THE CABLE REPAIR STEAMER MACKAY-BENNETT.

The present is peculiarly a scientific age, rife with great enterprises which have originated within the memory of most people. It is not a great many years ago when the completion of the first ocean telegraph was celebrated with great pomp and enthusiasm. Transoceanic telegraphy is distinctively a modern institution ; as such it is necessarily controlled by modern methods.

One of the great companies, the Commercial Cable Company, owns and operates three complete submarine lines between Europe and the United States. To keep these cables in order this enterprising company has a fine steamer, the Mackay-Bennett, which was built especially for the purpose by John Elder & Company, at Govan-on-the-Clyde, at a cost of $320,000. She is 260 feet long, 40 feet beam, and 22 feet deep, and is propelled by twin screws driven by independent compound engines, each having a high pressure cylinder 15 inches in diameter and a low pressure cylinder 25 inches in diameter, the stroke being 3 feet. The combined horse power of the engines is 1,500. The gross tonnage of the vessel is 1,700 and the coal capacity is 750 tons. Her speed is 12 knots per hour.

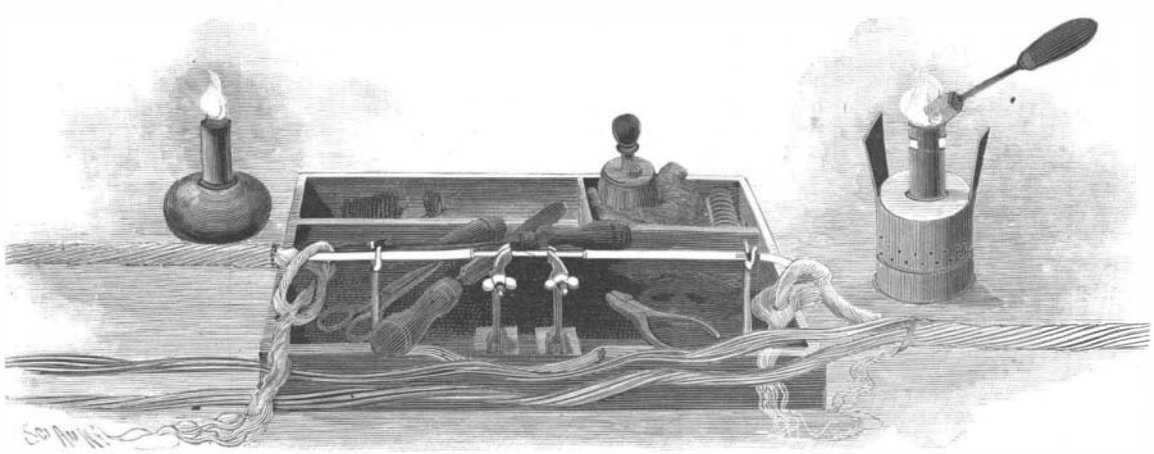
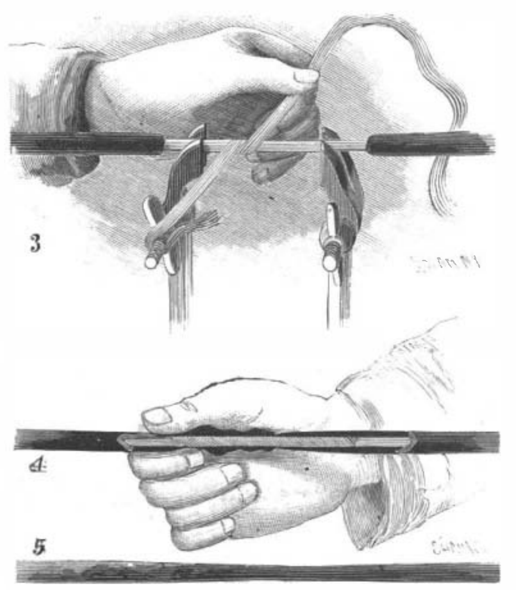
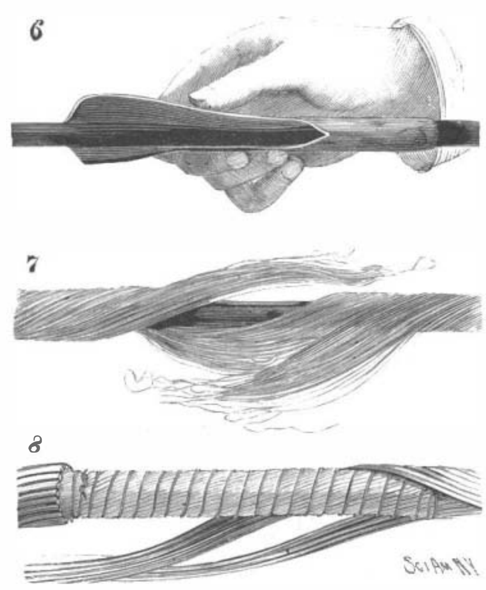


