

to the consumer. The most approved forms of electric meters in England cost about \$25, and there is a demand for one that will do the work as well and sell for one-third or one-quarter of that sum. Already electric meters register more accurately than gas meters, but there is much room for improvement.

VARIATIONS IN THE EARTH'S MAGNETISM.

Prof. Frank H. Bigelow, of the United States Weather Bureau, who has for several years been trying to discover how close is the correspondence between meteorological changes and certain fluctuations in the earth's magnetism, presented two papers. Certain simultaneous behavior of the magnets at widely scattered observatories suggests the possibility that the earth is immersed in what is called a magnetic field, in which there are variations of intensity and which may proceed from the sun. These variations, Prof. Bigelow says, show a tendency to fall into a typical curve. In March and September that curve stays right side up, but at the solstices it is upside down. The main object of his first paper was to explain this reversal, which he did by showing that it apparently depends on the earth's position in its path around the sun. His second paper covered a brief description of a special watch which had been made in Munich in conformity with his ideas for experimental purposes. A small magnet was suspended on the balance wheel and was apparently affected by the aforementioned changes in the intensity of the magnetic influence coming in from outer space. On some days the watch would gain one hundred seconds or two hundred seconds. On others it would lose as much. It seemed to tell the same story as the costly instruments in the special magnetic observatories. Unfortunately, the "vertical force" magnets in the Washington and Toronto observatories have recently been rendered almost worthless by the disturbing influences of adjacent trolley lines.

Our readers will find full reports, or much more complete abstracts, in current numbers of the SUPPLEMENT of all the most important papers presented at the meeting.

A CONGRESS OF PHYSICIANS.

At Montreal, last week, was held the sixty-fifth annual meeting of the British Medical Association, attended by over a thousand members and guests, including leading physicians and specialists from all parts of the United States. The association was founded in 1832, and has a collective membership of over 17,000, and Canada is the first country outside of Great Britain in which a meeting has yet been held. Dr. T. G. Roddick, president of the association, in his opening address especially welcomed the presence at the meeting of Dr. Charles Richet, professor of physiology in the University of France, and of Lord Lister, whom the president characterized as "the most illustrious surgeon of our generation, who stands for the rise and zenith of modern surgery, the most powerful agency in the development of which, in the present century, had been the introduction of antiseptic and aseptic methods of wound treatment, which he initiated."

At a subsequent meeting of the medical section, presided over by Dr. Stephen Mackenzie, of London, Dr. Wm. Osler, a professor in Johns Hopkins University, read the principal paper, tracing the development of the medical profession in America, and dividing it into three distinct periods—the time previous to 1820, from 1820 to 1860, and from 1860 to the present time. Previous to 1820, it was said, the profession here knew little else than British medicine, but after 1825 American students no longer went to Edinburgh and London, but to Paris, where a band of the noblest young men the country ever produced materially aided in promoting the signal progress of the profession. About 1860, when the energy and greatness of Virchow began to make themselves felt, the German influence on the profession here began to be strongly appreciated, especially in the treatment of several diseases, such as those of the eye, the skin, the larynx, etc., as specialties.

The section of pathology and bacteriology had for its president the well-known London surgeon Dr. W. Watson Cheyne, who said in part: "The most striking and important advance has been the growth of the great science of bacteriology, a science which has not only led to most important practical results, but has also thrown a flood of light on the processes which go on in the body as a whole, and has stimulated research in other directions not immediately associated with it. Twenty-five years ago bacteriology as a science was non-existent. It is difficult for those who have only taken up the subject of bacteriology comparatively recently to realize the absolute blank which it presented even twenty years ago. When I became house surgeon to Lord Lister in 1876, objections of all kinds were urged against the theory on which Listerism was based, some denying the existence of bacteria at all, others maintaining the theory of spontaneous generation; some asserting that organisms were always present in the healthy tissues, others denying that they had anything to do with disease, or that the success of the antiseptic principle depended in any way on the exclusion of micro-organisms from wounds.

