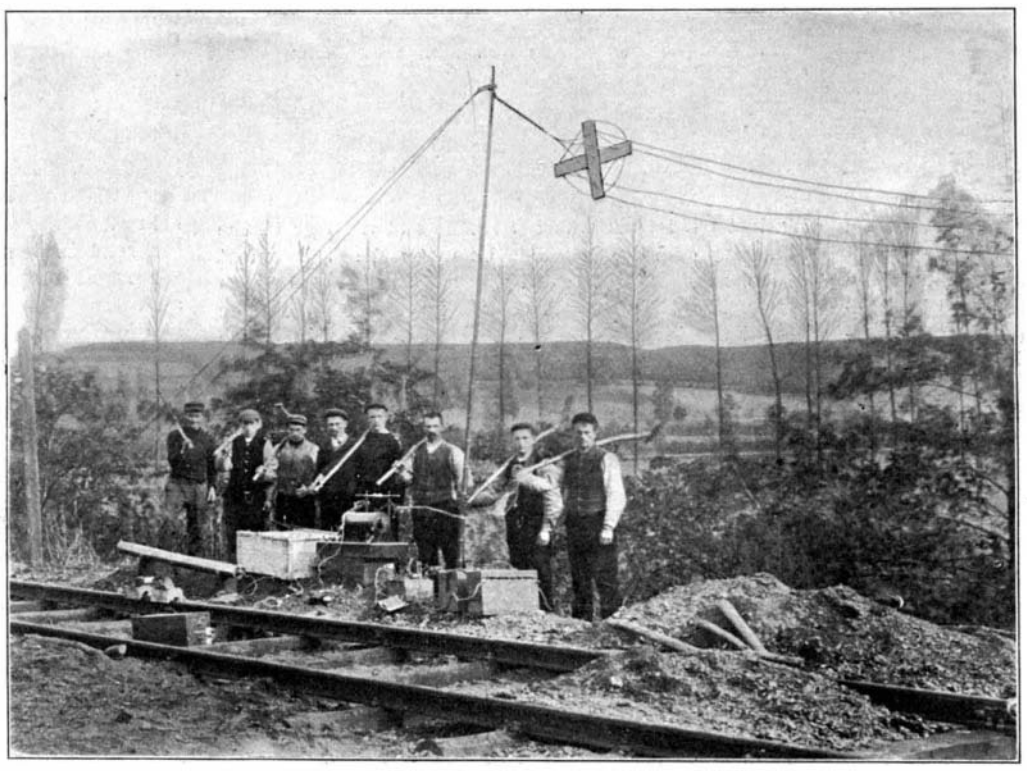
THE HYPOSCOPE.

Our successful contestants for the Palma trophy at Bisley this year brought back with them a little instrument which is destined to play a very important part in the warfare of the future. The instrument is called the "hyposcope," and its purpose is to enable a marksman to fire with accurate aim without exposing his head to the fire of the enemy. The device was invented by Mr. William Youlton, of Brighton, Eng. Mr. Youlton first conceived the idea of such an instrument after the battle of Colenso in the Boer war, during which it is stated that not a single Boer was to be seen, and it occurred to Mr. Youlton that a combination of reflectors might be arranged which would enable the British soldier to remain entirely concealed when in action. The rough model which he constructed as a result of these deliberations immediately elicited favorable comments on all sides, and it was not long before he received an order for a number of these instruments from the British War Office. The instruments were employed with good results during the remainder of the war, their use at Mafeking having received particular mention.

