sula of Noto on the west, and the island of Sado on the east. Now, it is just at this region that Sekino's 5° isogonic line makes a great bend to the north, doubling back just over the island of Sado, and then, after an easterly sweep, continuing north-easterly across the country. It is extremely doubtful whether the observations warrant such a delineation of 5° declination. A careful scrutiny of Sekino's numbers brings out certain discrepancies which should not altogether be neglected. Further, there is a complete lack of observations along the coast to the south and south-west of Sado, — just where observations seem most called for. The stations chosen are all inland, and show striking irregularities in the values of the declinations. True, the declinations at the three stations on Sado are all considerably less than the values at mainland stations immediately to the east, whereas we should expect to find them greater. But that seems hardly a sufficient reason for making the isogone of the form represented; for it is well known that the isogonic lines at and near islands often present irregularities of quite a local description: hence, in default of evidence which could only be obtained by a series of observations along the coast of the main island, it seems more prudent to draw the isogonic line of 5° fairly normal, and represent the disturbance due to Sado by a small isolated contour round that island. In this way it is shown on the map. As a matter of fact, every volcanic region is certain to present magnetic irregularities, and in Japan there are two regions specially to be noted as such. The one is the great central mountainous region, just where the Fossa Magna is. The other is the part between the 38th and 40th parallels, but there is nothing geologically comparable to the Fossa Magna. In both regions a prodigious development of volcanic rocks occurs, and this is presumably the reason for the irregularities in both regions.

Knott does not refer to the great horizontal dislocation which Naumann considers the cause of the northern irregularity. The question at issue is one of great interest. Local variations are observed in every country, even in those where no volcanic rocks occur; and the problem formulated by Naumann, which is a study of the local variations of the magnetic force as connected with the geological structure of the country, is well worth a thorough and continued study.

THE ELECTRIC-LIGHT CONVENTION.

The National Electric-Light Association met in New York at the Hotel Brunswick on Aug. 29, and continued in session for three days. Pres. S. A. Duncan opened the convention with an interesting address, in which he reviewed the growth of the association and of the electric-light industry. When the association was first organized, the foreign technical papers only noticed its proceedings in order to ridicule them: now the papers read at its meetings are copied by the leading electrical papers all over the world. The membership of the association has largely increased, as has the interest taken in it by the members.

The electric-lighting industry has rapidly advanced in the last six months, since the meeting of the association held in Pittsburgh. Then it was estimated that there were in the United States 4,000 isolated plants and central stations, supplying 175,000 arc lights and 1,750,000 incandescents. To-day there are 5,351 isolated plants and central stations operating 195,000 arc and 1,925,000 incandescent lamps, employing 459,495 horse-power of steam-engines. The increase in the capitalization of the electric-light companies in the last six months has been $42,210,100.

Coming to the question of the distribution of power, there are at present 34 electric railways completed, having 138 miles of track, with 223 motor-cars; there are in course of construction 49 other electric railways, with 189 miles of track and 244 motor-cars; giving a total of 83 roads, with 327 miles of track, operating 467 motor-cars. Besides these, there are 39 other electric roads incorporated which have not yet begun construction.

Mr. Duncan then urged that the association establish a permanent office, which would be the headquarters of the executive committee, and which should contain a good reference-library, together with domestic and foreign electrical journals, and the repository of the archives of the association.

Mayor Hewitt was then introduced, and welcomed the association to New York in a characteristic and eminently common-sense speech. He dwelt particularly on the question of putting electric wires under ground, — a subject in which New York is at present especially interested. To quote one of his remarks, "I congratulate you that it [the feasibility of putting high tension wires under ground] is going to be tested by a responsible company; and until it is tested, let me say to you frankly, that, if it were in my power to compel the other companies to do this thing now, to-day, I would not do it. . . . But I hope it will succeed; and if it does succeed, no public officer will be more prompt than I shall be in compelling every electric-light company to respect the intention of the Legislature." Again, speaking of the danger of the electric currents, Mayor Hewitt summed up as follows: "I found, that, with all the difficulties of this thing, the absolute results seemed to show that it was absolutely safer than any other useful agency at work in this city."

