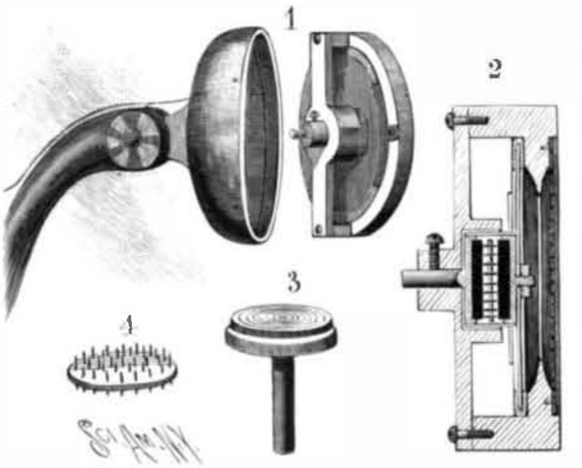
AN IMPROVED TELEPHONE TRANSMITTER.

In the novel form of transmitter shown in the accompanying illustration it is provided that granulated German silver may be held between the carbon buttons, or that there may be an intermediate disk with pins projecting from its faces to engage the faces of the buttons, the distance between the buttons being readily increased or diminished, according to the intended use and surroundings of the instrument. The invention has been patented by James H. Spencer and Malcolm S. Keyes, and the transmitter is being manufactured by the Spencer Electric Company, No. 163 Greenwich Street, New York City. Fig. 1 shows the application



THE SPENCER-KEYES TELEPHONE TRANSMITTER.

of the improvement, Fig. 2 representing a cross section, Fig. 3 the adjustable button, and Fig. 4 the intermediate disk with projecting pins. Opposite the carbon button on the rear face of the diaphragm is a similar button fitted into a cap and having a stem sliding longitudinally in a bearing on a bar secured to lugs projecting from the casing, the stem and second button being held in adjusted position by a set screw. The opposing faces of the buttons are roughened and have concentric grooves to insure a large contacting surface for a transmitting device held loosely between them, and preferably consisting of a disk of cork from the faces of which project German silver pins, although instead of the disk and pins loose granulated carbon or granulated German silver may be used. To prevent the loose transmitting device from working out between the buttons, the latter are inclosed by a flexible wrapper, in which are openings, that the wrapper may offer but slight resistance to the vibrations of the buttons.

The Submarine Cable.

The submarine cable is now one of the leading factors in international communication, says The Age of Steel. At its inception it met with failures, commercial or otherwise, but as methods of construction and laying improved, its earlier risks were largely averted. It now trails along the mud and sand of the seas, dangles its huge loops on submarine precipices and across their dark chasms, and along the gloomiest caverns of every ocean the silent messages of commerce, friendship, diplomacy and of governments make their lightning race around the planet. The laying of the first Atlantic cable was the initial of a supreme effort to unite the family of nations. It was costly, and in a commercial sense, up to a certain date, a failure, but as a triumph of engineering science it marked an epoch in international communication. Other cables had somewhat of a dismal beginning, but enterprise did not stop at disasters, nor did the engineer halt at what, after all, was but temporary obstruction. The good work continued and has reached such massive proportions that a navy of forty-one telegraph ships, fully equipped and manned, is distributed over the oceans of the world, representing a gross tonnage of 60,000 tons. The manufacture of cables represents huge investments of capital and an army of workers. Great Britain has so far led the way in this modern industry, and was for a time as supreme at the bottom as at the top of the sea. The honors are now being divided by France, Italy and Germany. Manufacture is no longer an exclusive monopoly. New cables will continue to be laid, and as time, corrosion, accidents, submarine convulsions and the encroachments of marine shell fish and monsters cause breakages and loss, the supervision of repairs will be a permanent occupation both to experts and seamen. The following table shows the mileage and number of cables now in use:

Cables under 5 miles in length	761
Exceeding 5 miles and under 50	223
Exceeding 50 " 100	65
Exceeding 100 " 500	155
Exceeding 500 " 1000	64
Exceeding 1000 " 2000	29
Exceeding 2000 "	8
Total	1305

The expenditure of money in the laying and manufacture of these submarine lines has been roughly estimated at $200,000,000. These are big figures, but they will be larger as the network of wire spreads on ocean bottoms.