Fig. 2.—SOLDERING THE SPLICE.

The Mackay-Bennett is provided with three cable-holding tanks with a total capacity of 385 nautical miles ; tank 1 holding 60 miles ; 2, 195 miles ; and 3, 130 miles. The central cores around which the cable is coiled are utilized as fresh water tanks. The steamer is fitted up with all the modern machinery for grappling, picking up and paying out cable. It is lighted throughout by electricity and is furnished with electric search lights, so that work can be carried on during the night. The steering is done by steam, and the necessary steadiness is secured by bilge keels. The vessel is provided with a bow rudder, so that it can steam astern. The maneuvering qualities are excellent. A staunch steam launch is provided, which is much used in work near the shore.





On the deck are placed two powerful engines for heaving in and paying out the cable. At the bow and stern are placed immense sheaves, as shown in our engravings, over which the cables pass when delivered or received. The engines for handling the cable are geared to drums 6 feet in diameter, 2 feet in width, each being mounted on a shaft 11 inches in diameter. The cable, which is wound several times around this drum, passes over quadrants or guides at the hatches. If it is being taken up, it is coiled around the core in the tank below, as shown in the large engraving. In this case it requires a powerful engine to bring it up from the depths of the ocean, but where the cable is paid out, it simply passes over the drum, which is then detached from the engines, and the paying out is controlled by a brake operated by the man on the platform. The cable in its passage to the bow or stern of the steamer goes under the sheave of the dynamometer, which indicates the amount of tension on the cable. The strain on the cable usually ranges from two to three tons.

On the upper deck at the bow and stern are electrical signals, by means of which the engineer in charge of the ship's engine and also the engineer in charge of the cable handling engines may be notified to stop, start, or go ahead or astern, fast or slow, as circumstances may require. Attached to the shaft of the drum is an indicator which shows the number of miles of cable paid out or taken in. On the deck of the steamer are guides which lead to the different tanks. The cable may be drawn from either of the three tanks by either of the cable handling engines. Upon the deck are carried buoys, which are launched and to which the cable is secured when it is desired to detach the cable from the steamer, and leave it to be subsequently picked up and extended. The cable tanks are watertight, and the cable is kept in water, and while the laying of a cable is going on, electrical tests are progressing continuously, so that any defect may be detected and remedied before the cable reaches its final resting place upon the ocean bottom. The electrical testing room has a very complete electrical equipment, and the electrician is always in attendance to discover and locate any faults.