"It was these objections which led me to take up bacteriology, for it seemed to me of great importance to ascertain whether or not, as a result of antiseptic treatment, organisms were absent from the discharges from the wounds. Although at the present time such an investigation would be one of the simplest, yet when I came to carry it out I was met with the greatest difficulties. Practically nothing of the kind had been done before, and all the means of investigation had to be devised. Methods of staining bacteria had not been introduced, we had no oil immersion lenses, and I very soon found that by looking at discharges from wounds containing leucocytes, granular matter, and debris with dry or water immersion lenses, and without substage condensers, no satisfactory result could be arrived at. Hence I came to the conclusion that attempts must be made to see whether organisms grew in suitable fluids inoculated from the discharges. Here again everything had to be devised. A suitable pabulum, methods of sterilization, of inoculation, and of incubation had to be worked out. A large amount of time was spent in getting over the preliminary difficulties, and after a satisfactory method had been found, much labor had to be devoted to preliminary questions, such as spontaneous generation, morphological characters of bacteria, their presence or absence in the living body, conditions of growth, and so on.

"Then came Koch's work on infective diseases of wounds, and the publication of his methods of staining and examining bacteria and of cultivating them on solid media, and this work is at the foundation of all modern bacteriological research. From this period the investigations have branched off in two directions. In the first place, almost all the infective diseases have been investigated for parasitic organisms, and in a large number the causal agents have been identified. And, in the second place, researches have been carried on in the direction of tracing out the life history and functional activity of bacteria, and of ascertaining what occurs in the body when organisms or their products are introduced.

"A very remarkable thing in connection with these advances, especially in experimental pathology, is the enormous direct practical benefit which has already resulted to the human race; and it is sufficient answer to the antivivisectionists, who oppose the use of intelligence and observation and experiment, to point to the saving of human life and the relief of suffering which has taken place in the last few years. The greatest of all the advances, because so wide reaching, has been in the prophylaxis of disease, especially in the prevention of septic disease after operations, as brought about by the discoveries of Lord Lister.

"As to advances in the cure of disease, in the case of diphtheria there can be no question that the antitoxin is a most potent curative agent, and that, used in the early stages, it is almost certain to cut short the disease. As regards tetanus, the evidence in the case of animals is absolutely convincing, but in patients suffering from the disease the effect is not certain, probably because we have to do with an acute illness, which runs its course before the serum has had time to act. The same may also be the case with the antistreptococcal serum, although I have great doubts as to its value as a curative agent. In other instances, such as plague and snake bite, we may apparently look forward to a cure; while researches are being carried on with regard to pneumonia which may lead to valuable results; nor must I forget to mention Pasteur's system of inoculating cattle against anthrax. What are we to say about the new tuberculin? We all know how careful an observer Koch is, and the fact that he looks on it as a valuable remedy is to my mind sufficient to make it necessary to give it a careful and hopeful trial."

What is Electricity?

The American Electrician condenses from the London Engineering's review of Prof. Trowbridge's new book, "What is Electricity?" as follows: The writer says that in spite of the all-round progress made during the last thirty years, we know no more about the essential nature of electricity than did Benjamin Franklin 150 years ago. The several explanations offered, based upon the ether, or ether and matter associated, merely substitute one unknown for another. "After all, what is matter? What is the ether? How is matter associated with the ether? To such fundamental questions we can return no other answer than the now famous ignoramus. They make, or tend to make, us painfully conscious of the infinitude of our nescience." The writer of the review adds that Lord Kelvin must have been brooding over these provoking unknowns when he wrote to him in 1892, "Tell me what electricity is, and I'll tell you all the rest." This inability to detect electricity in its primordial form need, however, exert no distrustful, no depressing effects on the mind of the student of physical science. "Let him remember that a ray of light is an unexplained phenomenon; yet what wonderful truths are revealed to Fresnel, what knowledge has been wrested from it by means of the spectroscope, and what marvels is it not every day recording on photographic plates! If he feels himself morosely affected by this agnosticism, let him recall the

astronomical phenomena which are accurately calculated years in advance without any knowledge whatever of the nature of gravitation; or let him think of that masterly bit of analysis which led to the discovery of argon without any knowledge on the part of Lord Rayleigh or Prof. Ramsay of what chemical affinity is. If he is a practical man, let him reflect that the engineer lives amid stresses and strains, and though ignoring the intimate nature of the forces which he uses, builds up powerful engines and dynamos, and as successfully tunnels a Mont Cenis as he throws a bridge across the Hudson or the Firth of Forth."