The hyposcope is adapted to be secured to the stock of the rifle near the breech. It consists of a series of mirrors mounted in a tube of inverted L shape; the shorter arm lies across the barrel of the rifle, while the longer arm hangs down at one side. The first mirror reflects the light coming in along the barrel of the rifle to a second mirror at the elbow of the instrument, which directs the rays downward to a mirror at the lower end of the tube, and thence it passes out at right angles to the eye. Thus on looking in at the eyepiece one can see the sights of his rifle, and take accurate aim while holding the gun above his head. The vertical arm of the instrument comprises two telescoping sections, so that, by means of a thumbscrew at the side, this arm may be extended to elevate the device for long-range shooting. The amount of elevation may be accurately determined by means of a fine scale on the upper section. In order to allow for windage, a thumbscrew at the end of the horizontal arm may be rotated to move the mirror contained therein slightly to one side or the other. A scale on this arm shows just how far the mirror must be moved for different velocities and directions of the wind. The entire instrument is very compact and light, weighing about a pound. It is provided with a holster, in which it may be incased to prevent it from sustaining any injury when not in use. The parts, however, are not liable to be easily injured. In case a mirror is broken, a new one can readily be slipped into the old frame. The advantages of this instrument in actual warfare will be apparent to all. Only the muzzles of the rifles are exposed to the enemy, and the soldiers are entirely concealed in the trenches. But aside from its advantages as a means of protection, the device will be found to greatly increase the effectiveness of the firing. It is stated that during the Boer war only one cartridge out of seven thousand was effective, which only goes to show how nervous a man is under fire, for no such work would ever be tolerated in target practice. The fear of being shot while taking aim makes the soldier fire hurriedly and at random; with the hyposcope attached to his rifle no fears will be entertained, and the soldier may fire deliberately and with perfect aim. Aside from its advantages in connection with a rifle, the hyposcope will be found very useful in scouting. By applying it to the end of a field glass, an observer can watch the movements of the enemy without danger of discovery. The same instrument has also been designed for use on Maxim guns, on which it will be particularly useful, judging by experiences in the Boer war, for these guns were always the center of a concentrated fire.



COMMUNICATION WITH TRAINS BY WIRELESS TELEGRAPHY.

COMMUNICATION WITH TRAINS BY WIRELESS TELEGRAPHY.

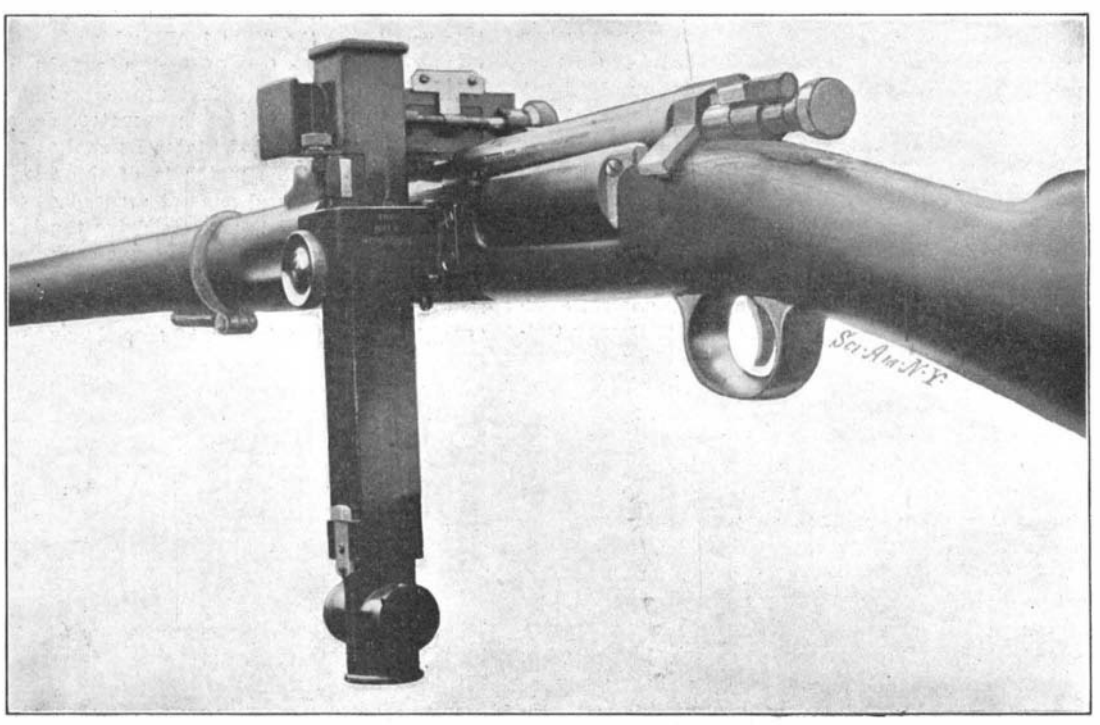
Although certain railroad managements, those of Belgium, for example, question the necessity (especially when they are provided with the block system) of communications of trains with each other and with stations, inventors in the domain of wireless telegraphy have, in recent times, directed their attention to this interesting branch, and experiments are being made on all sides. In England, the Marconi system has been experimented with; in America, the De Forest system; and in Germany, the Braun-Slaby.