To one not familiar with the characteristics of the electric current, it seems a difficult matter to locate a fault in an ocean cable hundreds of miles at sea, but a competent electrician can generally locate the fault within a few miles. The insulation of the conductor must be maintained in a very perfect condition; otherwise the cable is rendered useless. A puncture in the insulation of the diameter of a hair is sufficient to interfere with the proper working of the cable, and to necessitate the journey of the repair steamer to the point where such an apparently insignificant thing exists. On reaching the vicinity of the fault the grapnels are thrown out and the cable lifted to the steamer, when it is taken on board and dissected and repaired, the defective section being removed and replaced by a perfect piece of cable. The manner in which the cable is spliced is illustrated in Fig. 2. After the defective portion is cut out, the ends of the cable adjoining the splice are unwound, and the copper conductor at the center is laid bare. The ends of the copper conductor are scarfed and lapped, as shown ; then the joint is secured by soft solder, after which a spiral wrapping of fine copper wire is laid over the joint, as shown at 3 in Fig. 3, four or five fine wires being laid on parallel with each other, forming a spiral wrapping of considerable pitch. Upon the first layer of fine wires another layer is placed which is wound in the opposite direction, thereby causing the wires to cross each other. These wires are soldered smoothly, the interstices being completely filled with the solder, and while the conductor still retains the heat acquired in soldering the gutta percha covering is worked over the joint, as shown at 4 in Fig. 3, the splice having been previously coated with a cement to insure the perfect adhesion of the gutta percha to the metal. The appearance of the cable core after the completion of this step in the process is shown at 5 in Fig. 3. A wrapping of gutta percha is now placed on the joint, as shown at 6 in Fig. 4, this part of the work being done with the greatest of care to avoid the slightest possible air space communicating with the conductor. The gutta percha covered conductor is served with marline (7, Fig. 4), and this is wrapped with fine twine, as shown at 8 in Fig. 4, and last of all the wire armor is replaced. The total length of the splice is from 40 to 80 feet. The operation of splicing the armor is practically the same as that of splicing any wire cable. The splice thus made is stronger than the cable and its electrical conductivity is also greater than that of the other parts of the cable. The Mackay-Bennett can lay cable at the rate of 6 to 8 miles per hour.