Photographic Energy of the Light of Fire Flies.

A very interesting investigation of the luminous and other radiations emitted by fire flies has just been published in the ninth volume of the Journal of the College of Science, Imperial University, Tokyo, Japan, says the Lancet. The author, Mr. H. Muraoka, who writes in German, is professor of physics at Kyoto. He mentions that the spectacle produced by the fire flies about the middle of June is one of the sights of the place, and he states that the present inquiry was suggested to him by the resemblance of their light to that of fluorescent bodies, some of which have been shown by H. Becquerel to emit radiations possessing properties analogous to those of the Roentgen rays. The flies are most luminous from about 6 P. M. to 11 P. M. The experiments were made by placing a number of them, varying from three hundred to upward of one thousand, in a small flat box in which they were confined under a net made of hemp ("deren Wegfliegen mit einem Hanfnetz verhindert wurde"). The box also contained a photographic dry plate, in contact with which were plates of various metals (copper, aluminum, zinc and brass), all of similar thickness, sheets of cardboard, both entire and also with cruciform patterns cut out of them, being sometimes interposed between the sensitive plate and the metal and sometimes used alone with the sensitive plate. Thin wooden boards were also employed for the same purpose. The sensitive plate and the objects in contact with it were wrapped in several thicknesses of black paper and left in the box with the flies for two nights. The experiments were made in a photographic dark room, sunlight and artificial light being carefully excluded. The sensitive plates, though thus wrapped up, and additionally protected by metallic plates and layers of cardboard, gutta percha, cloth, silk, etc., were always more or less blackened.

Prof. Muraoka makes frequent reference to papers published in Nature in the early part of 1896 by Dr. John Macintyre, of Glasgow, and Mr. J. J. Thomson. His experiments led him to the following conclusions: 1. The light of the flies in its original state behaves like ordinary light. 2. The light contains rays which pass through cardboard, metal plates, etc., and possesses properties analogous to those of Roentgen rays or Becquerel's fluorescent rays. 3. When the photographic plate is covered with layers of cardboard, it presents an appearance which calls to mind the permeability of iron to magnetic lines of force. 4. The properties of these "filtered" rays appear to be influenced by the materials through which they have passed, perhaps by the thickness of the materials. 5. The properties possessed by the radiations and specified under No. 2 are apparently non-existent, or at least undiscoverable until after "filtration." The Roentgen rays are similarly undiscoverable until after "filtration"—i. e., through the glass of the Crookes tube—and "filtration" may, perhaps, afford a means of rendering the X rays homogeneous. 6. The "filtered" fire fly rays undoubtedly admit of reflection. Refraction, interference, and polarization could not be demonstrated, but Prof. Muraoka is of opinion that they take place. 7. The "filtered" fire fly rays seem to resemble Becquerel's fluorescent rays in possessing properties intermediate between the ultra-violet rays and the Roentgen rays.

The Boston Subway Open.

A part of the subway, Boston's new underground thoroughfare for street cars, was open to public traffic the morning of September 1. The sections to be operated for the present are about three-quarters of a mile long; other sections will probably be opened in the spring. The trip from the public garden entrance to Park Street was made in a little over four minutes; 100,000 people rode through the subway the day that it was opened. The contract for building the last section near the Union Station has been awarded and the work started. The transit commissioners believe that before next summer the entire subway will be in use and Tremont Street wholly free from cars.

Ground Broken for a Railway in China.

A dispatch from Vladivostok, dated August 30, says that the first sod in the work of construction of the Chinese Eastern Railroad was cut in Chinese territory, near Stanitzapoltavskaya, on that date. A number of Chinese authorities were present.