

HOW SUBMARINE CABLES ARE DESTROYED.

It might reasonably be supposed that after a well-protected telegraph cable once reaches its place upon the ocean bed it would not be liable to very many causes of injury beyond the natural deterioration of its protecting envelope. But that such is not the case will be seen from the following facts, for which, with the accompanying illustrations, we are indebted to *La Nature*:

In northern latitudes cables are frequently ruptured by icebergs or floes. The former often draw several hundred feet of water, and where the sea is shallow come in contact with and so break the cable. Another cause of rupture is sharp rocks on the ocean bottom, against the edges of which the cable chafes until the outer envelope and layer after layer of the protecting material are worn through. Earth contact of the interior conducting wires then usually occurs, and the cable no longer transmits signals. Other natural causes of destruction are coral banks, earthquakes, submarine currents, and the elevated temperature of tropical waters.

Numerous instances have occurred where cables have been damaged by fish, a notable example happening in the cable between Brazil and Portugal, and the coasting cables which run along the eastern shore of the South American continent. On these lines the cable is almost chronically attacked by sawfish. Pieces of the bone of the saw of this animal have repeatedly been found imbedded in the coverings so deeply that the interior conducting wires themselves are injured. Fig. 3 shows a section of the cable with the bone found inclosed therein. No less than five times have the cables above named been injured by sawfish attacks. It is supposed that the fish runs into the cable, and as its temper is none of the best, it becomes enraged and vents its anger on the obstruction by blows of its saw. An even more curious instance occurred not long ago in the cable across the Persian Gulf, which suddenly became inoperative. On examination it was found that a large whale had become entangled in the line. The animal was covered with parasites, and it is supposed that it attempted to use the cable as a rubbing post in order to rid itself of its annoying appendages. One stroke of its powerful tail probably broke the line, and then in rolling over and over the whale wrapped itself so tightly in the coil that it committed suicide by strangulation.

Among the worst enemies of submarine cables are three insects. The *teredo navalis* and its congener the *xylophaga*, which Huxley first discovered in 1860 in one of the cables of the Levant, enter the hemp covering and penetrate to the gutta percha, wherever the interstices of the wires of the exterior envelope afford them an opening. The *teredo* is a worm that constructs a tube for itself out of its calcareous secretion. The *xylophaga* is a bivalve, which does not penetrate deeply into the gutta percha, but simply attaches one of its shells thereto, chafing the material so that considerable losses of current occur. The *teredo norvegica*, Fig. 1, is quite a large worm, having two shells on its anterior part, with which it can cut through the hardest wood. It belongs to the genus of acephalous mollusks, and no less than 24 different species of it have been recognized.

The *limnoria lignorum*, Fig. 2, is a small crustacean about the size of an ant. It penetrates into the interstices of the wire envelope of the cable and makes its way to the core. The cables in the Persian Gulf and Indian Ocean and also on the Irish coast have been seriously damaged by the ravages of this creature.

NEW APPARATUS FOR THE COMPRESSION OF HYDROGEN AND OXYGEN.

M. Bouvet has recently addressed a note to the French Academy of Sciences, calling attention to the new apparatus illustrated herewith, by means of which he is enabled to subject oxygen and hydrogen to very high pressures. A is a voltmeter formed of a block of glass in which are hollowed two cavities, C D, the cubical contents of one exactly double that of the other. The voltmeter is inclosed in a strong metal case, B, and the orifice through which the former is introduced is closed by the screw, F. A special opening, G, allows of the introduction of the two wires which communicate with the electrodes in the cavities, C D. The two channels, H, closed by screws, allow the air to be driven out of the apparatus before the beginning of the experiment. At J is a tube in communication with a reservoir, K: The latter is closed by a strong screw, M, which serves as a piston to cause an augmentation of pressure in the cavities, C D, during the experiment.