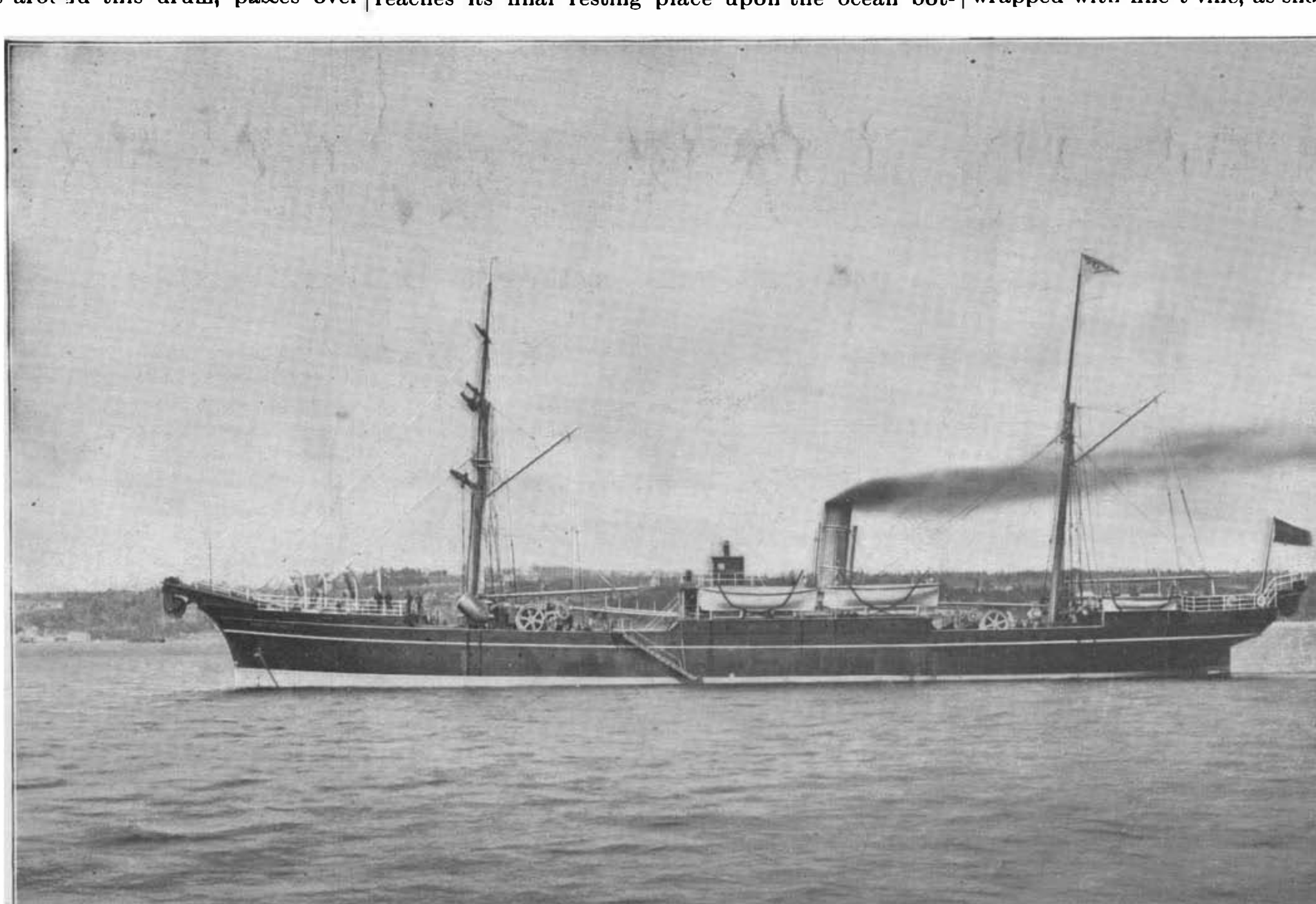


Fig. 7.—THE COMMERCIAL CABLE COMPANY'S REPAIRING STEAMER THE MACKAY-BENNETT.

It is obvious that in laying cable it is necessary to know something of the character of the ocean bottom. It is especially desirable to avoid shallow places. The steamer is provided with the James "sentry and sounding machine," which gives notice on board of the approach to shoal waters. A device called a "kite," shown in Fig. 6, is trailed behind the steamer, as shown in Fig. 5, being attached to the end of a piano wire wound upon the drum of the sounding machine. The kite is attached to the wire in such a manner that it dives under the stern of the boat to the minimum depth.

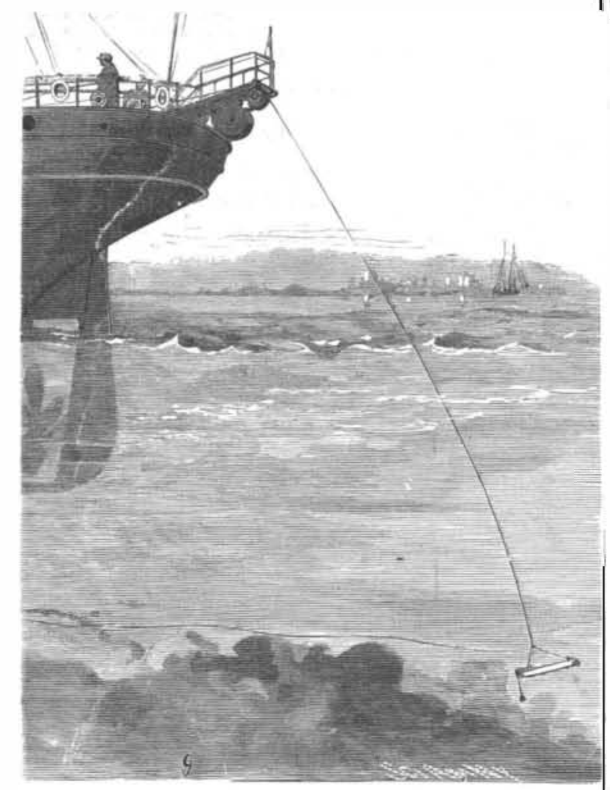


Fig. 5.—JAMES SENTRY AND SOUNDING MACHINE.

