THE ARMY SIGNAL CORPS.

The efficiency of the Signal Corps men in transmitting messages along the coast during the sham war between the Army and Navy calls special attention to the development of a branch of our Army equipment which has rarely received all the attention it deserves. It was in the American armies during the war between the North and South that the telegraph was first practically applied under war conditions, and some of the experiences gained at that time have been of inestimable advantage in developing a system of telegraphic communications that would be ready for instant use. When the Spanish war broke out the ability displayed by the Signal Corps in covering the whole coast with a system of communication, which would have made it difficult for any hostile fleet to approach without detection, was remarkably gratifying to all those interested in this feature of warfare.

The technical corps of an army is always proportionately small, and the pay for expert electricians has never been high enough in our Army to attract the most efficient men; but through the self-sacrificing endeavor of a few men the service has been enabled to accomplish much in recent years. Unfortunately, Congress has never fully appreciated the importance of the Signal Corps, which has full charge of constructing, repairing and operating military lines, and the funds grudgingly granted for this purpose have been totally inadequate to the actual needs.

The Signal Corps of the Army divides the system of covering the country with telegraphic lines into three divisions. These are the permanent, the semi-permanent, and the flying lines. The first consists of the established commercial telegraph and cable lines which the Army would use in the event of a war, and even take full possession of in an extreme emergency. The semi-permanent lines are those which have a number of stations along the coast equipped with all the necessary apparatus for communicating with other signal stations either by telegraph lines or by wireless telegraphy. The coast is divided up into sections with stations established at convenient points, which in times of peace are practically abandoned except for local watchmen whose business it is to look after the stored apparatus. Several of these stations have been equipped since the war with Spain with all the necessary implements for immediate and practical work.

The third division of the signal system is in some respects the most important. The field or flying telegraph lines must be erected in the very field of operations and often in the face of the enemy's fire. The signal men who operate these must be the bravest and most efficient. The extreme outposts of the Army must be connected with headquarters by some system of signaling. The Signal Corps division in charge of this must devise some means of establishing such communication in an emergency either by laying wires, erecting temporary wireless telegraph stations, or by signaling with flags or other flying objects. In order to accomplish this quickly in the face of the approaching enemy wires must sometimes be laid on the ground or stretched across marshes and creeks and small rivers.

In all field operations the apparatus employed must be of great mechanical strength and accuracy and comparatively simple and light in weight. The field telephone has been found to be of the utmost value in this branch of the service, for messages can be communicated quicker by means of it than by telegraph, while the telephone will often work over hastily constructed wires where telegraphic messages would fail.

The modern flying telegraph and telephone wires can be constructed under ordinary conditions at the rate of one to three miles an hour. The truck used for the purpose has a field searchlight which throws a strong path of light behind or ahead to enable the workmen to see their way on the darkest nights. All complete this truck weighs but 5,300 pounds, and carries sufficient fuel and water for two hours of steady work. A team of strong horses can drag it over an ordinary country; but in the event of the enemy approaching close to the lines, four horses would be assigned to the task to avoid any delay in crossing rough fields and marshes. Besides carrying oil for fuel and water for boiler purposes, the truck has a complete equipment of telephone and telegraph instruments, and a cable reel.

The flying field telegraph and telephone train consists of three sections, and the field searchlight trucks. Each section carries all the material and apparatus necessary to construct from fifteen to seventeen miles of line. There is the wire wagon, the lance truck, and the searchlight and generator truck. The second truck is loaded with four or five hundred lances of well-seasoned cypress or spruce, each a trifle over fourteen feet in length, crowbars, tools, rubber insulators, and similar articles. A preliminary surveying party precedes the lance truck, and pins are stuck in the ground by the surveyors to mark the places for the lances. A working party with crowbars follow next, and they make a hole two or three feet deep in the soil at each pin mark. The lance truck comes immediately in their wake, placing the poles near the holes made with the crowbars, and attaching the insulators on the upper ends.