METEOROLOGICAL KITES IN FRANCE.

For some time past, at the Observatory of Dynamic Meteorology, experiments have been in progress with kites carrying meteorological registering apparatus analogous to those employed at Blue Hill (United States), under the direction of Mr. L. Roth. Quite recently there has been detected a curious distribution of temperature in the vertical. In fact, on the 2d of November, the temperature, which was 7° at two o'clock at the Observatory of Trappes, fell progressively to 3° at an altitude of 450 meters and afterward rose to a little above 10° at an altitude of 1,200 meters. This distribution of temperature kept up during the entire night. An accidental circumstance having obliged the experimenters to leave the kites in the air until the following morning, that is to say, for eighteen consecutive hours, they descended more than 600 meters.

Each of such descents was accompanied with a drop in the temperature of more than one degree per 115 meters. In the middle of the night, at a few minutes' interval, the temperature was 8° at 1,000 and —1° at 120 meters. Such inversions of temperature are very often observed between mountain stations and stations on plains, but they usually coincide either with the different directions of the wind at two heights or with calm weather in the lower station, which permits the cold air to accumulate near the earth. In the case under consideration, nothing of the kind occurred. The map of the international bulletin for the morning of the third shows in Europe a very marked maximum of barometric pressure which gave rise to pretty strong east winds. The velocity of the wind at Trappes kept up to more than 5 meters during the whole night between the 2d and 3d of November.

The wind in the warm station reached by the kites was E. N., differing little from the lower wind, which blew from the N. N. E.

In Fig. 2 we reproduce a portion of the curve traced by the registering apparatus during a period in which, the heights of the kite having been made to vary, there were obtained two sections of the distribution of the temperature in the vertical. This example shows, once again, all the benefit that can be derived from the use of kites in the exploration of the atmosphere.

By providing the kites with a special registering apparatus of great precision (like the one represented in Fig. 1), that permits of obtaining the pressure within a fraction of a millimeter and the temperature within about a third of a degree, and by taking care to determine the position of the registering apparatus by sights taken from two stations separated by a proper base, it is possible to determine the difference between the height of the registering apparatus deduced from the barometric pressure and the absolute altitude determined by triangulation. Such difference, brought to the unit of height, is what is called the vertical barometric gradient, the existence of which was proved for the first time by the researches of M. Teisserenc de Bort upon the variation of pressure, first at mountain stations and later at the Eiffel Tower.

In order to calculate the barometric gradient, we compare the difference of barometric pressure, observed for a given height, with that which should have existed if the air had been in equilibrium and which is given us by the formula of Laplace. This formula does not express an empirical law, but is derived from the law of Mariotte, and its coefficients are known with great precision.

On the subject of the vertical gradient, we shall confine ourselves to recalling the principal facts that are revealed to us by the discussion of the observations on Puy de Dome, Ventaux and the Eiffel Tower.

1. Almost every day there exists, between the decrease of pressure in the vertical that corresponds to the state of equilibrium and the decrease observed, a difference that is now positive and now negative. Such differences, at least on the low strata, present a somewhat marked diurnal variation. The pressure decreases more quickly between 8 o'clock in the morning and 8 o'clock in the evening and more slowly during the night.

2. At the moment of the passage of the barometric depressions the decrease in pressure is more rapid than the law of equilibrium indicates (particularly in the anterior portion of the depression); but, on the contrary, the pressure decreases more slowly in the areas of high pressures.

The vertical gradient depends especially upon the horizontal movements of the air and upon the centrifugal effects that are the consequence of gyratory movements, and, finally, upon a series of effects due to the viscosity of the air and to the undulating motions of which the atmosphere is the seat. It is, therefore, a very complex phenomenon, which demands a minute analysis. In order to calculate accurately the vertical gradient, it is indispensable to know the temperature of the air and its humidity between the earth and the point of observation. This is why the kite is well adapted for use, it permitting of obtaining determinations of such elements at the same place at various heights. The accompanying curves furnish an example