Should the steamer enter shallow water, the lever at the lower end of the kite strikes the bottom and releases the front end of the kite so that it trails behind the steamer at or near the surface and offers less resistance at the machine. The diminished pull causes a bell to ring on the sounding machine and another on the bridge. The sounding machine is adjustable for different depths. On the deck at suitable places are placed electric signaling machines, made by Eliott Brothers, of London, for communicating with the engineer of the paying-out machines and with the ship's engineer.

The Mackay-Bennett came on from Halifax in September last to lay cable for reporting the yacht race. The shore end of the cable was dropped at Coney Island at a point east of the Oriental Hotel. From this point it was laid out to the lightship, and an extra mile was run out in great coils to enable the ship to change her position if necessary. By the use of this cable, reports of the movements of the yachts were instantly transmitted to New York City, so that the progress of the race was better known to observers of the bulletins than to most of the actual spectators. Through the courtesy of Captain E. G. Schenk, Chief Officer W. F. Linton, Engineer J. W. Burn, and Electrician C. Priest, we were enabled to thoroughly inspect everything on board the steamer.

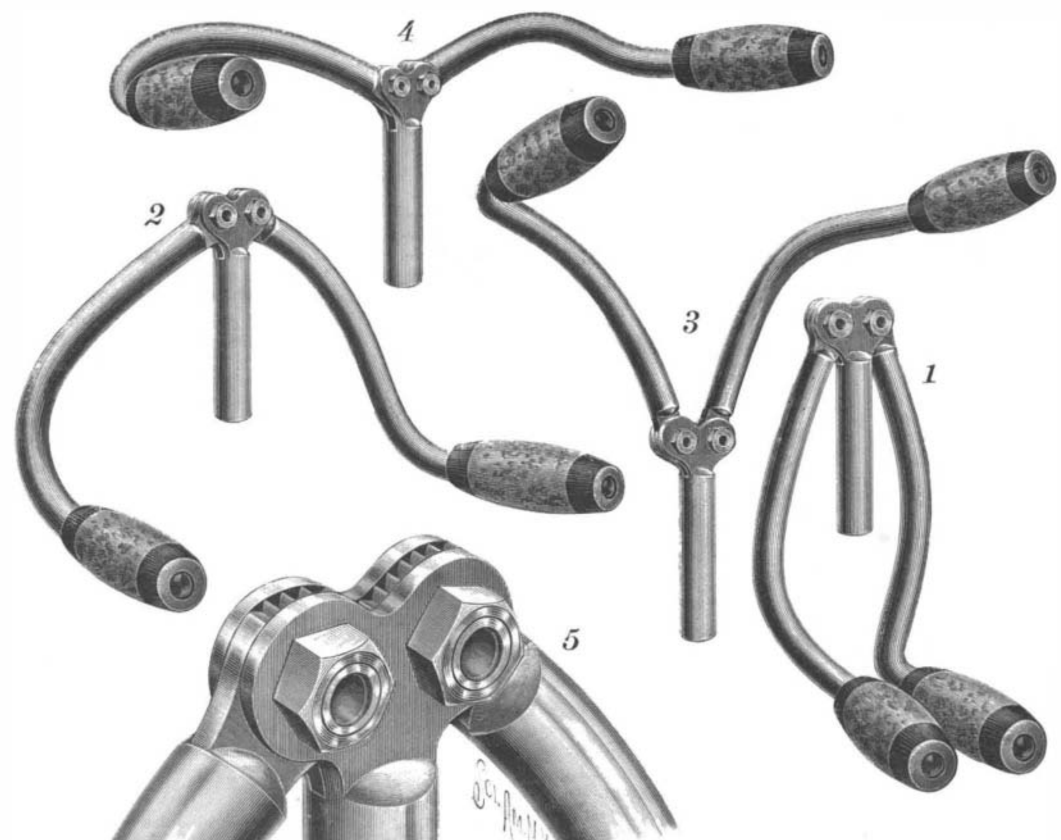
THE LOVELL ADJUSTABLE HANDLE BAR FOR BICYCLES.