The wire wagon with its load of wire appears on the field at this juncture, and the workmen slip the wire into the slot insulators and raise the poles to an upright position. The battery wagon then follows equipped with a number of cells to operate the lines, and with a supply of the various types of field telephone and telegraph apparatus. If the line is to be a permanent one more care is exercised in making the work of a substantial nature, and sometimes a second working division follows to improve and amplify the work of the first flying division. Operating stations are established at certain points, and skilled operators are in constant communication with the first end of the newly-laid line, which may in a short time be attacked and destroyed by the approaching enemy. Consequently as fast as the line is laid communication is established and the head division knows exactly what it taking place at the other end and all along the line. The constructing of such a flying line is one of the most interesting and dangerous classes of work that mechanics and electricians can undertake in war time. The enemy is equally alert to the value of such established communication, and scouting parties are sent out ahead to destroy the lines. Often the telegraph operators and electricians must be prepared to defend themselves and their work. Consequently the army electrician and operator is a fighter as well as a mechanical expert. He must enlist as a soldier and become proficient in the use of small arms and military drills and tactics. Where the conditions are peculiarly dangerous, a squad of soldiers follows in the rear of the Signal Corps men to protect them from an attack by the advancing enemy, and the electricians often work away at their appointed task while skirmishing battles are going on all around them. They only drop their tools to take a hand in the conflict when matters get a trifle too warm for the soldiers, and their protecting escort appears to be retreating before an overwhelming number of the enemy.

During our campaign in the Philippine Islands the field telegraph and telephone workmen performed excellent work along the line described, and as fast as the Army invaded new territory, following after the fleeing enemy, the electricians strung their wires over the ground or attached them to trees or insulated lances. They had difficult problems to solve in many parts of the country, for the land alternated between low marshy meadows, thick tropical jungles and rough mountainous country. But through all kinds of scenery and climate the Signal Corps men persistently pushed their way, keeping the rear of the advancing army in touch with headquarters. With the exception of only a few picked bodies of men who went in search of Aguinaldo, the advancing columns never once got far out of touch with the main division, so efficient were the flying telegraph corps of men in establishing lines of communication. G. E. W.

TO OUR SUBSCRIBERS.

This is the last issue of the year—the fifty-seventh of the SCIENTIFIC AMERICAN'S life. Since the subscription of many a subscriber expires with the present number, it will not be amiss to call attention to the fact that the sending of the paper will be discontinued if the subscription be not renewed. In order to avoid any interruption in the receipt of the paper, subscriptions should be renewed before the publication of the next issue. To those who are not familiar with the SUPPLEMENT a word may not be out of place. The SUPPLEMENT contains articles too long for insertion in the SCIENTIFIC AMERICAN, as well as translations from foreign periodicals, the information contained in which would otherwise be inaccessible. By taking the SCIENTIFIC AMERICAN and SUPPLEMENT the subscriber receives the benefit of a reduction in the subscription price.

EUROPEAN SALE OF PUPIN'S TELEPHONE PATENTS.

It is said that Prof. Michael Pupin has sold the European patent rights of his invention for the transmission of telephone messages over long cables to the firm of Siemens & Halske of Berlin. Whether any reliance is to be placed upon the report that he received a half million dollars from the firm for the exclusive European rights cannot be ascertained. No doubt the patents were bought for a large sum. Pupin's system has been exhaustively described in the columns of the SCIENTIFIC AMERICAN. The report made to the firm by its engineer states:

"The experimental tests demonstrate that the insertion of inductance coils into long distance telephonic conductors, in accordance with Pupin's invention, enables us to obtain in practice the enormous effects required, and that long distance telephony actually enters into a new area of development. The problem of transatlantic telephony has become through this invention a possibility, even if the cost of a suitable submarine cable might still be too high and the technical difficulties accompanying the manufacture and laying of a submarine cable with coils in great submarine depths might be considered as exceptionally serious.

