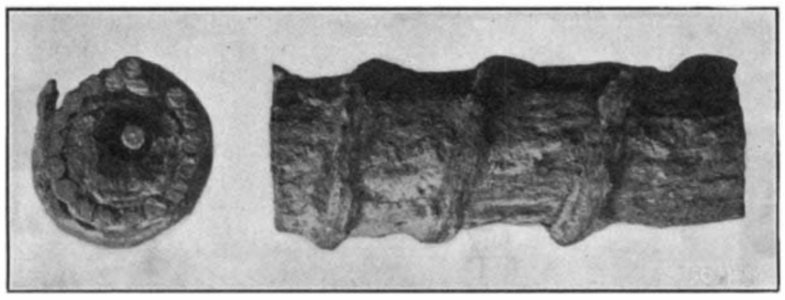
## THE FIRST SUBMARINE CABLE.

BY W. F. BRADSHAW, JR.

The first successful application of submarine telegraphy undoubtedly was due to Cyrus W. Field, of New York. But the idea and the first practical application of it, as Mr. Field himself has generously acknowledged, must be credited to John Boyd Sleeth, a Tennessee River steamboat captain.

Captain Sleeth was born at Allegheny, Pa., November 21, 1826, and died at Paducah, Ky., March 12, 1895. For several years he was on one of the old "broadbow" boats that plied on the Mississippi and Ohio Rivers. Then he settled at Paducah, and in 1845 was in the employ of Mr. Tal Shafner, who had charge of the telegraph line at Paducah, which connected St. Louis and Nashville. The Ohio, at Paducah, is something over a mile in width, that being the point of its confluence with the Tennessee. The rivers meet at an acute angle, and the backbone ridge between them breaks opposite the city into two islands. It was by means of one of these islands that Mr. Shafner found it possible to run his line across both rivers. He erected tall staffs, one on the Kentucky shore at Paducah, another on the islands, and a third on the Illinois shore. The wires of the line across the Ohio at Paducah were strung upon lofty poles high above the stacks of passing steamers, which cleared the line in low water seasons, but struck the sagging wires and tore them down when the rivers rose. Great difficulty was experienced in keeping the wires sufficiently high and taut to avoid such accidents. Young Sleeth knew something of the principles of insulation, and the idea of laying an insulated wire across the river bed occurred to him. His idea was received with some skepticism by Mr. Shafner until he proved its feasibility by experiment. About a year later the local management consented to let him make the experiment of running an insulated wire across the river. The work of insulating the wire was slow and uncertain; little was known about insulating materials, and the workmen were "day" laborers, entirely ignorant of the nature of the task, who had to be watched incessantly. One of the eye witnesses, Captain Wes Cooksey, has given the following description of the manufacture of the first submarine cable:

The wire chosen for use as the cable proper, one strand, was stretched along the float and wrapped first with canvas, such as was then used for roofing steamers. The canvas had been soaked thoroughly in hot pine tar pitch. The covering process was continued until the wire was about half an inch in diameter and then it was guarded by a wire of a slightly smaller size, this being placed parallel, as is now the custom. It was then wrapped by loose coil with another wire of the same size. The number of wires laid parallel to the cable outside of the canvas insulation was eighteen. The cable was made in sections, which were joined before being laid. Just how long it took to complete the insulation is not known, but it was several months. The cable was over a mile long, and when laid was reeled off from the end of a large "broadbow" boat in tow of a steam craft. The work of laying was attended with some difficulty and required several days. The first test was very successful, and the wires worked admirably for several weeks; then the pitch insulation of course became water-soaked and the cable began to "stick," as the operators say, and was soon abandoned as worthless. But the idea had proven practicable, provided a better insulation could be found. Some months later Mr. Field sent a representative to Paducah to see Mr. Sleeth. An offer was made him to continue his investigations, and form a partnership. Mr. Sleeth was then in very moderate circumstances and had to decline the offer. The local management went back to the overhead wire, and the unsuccessful cable was soon forgotten. Mr. Sleeth returned to boating, and was soon after made captain of a Tennessee River steamer. He fought through the civil war in the Confederate service under General Roddy, and came out a captain. After the war he went back to the river. Strange to say, he never patented his cable, or made any attempt to do so, but abandoned it entirely after the first failure. Mr. Robert Sleeth, of Pittsburg, Penn., wrote to Mr. Fields in 1891, asking him about the truth of the report of his having sent a representative to see the captain, Mr. Sleeth's brother, and discuss the idea of an insulated cable. Mr. Sleeth has the letter Mr. Fields wrote in reply, acknowledging the facts as stated.