The various papers read before the association were hardly so important as those given at the last meeting at Pittsburgh, but some of them contain valuable information. The following abstracts give the main points in each: —

Mr. S. S. Leonard, in his paper on 'Petroleum Fuel,' said that the advantages of oil over other fuels are many: it is more easily regulated, there is less attendance required, the fires can be started or stopped instantly, there is no refuse to cart away, it is cleaner than any other fuel except natural gas. The arrangements for the use of oil under the supervision of the writer are as follows: the oil is received in tank-cars holding from 90 to 150 barrels each; it is then drawn off into storage-tanks holding 320 barrels. These tanks are boiler-shaped, and are placed under ground end to end, and are connected together. Each tank has a man-hole and vent-pipe. The supply-pipes to the furnaces have valves at the tanks and at the furnace. These pipes are two inches and a half in diameter except about four feet at the furnace end, which is enlarged, and contains a small steam-pipe, which raises the temperature of the oil to 130° or 140°. The experience of the writer is, that the best burner for the oil is one that thoroughly vaporizes it before it is burnt, steam and hot air being used with it. As to economy over coal, there is a saving of from twenty to twenty-five per cent in fuel, and from forty to fifty per cent in labor. From tests recently made, the cost of oil was 70 cents per 100 horse-power per hour; of coal, at the rate of 86 cents per 100 horse-power per hour. Another test gave the cost as 80 cents for coal and 62 cents for oil. As for labor, one man can attend from seven to ten 150-horse-power boilers, while there is no dirt or ashes to haul away.

The discussion on this paper brought out no new facts, excepting, that, in view of the repeated attempts and failures of the past, there was a tendency to mistrust oil as a fuel, both as regards expense and the deterioration of the boilers. It was stated, however, that Mr. Leonard had been using oil for nine months, and was satisfied with its economy and reliability.

Mr. S. S. Wheeler, in his paper on 'Overhead and Underground Wires in New York,' reviewed the history of the Board of Electrical Control, of which he is electrician, and pointed out the difficulties that they had encountered in their work. Besides the fact that there was no precedent to guide them, the wholesale putting under ground of electrical wires never having before been attempted, the local conditions were particularly unfavorable. New York being built on a long, narrow island, the electric wires are crowded together, and the distance between points increased. The ground is full of gas, water, and steam pipes, sewer and pneumatic despatch-tubes, and the earth is saturated with gases. After describing a number of underground systems, Mr. Wheeler gave the history of the modified Dorset conduit used in New York. In the original system the conduit consisted of a bundle of parallel tubular ducts about two inches and a half in diameter, built of blocks made of a mixture of coal-tar, pitch, and gravel, cast with tubular openings running through them from end to end. These blocks were placed end to end so the openings were continuous, and were cemented together. The difficulty in this system was that the blocks were brittle and porous, and they would not remain water-tight. After various modifications, the plan finally adopted was to use parallel iron tubes, bedded in concrete. There are water-tight man-holes at intervals. The electric wires are drawn into the tubes, and the circuits for the lamps, etc., are taken off at the man-holes. Conduits constructed in this manner seem perfectly water-tight.

There are in New York to-day 420 miles of single duct, containing some 4,000 miles of telephone and telegraph wire, and some hundreds of miles of incandescent electric-light conductors. The conduits for high-potential wires are separated from those for telephone and telegraph wires. Up to the present, no arc-lighting company has put its wires under ground, but the Brush Electric Company is going to draw wires into the conduit between 14th and 34th Streets.

Mr. Wheeler then spoke of the present condition of electric circuits in New York, and pointed out the danger of the great number of 'dead wires,'— wires abandoned by the users, and allowed to remain because of the expense of taking them down. These come in contact with electric-light wires, and are a source of danger.

Summing up, Mr. Wheeler stated that the telegraph and telephone problems were practically solved: 4,000 miles of their wires were already under ground, and 12,000 more were to go this fall. The saving in the cost of maintenance is estimated at $100,000 per year. The laying of electric-light wires is not so fully developed; but when the initiative is once taken, the difficulties will be overcome and the undergrounding will become a settled and accomplished fact.

Dr. P. H. Van Der Weyde's paper on 'The Comparative Danger of Alternating *vs.* Direct Current,' is a criticism on the experiments of Mr. H. P. Brown on the danger of alternating currents, which were described and commented on in the last number of *Science*. It is mainly an attack on Mr. Brown's methods of measurement, and it betrays want of acquaintance with Ohm's law and Cardew's voltmeter. "After the lecture I examined the voltmeter, and found, that, according to the statements of Mr. Brown himself, its operation was based upon indications of rise in temperature. Now, it is well known that voltmeters based on this principle are based on false premises; rise of temperature is not produced by electro-motive force, but by amount of current. . . . This is so self-evident that Prof. G. Forbes from England, who last year exhibited . . . a meter for alternating currents, did not think of calling it a voltmeter, because its operation was based on rise of temperature, but he called it a current-meter." Dr. Van Der Weyde's suggestion for measuring the voltage of the current used possesses the charm of novelty. "In order to come to correct conclusions, it would be necessary to measure, by means of indicator-diagrams, the engine-power utilized, and measure the currents obtained by proper instruments, properly used and conscientiously observed." After this is done, the volts are to be calculated by dividing the energy calculated from the indicator-diagrams by the number of ampères.