Supposing that these cavities to the height *a b*, will contain, the one, one quart, the other, two quarts, and that the apparatus is filled with slightly acidulated water from which the air has been expelled. Then, the apparatus being closed, the current from a battery is sent into the voltmeter, the positive electrode being in cavity C and the negative one in D. As the water decomposes, it may be supposed

that its level in the cavities falls to *b*, hence all the water contained in said cavities may be considered as transformed into gas; and this, therefore, must be submitted to a considerable pressure which it is easy to calculate. The two cavities contain 8.7 cubic feet of water. Water being

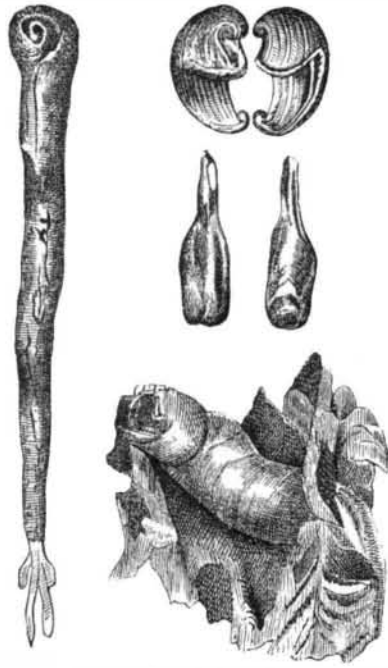


Fig. 1.—THE TEREDO.

taken as incompressible, it is therefore here replaced by 8.7 cubic feet of gas. Knowing the weight of hydrogen and oxygen, it is not difficult to find that the volumes of gas, produced as described, are submitted to a pressure of 1,854.5 atmospheres or 27,817.5 lbs. Now

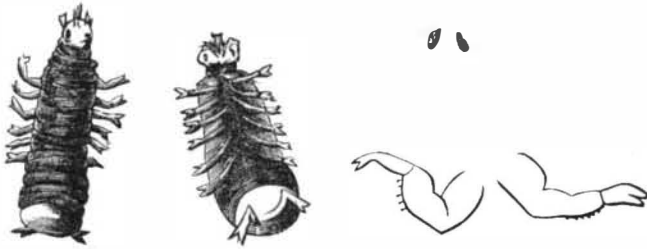


Fig. 2.—LIMNORIA LIGNORUM.

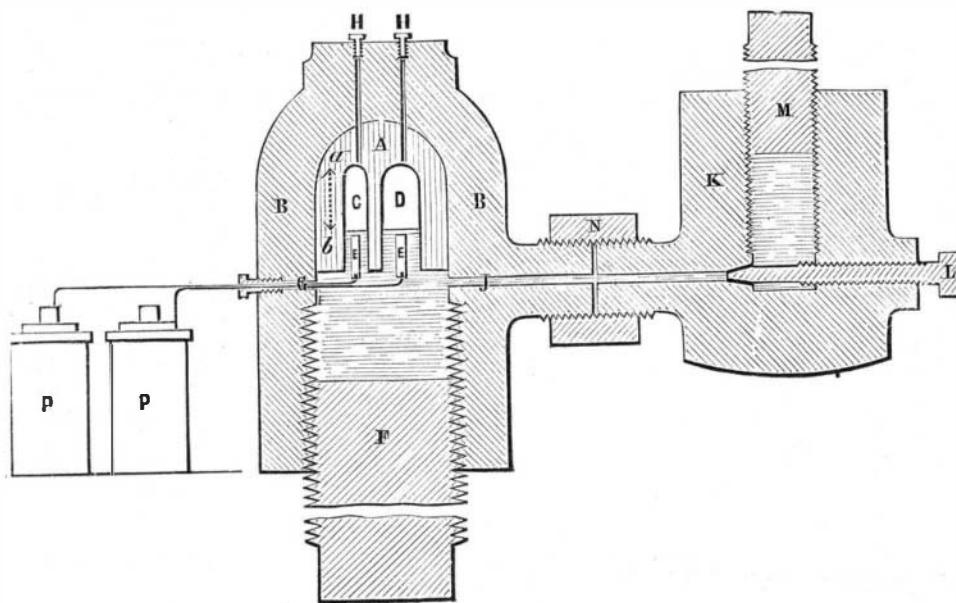
if the piston screw be operated in the reservoir, K, to drive water into the cavities, if the gas in the latter be thus reduced in volume in the proportion of 1 to 1/4, it follows that the pressure thereon is doubled and becomes 3,709 atmospheres or 55,635 lbs. The current can again be established, the water again caused to descend to the level, *b*, and the