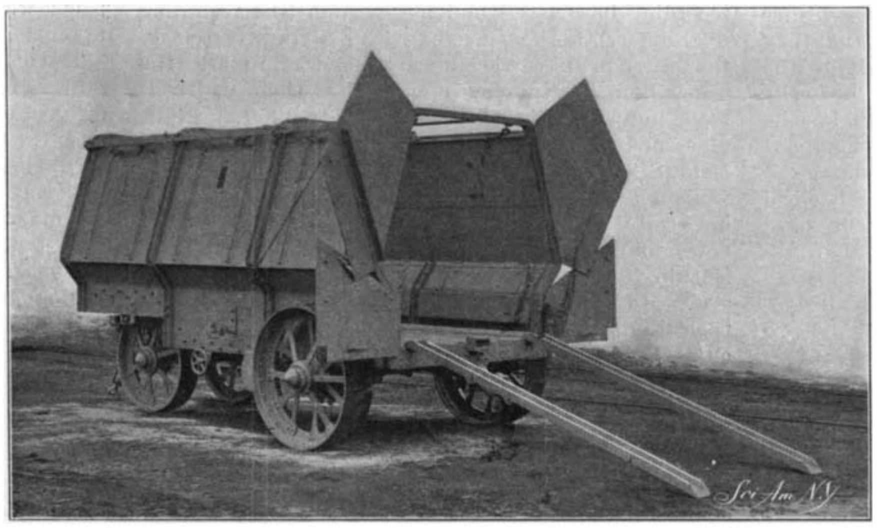


A PORTION OF THE FIRST SUBMARINE CABLE.

About three years ago the end of the cable was found on the Kentucky side of the Ohio River, during the low water in August, and the accompanying illustration is a photographic reproduction of a piece filed off and now in the possession of Mr. James B. Sleeth, of Paducah, son of Captain Sleeth.

## ARMORED TRACTION ENGINE AND TRAIN.

The events of the South African war have proved that the problem of transportation has been rendered if anything more difficult than ever by the changed conditions of modern campaigning. The wastage in horses alone in the army under Lord Roberts was estimated at one time to amount to 5,000 a month. It was inevitable that in an age so mechanical as the present, attempts would be made to substitute steam power for the horse and the ox, and the armored traction engine and train, herewith illustrated, represents the most successful design for military traction in the field that has yet appeared.



ARMORED WAGON, OPEN TO RECEIVE A FIELD GUN.

Each train consists of a special road locomotive and three or four wagons, all armored with special steel bullet-proof plates tested to withstand rifle fire at 20 yards range, or splinters from shells. Each vehicle is intended to carry one 5-inch or 6-inch howitzer on its carriage, and a 4·7-inch naval gun arranged for th same carriage as the howitzer. It can also be used, if necessary, to carry ammunition, stores or men. The train is fitted with a special arrangement of winding drum and steel cable, which enables it to cross spruits and other difficult, soft, or steep places, by winding, should the train be unable to travel direct.