The paper, in fact, is of the type that brought the ridicule on the association at its early meetings, of which the president complained in his address.

The other papers read will be given in a later issue.

SCIENTIFIC NEWS IN WASHINGTON.

The Army Medical Museum: a Great Object-Lesson for Those who understand its Purpose and System of Arrangement: Interesting Subsidiary Work. — An International Marine Congress: an Important Plan of the United States Hydrographic Office to be carried into Operation. — Disinfectants that destroy the Germicidal Power of Each Other.

The Army Medical Museum.

OF the thousands of people who visit the Army Medical Museum every year, not one per cent, probably, have any clear conception of the object aimed at in gathering and exhibiting a collection of what to most people are disgusting objects. They look upon the museum as a sort of chamber of horrors, placed there for the purpose of giving people an opportunity to gratify a rather depraved curiosity.

But to those who understand that the museum is a great, systematically arranged object-lesson, in which the physical history of man in health and in disease, and at all stages of development, is given and illustrated, it becomes no longer a place in which to gratify a morbid curiosity, but one in which to pursue, under the most favorable circumstances, one of the most fascinating of studies.

The Army Medical Museum, which for many years was housed in the old Ford's Theatre building, the scene of President Lincoln's assassination, was removed last spring from its contracted and inconvenient quarters to a fine new building erected especially for its use and for the accommodation of the medical library. It is near the Smithsonian Institution and National Museum. A smaller building, to be used as a biological laboratory, has since been added, so detached from the main building and so scientifically and thoroughly ventilated as to make it impossible for gases or odors to pass from it into the main building or into the surrounding air. Congress has not yet made an appropriation to pay for fitting up this laboratory, but is expected to do so in one of the bills now pending.

The museum itself is provided with a large, airy, and well-lighted exhibition-hall in the second story of the new building. There is plenty of room to accommodate it for many years to come, although it is at present receiving accessions at the rapid rate of more than five hundred specimens a year, and is now one of the ten largest medical museums in the world. The aggregate amount of money appropriated by Congress for the museum itself, aside from the cost of the building, has been only about fifty thousand dollars. Several of the great museums of Europe have been in existence since the last century, and the great museum in London began with a collection for which one hundred thousand dollars was paid. In consideration of the short time since the museum in Washington was established, and the small amount of money spent upon it, the results are very highly creditable to Dr. Billings, who has charge of it.

In arranging the objects in the museum, the embryology of man as a complete individual in health is first illustrated. The specimens in this department are numerous and very interesting. The embryology of the lower animals is also shown, as far as it throws light upon that of man, but Dr. Billings does not enter deeply into the illustration of the comparative embryology of the lower animals, as that falls not within his province, but in that of the National Museum.

The next step in illustrating the physical history of man is to divide the body into its several parts, and to treat each separately. For instance, the head is first presented in its healthy state. This is shown in all stages of development, from its first appearance in the embryo, with its gradual growth and the appearance of new organs, to its state of development at the period of birth, — in childhood, youth, maturity, and old age. Not only is the head as a whole shown, but the separate organs are also presented in every form, at all ages, and in all their varying conditions. Here, also, corresponding portions of the lower animals are shown, but, as in the former instance, only so far as they illustrate, and assist in understanding, the organs and functions of that particular organ of the human body. Every part of the body is treated in the same systematic way. There is also a case showing remarkable monstrosities in man and animals.

Having treated and shown the body as a whole in its embryology and its anatomy, and all the parts separately, in its healthy, normal conditions, the next series of cases shows the body in disease. The system of treatment is the same as that adopted in illustrating the body in health. Beginning with the body as a whole, in its earliest embryo state, and showing by actual specimens the effect of all diseases to which it is subject, its different great divisions are shown in all known conditions of disease, from the head, when it first appears in the embryo, through all its history, and in all its separate organs, and in every morbid condition to which its various parts and organs are subject, to the lower extremities. Thus the organ and its several parts are shown through their entire life-history whenever modified by disease. The entire series, therefore, includes a representation, by actual anatomical specimens, of the effect of disease upon every organ of the body. By the side of the diseased organs affected by bacteria that have been identified by biological research, such as typhoid-fever, diphtheria, cholera, yellow-fever etc., it is proposed to place the cul-