All such experiments have permitted of ascertaining the fact that great energy is necessary, even for slight

Marksman Concealed Behind a Sand Bag and Sighting Through Hyposcope.

Aiming with the Hyposcope Over Breastworks.

Seated Marksman Entirely Concealed While Firing.



The Hyposcope Attached to a Rifle.

THE HYPOSCOPE; BY WHICH A MARKSMAN CAN TAKE ACCURATE AIM WITHOUT EXPOSING HIMSELF.

distances. In order to communicate at a distance of about six miles, it requires, it would appear, no less than one horse power.

The problem is, moreover, much more difficult than might be thought at first sight. The distance of transmission, in wireless telegraphy, as well known, depends before all else, upon the energy brought into play and upon the length of the antennæ. In this latter factor resides the principal difficulty. Tunnels, stations, and bridges prevent the putting of vertical antennæ of more than six or ten feet upon trains. In default of antennæ of considerable height, no other means therefore remains but to increase the energy brought into play. It is to a solution of this problem that experimenters in general are applying themselves. The difficulty might be surmounted, nevertheless, if horizontal antennæ could be effectively employed. But here a new difficulty is confronted. Antennæ placed one after another lose their efficiency. On the other hand, the displacements of the trains produce a respective displacement of each antenna.

As another method, it has been proposed to place along the track, and for its entire extent, a horizontal antenna, connected now with a transmitter and now with a receiver. Another horizontal antenna would be established upon the train and stretched, for example, over the roof of the cars. This system, it will be at once seen, has two disadvantages. In the first place, it necessitates a special wire and consequently involves a very great expense; and, in the second, it does not permit of a communication between trains. A truly simple solution, however, permits of conquering the difficulty, and this has been furnished by M. Guarini and his collaborators, M. Cesar and Lieutenant Poncelet. As may be learned from the Guarini and Cesar Belgian patent No. 167,023 of November 29, 1902, the system consists in employing an existing line of telegraph wires and using others as intermediate ones. For this purpose, there is produced at a point that may be fixed (station) or in motion (train), and that is situated near the said wires, an electro-magnetic disturbance by employing an oscillator, for example. Such disturbance is perceived, notably by means of a coherer, at another stationary or movable point placed near these same wires. These latter, in the first place, take up the waves and afterward radiate them. They therefore play the part of intermediate antennæ.

Some experiments with the Guarini-Cesar system have been performed upon the Belgian State line, have been watched by one of the latter's engineers, and have been crowned with entire success. The energy of 40 watts and an antenna of 4 strands of 32.8 feet sufficed to communicate between West-Saint-Georges and Ottignies, say a distance of 10.5 miles. With an energy of 15 watts, a spark of 1-10 inch, and a good coherer, signals were received at a distance of 2.5 miles, although the antenna of the movable station, arranged upon a small car, was one of but 6.5 feet. It consisted of an iron tube 4 inches in diameter. At the other station the antenna was 32.8 feet. Messages were received in both directions, from the car to the wire and *vice versa*, even when the car was at 100 or 130 feet from the telegraph wires. No disturbances of any sort were observed in the numerous telegraph and telephone receivers placed along the line. This fact is not wanting in interest, and agrees with the numerous researches of such scientists as Slaby, Turpain, and others, who have studied the simultaneous transmission of ordinary and high-frequency currents by means of the same wire.

In order to obtain such results, it was not even necessary to connect one pole of the oscillator, or of the coherer, with the earth. It sufficed to employ a condenser or even a simple capacity consisting of a tube parallel with the earth. Upon the car the ground connection was formed by the axles and wheels.

