AN INGENUOUS TORSIONAL WAVE DETECTOR

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN

Prof. A. G. Rossi, of the Royal Polytechnic Institute of Turin, has devised a new form of detector for use in wireless telegraphy, which is of special interest because of the novel principle it employs. He uses the property known as "magneto-striction" found in

iron or nickel wires. A fine iron wire stretched in a magnetic field is found to lengthen at first, and then shorten, according to the strength of the field, the value effect being about 1-400,000th of the length of the wire. The inventor sought to increase this effect and to apply it to a detector for waves. The principle of the apparatus is shown in Fig. 1. A fine iron wire is stretched in a vertical position

How the torsional effect is produced.

between two fixed points A B. Two constant magnetic fields formed by two equal bar magnets, magnetize the wire in two halves in the opposite sense with the intensity J J and longitudinally, as shown by the arrows. At the same time a current is sent through the wire from i to i, and this gives a circular magnetization to the wire, with an intensity c. The result of the combined magnetic fields will be a magnetization of helical form, E. Owing to the effect of magneto-striction, the

wire will have a torsion represented at C in the direction of the arrow, this being what is known as the Wiedemann torsion effect. Leaving the longitudinal field as it is, if we reverse the current in the wire the torsion effect will be also reversed. When we send an alternating current through the wire we have a strong effect of vibration, as the torsion is also alternating in its sense. A mirror placed at the middle of the wire is made to reflect a beam of light on a screen, and the spread of the beam shows the amplitude of the vibration. The effect is much stronger when the period of the alternating current is of the same value as the normal vibration rate of the wire, and we have a much longer line of light on the screen. The wire is of about 0.02 millimeter diameter, and is held under tension between two light springs mounted on an insulating plate. Fig. 3 shows the arrangement, and the springs are coupled to the binding posts A B. Near the ends and at the middle of the wire project three iron points, which come from the bar magnets n s, n s, so as to guide the magnetic flux into the wire. This latter is stretched inside a glass tube of small diameter, leaving a gap at the center for the mirror m. A spiral of insulated copper wire is wrapped about the glass tubes with the two halves coiled inversely and the current comes from a and b into the wire. The copper spiral is designed to receive the waves from the antenna, and it acts to modify the effect which we have seen above to be given by the combination of the alternating current and the bar magnets in the wire. When no waves are received, we have a constant torsion effect in the wire, that is a constant rate of vibration. When on the contrary the wave effect occurs in the copper spiral, the rate of the vibration is modified, and the line of light on the screen is changed. The terminals a b are connected to a pair of vertical antenna wires which are insulated from ground. All the rest of the apparatus is held insulated on a glass tube support 5 feet from the floor. Light for the beam is given by a Nernst lamp, and the same alternating current circuit is used for exciting the wire, using the proper means to secure a very small current through the wire. The copper spiral is joined at the top to the antenna and at the bottom to ground. With such an arrangement, the instrument shows the effect of waves received from a distant station, and

we notice variations in the beam of light due to this cause. It is designed especially to be used for receiving signals formed by a succession of waves; such waves to follow each other in series so as to form periods of low frequency. The frequency is first adjusted so as to be the same as that of the vibrating wire. Besides the tuning of the high frequency waves, this allows us to use a second, or local tuning of the low period waves. It should be remarked that Prof. Rossi's instrument transforms directly an electric vibration of low frequency into a mechanical vibration, and contrary to other detectors, there is no transformation of energy between the effect of the name and the registered optical indication. It is thus extremely sensitive. To have a permanent record of the signals, the author proposes the use of a photographic band descending in front of the beam, and as the variations of the latter are sideways, we would have a set of wave-like signals printed on the band. By using a selenium cell, which is lighted by the beam, we could work a Morse register with the instrument, provided a strong enough light is reflected by the mirror on the cell. Owing to the sensitiveness of the instrument, there is no doubt that it can be used with a much less expenditure of power at the sending station. On the other hand it simplifies the apparatus which is needed at the receiving station. An alternating current generator is not required in this case, but a simple vibrator will give the needed impulses for exciting the stretched wire.

A detector which transforms electrical wave trains into mechanical vibrations.

THE HEIGHT OF THE ANTARCTIC CONTINENT

BY WALTER LANGFORD

Our knowledge of the Antarctic continent is daily becoming more precise. Soon after Shackleton's memorable dash toward the South Pole had furnished very important data in regard to the interior of the continent, Charcot's voyage supplied valuable additions to our knowledge of the boundaries of this vast territory. The French expedition succeeded in surveying accurately a great many miles of coast line that had previously been entirely unknown or only conjecturally laid down.