The subject of adjustable handle bars for bicycles has received much attention during the past season. We illustrate in our present issue a new system of adjustment, which seems to possess all the desirable requisites while avoiding the difficulties which have been encountered in other ones put upon the market. In the upper part of the tube or handle bar stem is a double swivel joint, which receives the ends of the two handle bars, they being secured by bolts passing through them. The handle bars terminate in lugs, which fit within the swivel joints and which lugs are on their inner periphery provided with teeth. When the handle bars are in position, these teeth mesh into each other. This makes the movements of the bars interdependent. If one bar is raised, the other one rises with it, if depressed, the other one is depressed; hence the handles are always on the same level. Another feature about the bar is, that the inclination of the handles is invariable. In the usual type of handle bar when swung up or down the inclination of the handles varies so that in the upper and lower positions they are very uncomfortable, the inclination being only correct in one position. In the Lovell bar the inclination is always correct—one of the minor advantages of this bar applied in the storage of a bicycle when it is kept in the hallway of a house or other restricted space. This especially applies to shipment on trains, and when crated they can be shipped with bars in place, but dropped, there being no loose and attached handle bars to be tied on or otherwise disposed of.

The cuts show the bar in detail. Fig. 1 shows the handle bar when not in use or when ready for shipping on the wheel. Fig. 2 shows the mode of adjustment. Fig. 3 shows the bar inverted to its full height. Fig. 4 shows the bar about where it would be used by the average rider. Fig. 5 shows it as in use by a fast rider or racer.

As can be seen from Figs. 1 and 2, the handle bar can be adjusted to any position desired, so that the rider can have his handle bar adjusted to where it suits him best. This adjustment does not in any way change the position of the grips, and is the only one of its kind on the market which gives any adjustment and at the same time leaves the grips in a comfortable or natural position.

The manufacturers are the J. P. Lovell Arms Company, Boston, Mass.



THE LOVELL ADJUSTABLE HANDLE BAR FOR BICYCLES.

Exploring the Colorado River.

The San Francisco Call says: 2d Lieut. F. M. Davis, 4th Cavalry, who accompanied 1st Lieut. C. L. Potter, of the Engineers, in his late expedition down the Colorado River, is busily engaged on his official report of the undertaking. Although the report is primarily prepared for official eyes, it will be no ordinary compilation of technical information and forbidding statistics. On the contrary, the report will record one of the most thrilling experiences which human beings ever survived. Speaking of their adventures, Lieut. Davis said recently: "Some time near the 1st of October Lieut. Potter received orders to proceed to investigate the possibilities of the Colorado River for navigation purposes, from the mouth of the Virgin River to Yuma. The understanding was that he was to proceed to the Needles and from there be towed up the river, a distance of 250 miles, by Indians."

The adventures of the party, as described in the Call, were very thrilling. As Indian boatmen refused to brave the cruel rapids of the treacherous river, two old trappers were hired, who, for $5 a day, were willing to undertake the risk. They were experienced watermen and cool headed. They had bow and stern lines, each 200 feet long, and at one point had to send the men up on cliffs 100 feet high, from which, by the aid of the lines, they would "snub" the boat around the ledges of the canyon walls. In one day, within six and one-half miles, they shot fifteen dangerous rapids. Before them seemed almost certain destruction, and to turn back was impossible. The further they went the deeper and blacker became the canyon. Concerning rapid No. 26, Lieut. Smith says:

"Here on both sides towered the steep black walls, 1,000 feet high. Between these walls for a mile there was nothing but angry, hissing foam. We examined first one side and then the other for ledges along which we might climb and draw the boat. It was useless, and to attempt to run that frightful place would have been madness. It was at this point that Major Powell's men abandoned him. We searched for the trail by which they escaped from the prison-like inclosure, but in vain. In our explorations I had sprained my ankle, and we were compelled to lie over a couple of days until I could walk. In the meantime Lieut. Potter investigated several branch canyons in the hope of finding a means of egress. On the Arizona side he followed a canyon for eight miles, to where it abruptly ended in a perpendicular wall 4,000 feet high.