M. Guarini desired also to ascertain whether the rails might not perform the rôle played by the telegraph wires. With this object in view, some experiments were made after connecting the oscillator with the rails or with antennæ placed near the rail and parallel with it, as shown in our illustration.

With an energy of 100 watts and a sensitive Blondel coherer, MM. Guarini, Cesar, and Poncelet were enabled to receive signals, but at much shorter distances. The system in which telegraph wires are employed might, M. Guarini thinks, prove an economical means of constituting a block system with signals upon the locomotive. The inventor, moreover, from these experiments, draws some interesting conclusions, from a different point of view, but one that seems to have been the motive that led him to perform them. Submarine cables, which are insulated from the aqueous medium that surrounds them, might, perhaps, in his opinion, perform the rôle, in certain cases at least, of intermediate antennæ in wireless telegraphy to a great distance. In such a case, it would be very easy, he thinks, to assure by submarine cables, without interfering with their ordinary business, telegraphic communications between ships and with the coast. He does not favor, then, the bringing into play of the enormous amount of energy to which Marconi has recourse.

RUINS OF PIEDRAS NEGRAS.—ALTAR WITH HIEROGLYPHIC INSCRIPTION.

PIEDRAS NEGRAS.—SCULPTURED LINTEL FROM DOORWAY OF BUILDING.

PIEDRAS NEGRAS, A NEWLY DISCOVERED PREHISTORIC CITY IN GUATEMALA.

BY CHARLES C. WILLOUGHBY, PEABODY MUSEUM, HARVARD UNIVERSITY.

The region comprising the greater part of Guatemala, the western portion of Honduras, and the southern part of Mexico, including the peninsula of Yucatan, was the seat of an ancient American civilization highly developed and as interesting to the archæological student as any of the primitive civilizations of the Old World.

Throughout this region are found numerous remains of ruined cities, or, more correctly, ruins of religious and governmental centers; for religion and government were inseparable among this people.

The Spaniards, upon their arrival, found numerous books among the priesthood, each book consisting of many pages, the leaves being eight or ten inches in length and folded like a screen. The pages were covered with numerals, glyphs, and explanatory drawings beautifully executed in colors, which are supposed to refer to the calendar, to astronomical matters, and to religious ceremonies. The Spanish priests collected and burned every book they could obtain. Fortunately for students, three of the books found their way to European libraries. Their value is now appreciated, and they have been carefully reproduced by photo-lithography and are known under the titles of "Codex Dresdensis," "Codex Troano-Cortesianus," and "Codex Peresianus." Copies are now accessible to all students.

Upon the monuments and altars, upon the lintels, walls, and stairways, and upon the altar slabs within the sanctuaries of the temples are sculptured with elaborate detail hieroglyphs of the same character as those occurring in the codices. It is known that in many instances these hieroglyphs record certain dates by days, months, and longer time periods, but the significance of the great majority of the glyphs is as yet unknown. When they are deciphered, as they are sure to be in time, a flood of light will be cast upon the religious history of one of the most remarkable primitive cultures known.

With the view of bringing together reproductions of all the inscriptions upon the monuments of the Mayan peoples, the Peabody Museum of American Archæology and Ethnology of Harvard University has for several years had expeditions in the field conducting explorations among the ruins and making paper molds of inscriptions from which plaster reproductions have been made. While engaged in work for the Peabody Museum, Toberto Maler, long a resident of Mexico, heard of the existence of certain ruins in western Guatemala known only to the native wood cutters. After a long journey through tropical forests he reached the Usumacinta River, upon the banks of which the ruins lay.

The structures are built upon an irregular plateau or series of connected hills, artificially terraced. A transverse valley opens upon the river at the south of the plateau. At this point is a mass of blackish limestone rocks, visible for a long distance from the river in either direction, and called by the natives *Piedras Negras*. This name has been given to the ruins. Upon the flat surface of the largest of these rocks is sculptured a circle of hieroglyphs inclosing two seated figures. Entering the transverse valley