drinking-water from the Danube in the immediate neighbourhood of the towns could undoubtedly be a cause of the spread of cholera, it seems to me very unlikely that a town can be infected from another town lying much higher up on the river.

[Prof. Babes pointed out that the air can only be rendered infective through dust, though different gases in impure air can produce other illnesses. He afterwards considered the means to counteract such diseases as tuberculosis, syphilis, cholera, typhus, yellow fever, the plague, and small-pox, urging that the State should interfere to prevent the spread of all these and many others. Continuing, he said]:—

From these few examples it becomes manifest that a State, perfected in the way I have laid down, could by the means at our disposal already do much more for the health of its citizens than it does at present, and it is clear that the erection of proper institutions would help to this end. It is clear also that we are not justified in separating the public health from that of the individual, but just on this account the State work will be increased and a thorough reform of the sanitary administration appears necessary.

If we were to contrast the demands made here with those acknowledged by statesmen, we should see that the latter limit the rights of the State too much and do not take the universal importance of hygiene into due consideration. Although they profess to acknowledge the immense importance of hygiene, they place other State interests in the front, which prevent the carrying out of measures for the advantage of hygiene; they only recognise certain conditions under which the State can take care of the health of individuals, and they always dread the interference of the State with family life, though in the interest of public health.

Against these objections science will be powerless until it can practically and clearly demonstrate the results of modern research; but on our part it will first be necessary to free ourselves of all non-scientific interests, and leave to others the interests of commerce, industry, politics, the army, and the family. There should be doctors who are not fettered by practice, but specially trained to make known to the ruling bodies—especially the Parliament—the advances and practical application of science, so as to obtain that position for the organisation of hygiene which belongs to it as being of the greatest importance for the happiness of the citizens.

The first result of this should be the erection of a richly-endowed institute of State hygiene, in which laboratory work may be tuned to practical use, and which may serve as a high school for the statesmen in question, directors of hygiene and hospitals, and all Government officials, whether of the departments for instruction, medicine, or the useful arts, who occupy themselves with matters of hygiene.

An international and social reform should be obtained, because individual health cannot be separated from public health, because the health of one class is necessary to the health of other classes, and the health of the lower classes is of the highest economical value to the State. The health, however, of the lower classes is affected by an unjust want of the primary necessities of life and health, as well as by the insufficient care taken by the State for public and private health. A settling of the social question becomes, therefore, essential for public health.

Furthermore, there would have to be an international agreement by which the sanitary interests of the working classes are placed above the interests of capital and competition, and by which a part of the expensive State institutions—namely, the armies—are lent or given up for hygienic purposes.

The position of the sanitary officials should be raised, and all the strength of the sanitary department should be used to fill up lacunæ in professional knowledge. The sanitary administration should have equal power with the Ministry, but should be without the political instability of the latter, and, on urgent occasions, should have the free right of direction. Its organs should be more numerous, higher placed, well paid, and excluded from all other political or medical work.

Under such conditions sanitary questions can be thoroughly and scientifically considered, and the proper extent can be found to which the State shall enter on matters of individual and public health.

Although the free mental development of the individual is necessary for progress, the proper conditions for bodily development, which consist chiefly of the keeping off of harmful external influences, are more and more found to belong to the sphere of State work. The State thus perfected is justified and bound to interfere directly or indirectly in the freedom of individual life, and moreover to a much greater extent than before seemed justifiable, because modern research tells that this is in favour of the sanitary development of the community.

Although the sanitary administration of to-day, even in the best developed countries, is but poorly furnished with power, and in most civilised countries is absolutely powerless, nevertheless, in some few countries rational measures could be carried into effect which would clearly show how beneficial the general

adoption of such measures would be. As soon as a sanitary measure has been approved anywhere, as soon as some hygienic discovery has been made in the workshops of medical science, it should be the duty of the State to try it, to estimate its practical value, and to make it generally known.

It is only by such means that hygiene will become a science, that this science will become the most important part of statesmanship, and that the State will become, as it ought to, a healthy State.

ACROSS CENTRAL ASIA.

AT the meeting of the Royal Geographical Society, on April 9, Mr. St. George Littledale read a paper on his recent journey across Central Asia. Mr. and Mrs. Littledale left England in January 1893, with the intention of crossing Asia from west to east, filling up some blanks in the map, and procuring specimens of the wild camel. After purchasing nearly two pony-loads of silver Yamboos, known on the Chinese coast as Sycee Silver, they travelled in carts to Kurla, where they organized a caravan of twenty ponies and forty donkeys, and followed the river Tarim to Lob Nor. They camped by the Lob Nor swamp, but found the water too salt near the edge to drink; by wading out some distance they were able to get some less brackish, which was just drinkable. Along the Altyn Tag range, as far as the Galechan Bulak, there was a certain amount of water and grazing. This was the point where the great Russian traveller, Przhevalsky, turned back; but beyond, the desert was of an appalling nature—hardly any grass was to be found, and water was very scarce; all the men suffered greatly from thirst, the animals lost flesh rapidly, and many died. Water as a rule was only found every second day. Mr. Littledale in this district shot four wild camels, one of which he has presented to the British Museum. Przhevalsky's wild horse was not seen. The guides were thorough scoundrels, and tried to wreck the expedition in every way; on one occasion they denied the existence of a spring from which they were discovered getting water secretly during the night.