"The manufacture and laying of Pupin's cables in the less considerable depths of the Mediterranean, the North Sea and the Baltic offer no difficulty whatever, so that there is nothing in the way of establishing direct telephonic communication between Berlin-London, Berlin-Copenhagen-Stockholm, etc."

SCIENCE NOTES.

Some two years ago, while tending the roots of the vines in a vineyard at Attenburg, Lower Austria, a gardener unearthed the lower jaws and upper molars of a gigantic animal, presumably a rhinoceros, which were taken to the high school at Vienna for further investigation. Prof. Toula closely examined the relics, and recognized from the structure of the teeth that the remains were not those of the ordinary wooly rhinoceros. He immediately repaired to the vineyard, where he continued excavations at the point where the skull was disinterred, and discovered practically the whole of the skeleton of this interesting animal, which has now been mounted. Although a portion of the skull is missing, there is sufficient to show that the beast was of the two-horned species found in Sumatra. The breccia where the skeleton was found is of the Pleistocene age. It also contained the remains of a goat.

Prof. A. L. Rotch, of the Blue Hill Meteorological Observatory, intends to explore the upper regions of the air above the equator by means of kites and balloons sent up from ocean steamers. In this manner Prof. Rotch hopes to study the overlying and anti-trade winds and to make a map of their course. It is only on the peak of Teneriffe that the anti-trade winds can be observed the whole year. Their mean lower limit is at the height of 9,000 feet, and their height is greater in summer than in winter. In October this altitude sinks to 6,000 feet. We know that the anti-trade exists over the trades, at least in the North Atlantic and at the Sandwich Islands, but no one has found this upper current in Central America or in Ecuador, while the smoke of the highest volcanoes around Quito constantly indicates a strong wind from the east. It remains to be seen whether kites or balloons sent up from ocean-going steamers will add something to our very limited knowledge of the anti-trades.

At the recent annual congress of the Swiss Society of Natural Sciences, held at Berne, a new and interesting theory as to the origin of the appearance of the higher atmosphere, which is popularly styled as the "blue sky," was advanced by M. Spring, a well-known scientist of Liege. Hitherto the azure tint has been supposed to be due to the refraction of light upon minute corpuscles disseminated in the air. M. Spring, however, has conceived a new explanation of the phenomenon. He has carried out a number of experiments with luminous rays under almost all conceivable conditions, injecting them into agitated solutions, and into a glass tube, containing pseudo solutions such as chloride of aluminium of absolute limpidity; but although he could obtain red, yellow, violet, etc., under no circumstances could he obtain blue, until by the use of electricity he secured a perfectly pure atmosphere in which blue was clearly discernible. M. Spring therefore concludes that the blue of the sky is purely electrical in origin, and is an essential quality of the air.

Mr. Oscar Neumann, the well-known explorer, has delivered a lecture before the Royal Geographical Society of Great Britain dealing with his journey from the Somali coast to the Soudan through southern Abyssinia. He was accompanied on the expedition by Baron Von Erlanger and Dr. Ellenbeck. The journey was of great scientific value. The party discovered several fossils of Upper Jurassic strata (north of the Wabi), and still more that of cretaceous strata in the Gillet Mountains. They found that the belt of country from Abulkasim and Abu Nas to the Blue Nile, and the headstreams of the Sobat, consists for the most part of tertiary volcanic rocks, the date of the formation of the rift valley —formerly occupied in its northern parts by a great lake basin, as is shown by mollusks found on the Suhsuk River—belonging also probably to the tertiary period. Between Zeila and Addis Abbeba Dr. Ellenbeck made a collection of some 2,500 botanic specimens, and after separating from the rest of the party Mr. Neumann obtained some 200 plants. The zoological collections are the largest that have ever come to Europe from Africa at one time. Mr. Neumann's collection includes 1,000 specimens of mammals, 1,300 of birds, 30,000 of insects, 2,000 mollusca, besides reptiles, fishes, etc. Twelve new mammals and ten birds were discovered.