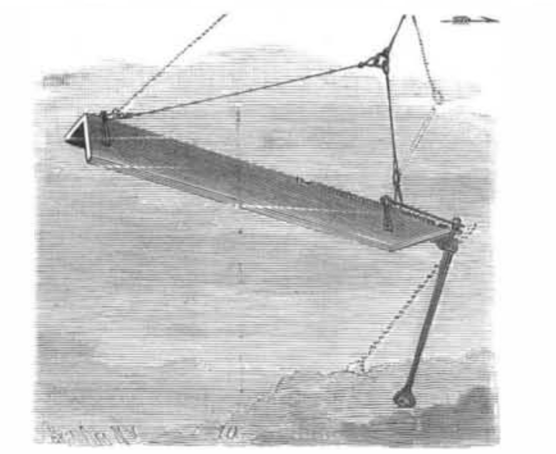


Fig. 6.—THE KITE.

He followed a canyon on the Colorado side fifteen miles with a similar result. At last we determined to take desperate chances. Taking all our provisions and outfit from the boat, we prepared to attempt to follow a faint bighorn trail for a few miles. Lieut. Potter and the rest of the party went on ahead, while I stayed with the boat. The plan was to turn the boat loose and let it shoot the rapids empty and unguided. Lieut. Potter and his party would attempt to catch it as it went by. I waited half a day, and in that time the lieutenant had reached the river three miles further on. Then I turned the boat loose, and in ten minutes it shot by them like a race horse. That left us but one alternative, to follow the bighorn trail. Taking provisions, a blanket each, and our firearms, we started on this perilous journey. Sometimes our path was 100 feet wide, sometimes for 100 feet we had scarcely six inches to cling to. In the latter situation our sensations were horrible. Over 1,000 feet below us yawned the black chasm; beneath us the rock was treacherous and slippery. It was always level, always the same dizzy height from the white, brawling stream below. For twenty-two miles we followed this dangerous trail. Then, with feelings of joy, we emerged upon the Hualapais Desert. We were three days in crossing this. We had plenty of water and provisions, but the men's shoes had given out and they suffered greatly from the hot sand and the cacti. On the third day we reached the Union Pacific Railroad and were taken up. We then proceeded to the Needles and completed the trip as originally contemplated without incident. We found that the river could not be navigated advantageously by any vessel drawing more than two or three feet of water without the expenditure of an immense sum of money."

The Under-running Trolley Patent.

Judge Townsend, of the United States Circuit Court at New Haven, Conn., on the 7th inst., rendered a decision in the suit of the Thomson-Houston Electric Company vs. the Winchester Avenue Railroad Company, declaring one of the Van Depoele under-running trolley patents in suit to be invalid and sustaining the other. These patents are controlled by the General Electric Company.

The patents upon which suit was brought are Nos. 495,383 and 495,443, both bearing date of April 11, 1893. The broad character of the patent No. 495,443 is illustrated by the 6th claim, which is as follows:

6. In an electric railway, the combination with a suitable track and a supply conductor suspended above the track of a car provided with a swinging arm carrying a contact device in its outer extremity and means for imparting upward pressure to the outer portion of the arm and contact, to hold the latter in continuous working relation with the under side of the supply conductor, substantially as described.