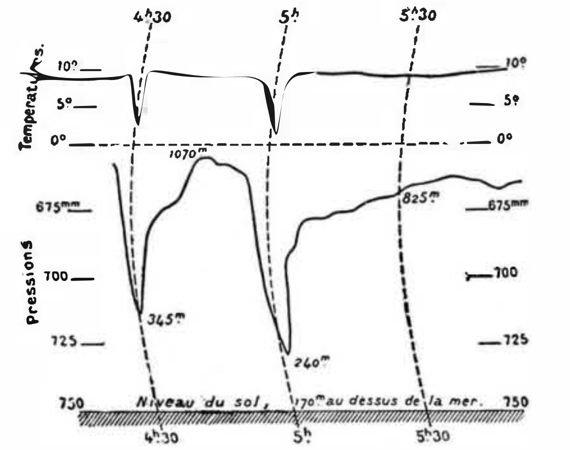


Fig. 2.- TEMPERATURE AND PRESSURES INDICATED BY A REGISTERING APPARATUS CARRIED BY A KITE.

of this. For the observation of the temperature at 1,100 meters and at the earth, it was impossible to foresee the variation of the temperature that occurs between 500 and 1,000 meters and that lowers by two degrees the mean temperature of the total stratum of the air considered—the effect of which would be, if account were not taken of it, to introduce large errors into the calculation of the gradient.

The numbers collected by these sections of the atmosphere are much more accurate than those that can be deduced from stations situated at different heights along a mountain where the influence of the earth is very marked. For researches that demand great precision, we have, therefore, in the use of the kite a very satisfactory method for studying the state of the atmosphere when it is absolutely free in its motion.—La Nature.

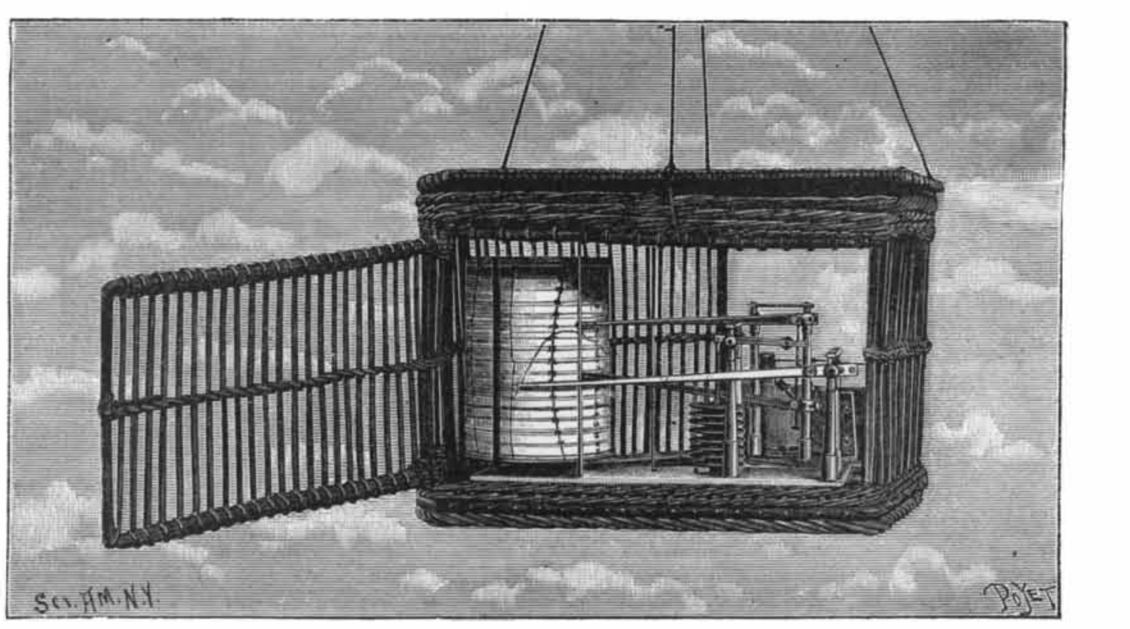


Fig. 1.—ALUMINUM REGISTERING APPARATUS FOR STUDYING THE VERTICAL GRADIENT.

ROMANIUM is the name given to a new alloy of aluminum with tungsten and nickel. The alloy is comparatively light and resists acid action well. It has the consistency of a good manganese bronze. It is extremely malleable. Aluminum forms 94 to 95 per cent of the alloy.—Monatschrift für den Oeffentlichen Baudienst.