The results of these expeditions prove that the mass of land accumulated about the South Pole is even greater, in comparison with the other continents, than had previously been supposed. The elements involved in this comparison include an estimate of area, and a determination of the heights of the mountain masses. Both of these elements require exact and comprehensive surveys. The problem was first attacked by Humboldt, at an epoch when our knowledge of the earth was very incomplete. Hence Humboldt's estimates of the mean elevations of the known continents above the sea level, are far too low. This mean elevation is the height of a fictitious plateau obtained by distributing the mass of the continent uniformly over its surface, i. e., it is the quotient obtained by dividing the volume by the area. Humboldt's estimates of the mean elevations of continents are: Europe, 672 feet; North America, 748 feet; South America, 1,151 feet; Asia, 1,164 feet; entire known land surface of the globe, 1,004 feet. Except in the case of Europe, these values differ enormously from the more recent estimates given below. This discordance shows the necessity of thorough explora-

tion and accurate surveys, although a general estimate can be obtained from elements of a totally different character, as we shall see in connection with the

Antarctic continent. Kruemmel, who was the next after Humboldt to attack the problem, estimated the mean elevation of the entire known land surface of the globe at 1,443 feet, a value which was still far below the truth. The later estimate of Lapparent, based on more complete data, was 2,000 feet, or more, while the more recent estimates of Murray, Penck, Lupan and De Lillo are still higher. Murray's values, as revised by Penck, are: Europe, 918 feet; Australia, 918 feet; North America, 1,968 feet; South America, 2,066 feet; Africa, 2,132 feet; Asia, 3,116 feet; general land surface, 2,312 feet. From these values, which appear to be very nearly correct, the total volume of the continental masses is computed to be about twenty-four million cubic miles.

All of these estimates relate only to those parts of the world that were known at the epochs when the various estimates were made. The recent Antarctic explorations have entirely changed the face of the problem and have raised the Antarctic continent to the first place, which was formerly occupied by Asia. The exact and extensive knowledge which we now possess in regard to the other continents is still lacking in the case of the Antarctic, of which we know only the few points that have been reached by the expeditions.

Meinardus has endeavored to determine the height of the Antarctic continent from meteorological data. From the distribution of atmospheric pressures and the exchange of masses of air between the two hemispheres, he

MEAN HEIGHTS OF THE CONTINENTS.

(Concluded from page 470.)

bard, first president of the first telephone company, it is doubtful if the telephone industry would have been so rapidly developed. Fortunately, the original owners and promoters of the telephone were, above all, business men, actuated by the sole idea of developing the business along broad lines. Whatever reward they expected or received was the legitimate reward following the legitimate development of a substantial and beneficial business. To develop that business it was first necessary to develop an art. There was nothing like that art in existence at the time. Indeed, the whole art of the practical application of electricity was new.

The telephone is not the only art with which Professor Bell's name is linked. In wireless signaling, too, he made some early experiments which, had they been extended, might eventually have led him into the field of wireless telegraphy and telephony. During experiments which he made on the Potomac River in 1878 and 1879, he succeeded in signaling for over a mile. He informed the writer of this article that an account of his work on the Potomac River which he gave to Preece in England, may possibly have influenced Preece in his own work. His attention was first called to the subject in 1877, when he was experimenting on ground connections. He used poker as terminals. When he thrust a poker into the ground and put the telephone to his ear he heard a clock ticking. It was the Cambridge Observatory clock, which he easily recognized because it missed a tick now and then as it regulated the time in Boston. Cambridge was nowhere near Mr. Hubbard's country seat, where the experiments were conducted.

Aerial locomotion is another art with which Professor Bell has become identified. His interest in the subject was aroused when, in 1880, he began to make kite-flying experiments, largely for the sake of his health. He started with a Hargrave box kite and eventually developed the tetrahedral principle, which is now well known among aeronauts. During the course of his experiments he found that he needed the services of civil and mechanical engineers. Accordingly, a little association was started under the name "Aerial Experiment Association," which included among its members the late Lieut. Selfridge, Glenn Curtiss, Baldwin, and McCurdy, all of them now well known. Baldwin and McCurdy acted as engineers; Curtiss was the motor authority. The association was Mrs. Bell's idea, and was founded to carry on Mr. Bell's own work. She sold the only piece of property which was hers in her own right, and which had not been given to her by Mr. Bell, in order to finance the association. Although these engineers were all originally engaged to help Mr. Bell in his tetrahedral experiments, the members of the association ended by helping one another. Selfridge was the first man who profited by the association's assistance. Believing that it was best to follow in the footsteps of others, and then to improve on their work, he started with gliders, and finally built the "Red Wing," which flew successfully. Next came Baldwin's chance. He embodied his ideas in the "White Wing," in which wing tips were introduced, controlling devices which are now the subject of so much controversy. Then came Curtiss's "June Bug," which won the Scientific American Trophy. McCurdy followed with the "Silver Dart." Baldwin and Bell worked at the tetrahedral principle in Nova Scotia, experiments which are not yet concluded. Curtiss remained at Hammondsport, New York, and Selfridge was recalled to Washington by the War Department. The association was so scattered that it was necessary to adopt some means of communication. Hence, the weekly bulletins were started under the title "Bulletin of the Aerial Experiment Association," which had a combined circulation of seven, and which

Sears Model "L"
\$495.00 Complete

Automobiles

We build them

We guarantee them

We sell them to you direct from our factory

Real Inside Prices

OUR new Automobile Catalog quotes THE ONLY REAL INSIDE PRICES ON AUTOMOBILES. In this catalog we show automobiles for \$370.00 and up, six different models, all built by us in our own automobile factory. When you buy a SEARS you get it direct from our big Chicago factory at the factory price.