Mr. Littledale was unable to see any trace of a large range of mountains marked on the maps as running north-east from the Altyn Tag. When a few days' journey from Sai-ju they met the first inhabitants, and in vain tried by bribes to get a guide to show a pass over the mountains. They afterwards discovered that their interpreter was playing false; he was scheming to get to some town where he could desert.

They passed an embankment several miles in length, which it was difficult to account for unless it was a continuation of the Great Wall of China from Suchan, two hundred miles to the east. At Sai-ju the Chinese officials were civil, but tried to prevent the travellers returning to the mountains, and their men, exhausted with their journey, were now in addition terrified at the tales they heard of the Tonguts, a Tibetan robber tribe, and refused at first to go on.

Colonel Yule questioned the accuracy of Marco Polo's statement that it was a month's journey from Lob Nor to Sai-ju; but, curiously enough, it took Mr. Littledale exactly thirty days to traverse the distance. As they travelled further east, and crossed the Humboldt range, they found the map which had been constructed from native evidence entirely wrong, and a considerable readjustment is necessary in order to secure an approach to accuracy. They passed large herds of yaks and thousands of antelopes and wild asses. Guides were a great difficulty, and the party were soon left to find their own way. At one place upwards of a hundred mounted Tonguts, carrying lances at least fourteen feet long, match-lock guns, and swords, came past their camp. Their followers predicted an immediate attack. Two Ladakis were sent to parley with them; one expounded a repeating rifle with such marked effect that when the other man proposed to explain the beauties of a revolver they begged him to put it aside, and any idea, if it ever existed, of attacking the camp died a natural death.

Mr. Littledale found his own way over the mountains by a pass, and reached the head waters of the Buhain Gol. They travelled for six days through a luxuriant grass country, and camped on the shores of Koko Nor. Thirteen days more found them at Lanchan, where they disbanded their caravan; their interpreter, who was an arrant coward, absolutely refusing to go to Pekin. Here some China inland missionaries kindly helped them to arrange a raft, on which they drifted down the

Hoang-ho, a journey of exceptional interest through country which is largely un-mapped. Soon after leaving Lanchan the river dashes through a narrow gorge, and the raft had several narrow escapes of being broken up; it was knocked out of shape, and some of the logs smashed. The boatmen had each an inflated sheepskin to act as a life-buoy in case of accident, but none were provided for the passengers. Lower down the river became broader and shallower, and they changed their raft for a flat-bottomed scow, and reached Bonto in twenty-five days. From Bonto to the Great Wall they passed through a country abounding in ruined towns and villages, the result of the disastrous Mahomedan rebellion in 1861. On September 27 they passed through the Great Wall, and reached Pekin three days later.

ELECTRIC TRACTION.

IN the present state of electrical science and practice, electric traction must be considered as a branch of the electrical transmission of energy. We require, first of all, a natural source of energy, such as coal or other fuel, or water at a high elevation or in motion. In the next place, we require a prime mover to transform energy into work, such as a steam or gas engine, a turbine, or water- or tide-wheel. Then this work has to be transformed into electric current, by means of a dynamo or magneto-electric machine, the so-called primary machine. The electric current has then to be transmitted from the place where it is produced to the place where it has to be used, by means of a conductor or a storage battery. The current has next to be retransformed into work, by means of a motor carried by or attached to the vehicle which has to be moved. This work has then to be mechanically transmitted from the motor to the axle of the wheel of the car which travels along the line.

In each of these transformations and transmissions a loss takes place, reducing the original unit of energy to a less and less fraction of itself. In the case of water, with a turbine as the prime mover, we obtain 60 per cent. of the energy as work or motive power, or an efficiency of '6. With a steam-engine, owing to the coal having to break up water into steam, a proportion only of the heat or expansive energy of which can be applied as pressure to drive the piston, because of the impossibility of obtaining, at least at present, a perfect vacuum, or, stated otherwise, of getting the lower limit of temperature anywhere near the absolute zero; and again, owing to the loss occasioned by transforming the motion of translation of the piston into rotatory motion, we have a much smaller efficiency than in the case of a water-wheel. About one eighth only of the energy of the coal is transformed in a steam engine into work to drive the axle, or we have an efficiency of only 125.

The efficiency of electrical machines is very high, as high as '9 with primary machines or dynamos, and '75 with secondary machines or motors. The conductor, or its substitute a storage battery, offers a resistance to the passage of the current, and when the latter is used its weight is so much extra weight to be carried by the car.

All these considerations seem to lead to the conclusion that before electric traction can be employed on a very large scale, we must possess a means of producing the electricity on the spot and at the time it has to be used, or, in other words, we must possess a battery in which the energy of coal can be transformed directly into electric current, so that we may do without storage batteries in which to carry electric energy about, or heavy copper conductors through which to convey it at moderately low tension from the spot where it is produced to where it is used, or light aerial conductors through which to convey it at high tension.

How long we shall be without this, or how many minds are engaged in the solution of this or some such problem, we know not, but the moment it is solved, and solved doubtless it will be, there will be such a transformation scene in the industrial applications of electricity as one can hardly conceive. It would mean that for almost every purpose except those in which heating is required, electricity would or could be used. An electric light-producing battery in every house, quite independently of any mains in the streets; an electric power-producing battery, to carry us whither we would on rails or on the street; and in every house, to put an end to all the evils attendant on crowded factories and workshops in crowded streets and towns; such