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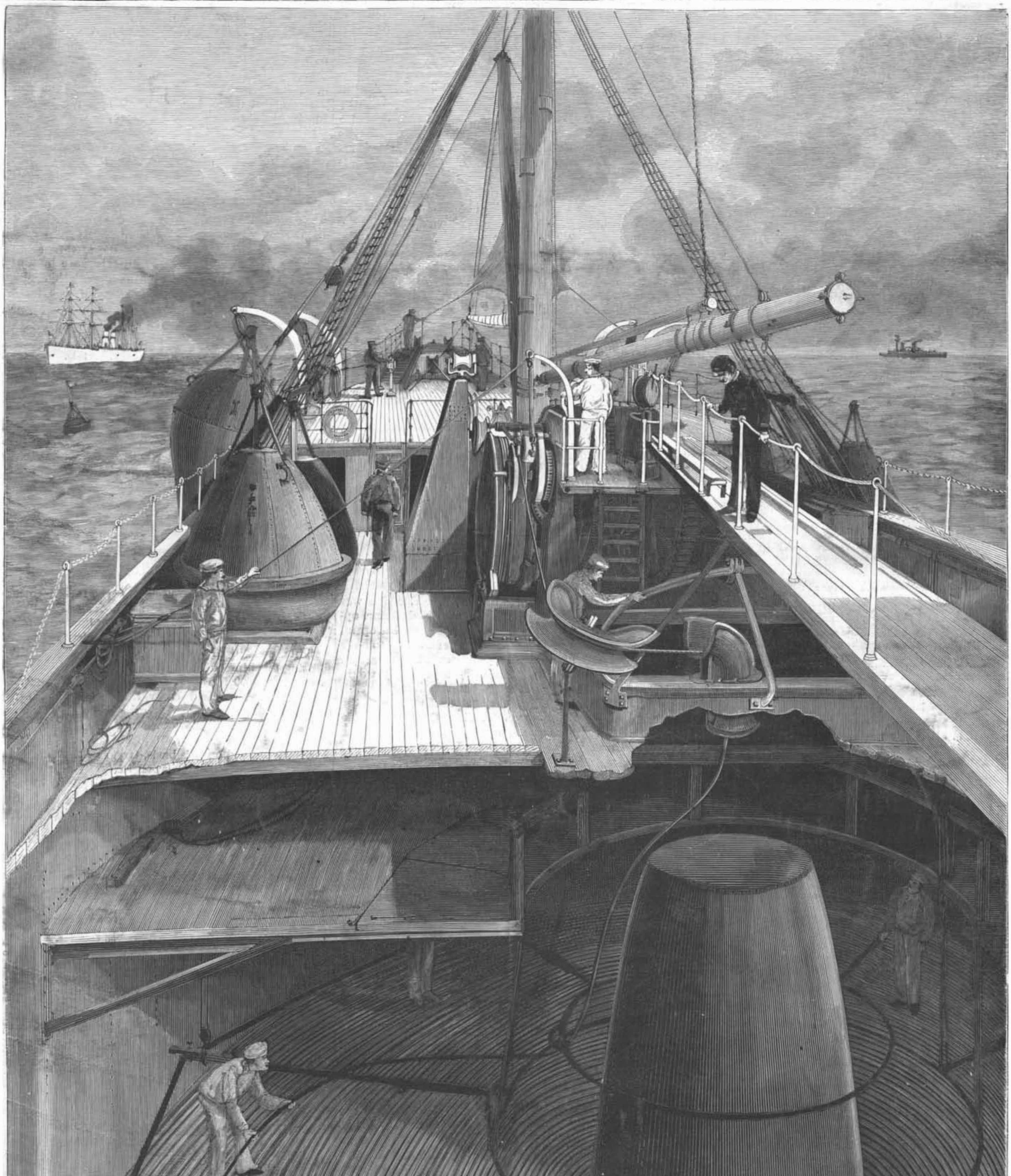

THE COMMERCIAL CABLE CO.S REPAIRING STEAMER MACKAY-BENNETT—DECK, SHOWING ONE OF THE CABLE TANKS.—[See p. 409.]