With our new Automobile Catalog we will send you our Booklet of Testimonials showing pictures of customers using Sears cars in every part of the United States, with letters from them telling their experiences.

If you are interested in an automobile of any kind, write today for our Sears Automobile Catalog No. 70541

Sears, Roebuck & Co. Chicago

14 ft. Launch Complete with Engine \$94.50
Ready to Run

16, 18, 20, 22, 24 and 26 footers at proportionate prices, including Family Launches, Speed Boats, Auto Boats and Hunting Cabin Cruisers of the latest design. Sixty-four different models in all sizes ready to ship, equipped with the simplest motors made; start without cranking; ten year-old child can run them. Boats and engines fully guaranteed. Let us send you testimonials from some of our 12,500 satisfied owners. We are the world's largest power boat manufacturers. Our free consultation department can give you valuable, money-saving information. Write today for Free Illustrated Catalog and Demonstrating Agents' Proposition. (42) DETROIT BOAT CO., 1151 Jefferson Ave., DETROIT, MICH.

How Would You Like to Have A SUMMER HOME

Built, Furnished and Equipped with
Garage, Automobile and Motor Boat for

\$2,000

Esther Singleton tells how the above may be purchased in her article which appears in the June number of

American Homes and Gardens

The article specifies the cost of the house, the garage and the boat house; the cost of the automobile and motor boat. It also gives the exact cost of each article of furniture and each piece is illustrated, so that the reader can judge for himself whether the objects described appeal to his particular taste.

Copies of this number of

American Homes and Gardens

can be purchased at news stands, and in the Subway and Railroad Stations.

Price, 25 Cents

MUNN & COMPANY, Inc., Publishers
361 Broadway, New York, N. Y.

served the purpose of keeping the members in touch with one another.

HEIGHT OF THE ANTARCTIC CONTINENT.

(Concluded from page 464.)

concludes that, if the continent covers an area of 5,200,000 square miles, as Bruce and Kreummel assume, its mean elevation above sea level is about 6,600 feet, with a probable error of ± 660 feet.

If this estimate is approximately correct, as the results of the recent explorations appear to indicate, the Antarctic continent is by far the highest mass of land on the globe. By the addition of this huge polar cap the mean elevation of the entire land surface of the earth is increased from 2,312 feet to 2,706 feet.

The process by which Meinardus reached these conclusions may be sketched as follows: It was already known that the mean height of the barometer over the northern hemisphere is 0.8 millimeter higher in January than in July, but that the corresponding barometric height for the zone extending from the equator to 50 degrees south latitude is 2.1 millimeters lower in January than in July. Hence, as the entire mass of the atmosphere and, consequently, the average atmospheric pressure over the whole surface of the globe remains constant, the mean barometric height for the zone south of 50 degrees south latitude, which is equal in area to about one-fourth of the southern hemisphere, must be about 3.6 millimeters greater in January than in July.

The observations made by recent explorers, however, led Meinardus to the conclusion that the mean atmospheric pressure over the zone lying between 50 degrees south latitude and the Antarctic circle is not greater, but is 0.73 millimeter less in January than in July. This result increases the January deficit of pressure and restricts the area in which it can be made up to the Antarctic zone, in which, consequently, the mean atmospheric pressure must be 11 millimeters higher in January than in July. Within the Antarctic circle the only observations available for this discussion are those of the ships "Discovery," "Belgica," and "Southern Cross," which together comprise the records of four entire years. In three of these years the atmospheric pressure was lower in January than in July. Thus the area in which compensation for the deficit can be sought is still further restricted, apparently to the Antarctic continent.

Meinardus finds the explanation of this puzzling state of affairs in the great height of the Antarctic continent. The atmospheric pressure diminishes as the elevation of the point of observation increases, and the difference is greater at low than at high temperatures. Hence, in a region where the atmospheric pressure is constant throughout the year at the sea level, it is appreciably higher in summer than in winter, at an elevation of several thousand feet. For a given elevation, this difference increases with the difference between the summer and the winter temperature. Meinardus and Hann have computed that the mean atmospheric temperature of the Antarctic continent is $+26.9$ deg. F. in January (Antarctic midsummer) and -14.8 deg. F. in July (Antarctic midwinter). In these conditions it can be calculated that the mean excess of January over July pressure (11 millimeters) required for the entire Antarctic zone would be furnished by a mean elevation of that zone of about 4,400 feet, on the assumption of a constant atmospheric pressure at the sea level. But the coasts of the Antarctic continent have been explored sufficiently to make it reasonably certain that that continent occupies, very approximately, two-thirds of the entire area of the Antarctic zone. Hence, on the assumption of a constant atmospheric pressure over the remaining third, which is covered by water, Meinardus arrives at the conclusion that the average height of the Antarctic continent is about 6,600 feet.