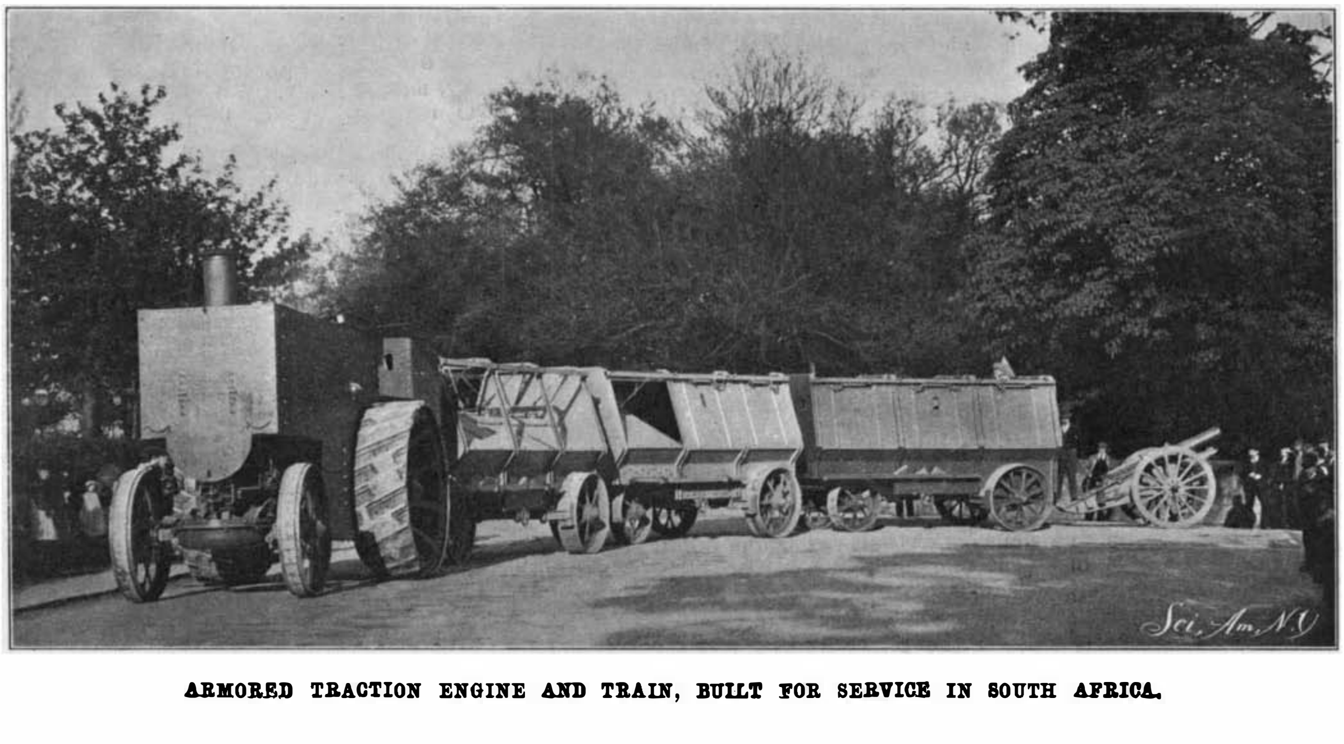
The most perplexing problem that faced the constructors in designing the engine was the effectual and adequate protection of all the vital parts, yet in such a manner as not to interfere in any way with the easy manipulation of the engine by the driver and steersman. Then, again, special attention had to be given to the boiler—blowing off, washing out and cleaning—lubricating the working parts of the engine, the use of the winding forward drum, the proper paying out of the cable, and so forth. These arrangements necessitated a special construction throughout.

The locomotive is Fowler's compound, spring-mounted type, specially designed and built to carry armor. The latter is so arranged that if the exigency arose, it could be easily dismounted, and then the engine would be similar to the army service type, which is now being used with great success in South Africa. The boiler is constructed to work at a pressure of 180 pounds to the square inch. The power is transmitted from the crankshaft to the hind axle by a train of cast steel gearing, with a self-acting differential gear on the main axle. The ratio of the gear is such that a speed of 1½ to 3 miles per hour is made in slow gear, about 2½ to 4½ miles per hour in middle gear, and about 6 to 8 miles per hour in the fast gear. These speeds can be increased if desired by simply running the engine faster. The capacity of the water tanks is sufficient for a run of from 10 to 17 miles, according to the weight hauled by the train and the conditions of the road upon which it is traveling.

All parts of the engine, with the exception of the road wheels, are protected from rifle fire, and all levers, rocks, and lubricators are arranged so that they can be adjusted from the footplate. The driving wheels are of special construction and measure 7 feet in diameter by 24 inches in width, with the section strips for giving increased adhesion on the veldts and on sandy ground. The armor is of bullet-proof plates manufactured by Messrs. Cammell & Company, of Sheffield. Every plate was tested by the War Office officials at 20 yards range point blank with Lee-Metford and Mauser bullets, which were found to have no appreciable effect upon the plates. The driver and steersman are inclosed in a large cab, access to which is obtained by a small door in the rear. Lookout holes provided with special shutters, convenient for the engineers in charge of the locomotive, are provided in the cab.

An important advantage possessed by this locomotive is that it is mounted entirely on laminated springs, with an arrangement of suspending levers, etc., which enables the engine to attain a high rate of speed, even upon rough ground, without affecting the true working of the driving gear in the slightest degree, and yet at the same time reducing the oscillation risk of damage to a minimum. In fact, without this spring gear, it would have been impossible to have successfully armored the engine.

The general design of the wagons, and also the details regarding their protection from rifle fire, were prepared by the War Office. The main frame is constructed entire of steel scantlings with an arrangement of springs which yields sufficient elasticity to enable the wagons to ride steadily when traveling over rugged country. The wheels are specially built with hard steel tires



ARMORED TRACTION ENGINE AND TRAIN, BUILT FOR SERVICE IN SOUTH AFRICA.