Fig. 3.—BONE IN TELEGRAPH CABLE.

operation as above described repeated; so that ultimately pressures can be reached only limited by the resistance of the apparatus.

JOSEPH S. LYNN, the aeronaut who on one of his ascents in England reached an altitude of 32,000 feet, recently made an ascent of 7,000 feet near Caranjah, in India. He is considering the feasibility of taking observations from a great height for the discovery of the northwest passage.



NEW APPARATUS FOR THE COMPRESSION OF HYDROGEN AND OXYGEN.

New Agricultural Inventions.

Mr. Thomas G. Bass, of Pittsburg, Texas, has devised a new Single Tree for Plows, etc., which is made wholly of wood. The construction, which is very simple, obviates vertical play and prevents the traces either from coming off or from becoming loose and falling under the horses' feet.

A new Corn Marker, patented by Mr. Michael Akerman, of Steamboat Rock, Iowa, embodies a self-dropper and marker to operate the dropping slide and to mark the ground opposite the hills. The construction embodies numerous new devices, and is ingenious and effective.

Mr. Nathan L. King, of Catskill, N. Y., is the inventor of a novel Shearing Instrument for clipping horses, removing wool from sheep, etc. The outward motion of a follower carries a plate forward toward teeth, and curved blades are caused to swing on pivots, so that their cutting edges follow those of the plate, thus making a shearing stroke. The teeth prevent the wool or hair from sliding between the edges of the instrument.

An improved Cultivator, patented by Messrs. John S. and Chas. A. Johnston, of Rockford, Ill., is so constructed that the plows may be raised from the ground by the backward movement of the driver, and that it may be easily guided and controlled. The construction is simple and ingenious.

A new Rotary Cultivator, patented by Messrs. Chas. C. Breeden, and O. T. Wheeler, of Bedford, Ky., is so constructed as to stir the ground thoroughly while leaving its surface smooth. It is also of light draft, and it may be adjusted to work at any desired distance from the plants.

Messrs. Philander W. and Hiram G. Briggs, of Howell, Mich., have patented a new Grain Drill, which enables grain to be put in the ground to any depth, prevents its being covered too deeply when it may be advisable to run the drills zigzag, and stops loose stones from falling upon the seed.

A new Gate has been patented by Mr. Sanford W. Erwin, of Fayette county, Ind., which may be conveniently opened by hand or by the wheels of a passing vehicle. The construction is novel and very ingenious.

An improved Oatmeal Cutter, invented by Mr. Herbert Z. Cole, of Cortland, Ohio, consists in the combination with a cutting cylinder, formed of a series of toothed circular disks, of a stationary cutting plate provided with a series of notches corresponding in number to the circular cutters. The latter enter the said notches to effect the cutting of the oats at the point of contact with the said plate.

Mr. David E. Lupold, of Driftwood, Pa., has devised a portable fence which has panels made of rails with tapering ends and extending only to the center of the posts. Said panels alternate with other panels in which the rails are extended to half the width of the posts, so as to fit on the posts of the first panels. The posts are driven into the ground and the panels are connected by wires or ropes.

Mr. Robert Cowden, of New Richmond, Pa., has invented a new Hay and Grain Unloader which embodies several ingenious devices whereby the hay and grain may be unloaded quickly and conveniently and without being scattered or wasted.

In order to protect the udder of a cow from the dirt of a stable, and to keep it warm during cold weather, so as to increase the free flow of milk, Mr. Marshall R. Dowlin, of North Adams, Mass., has invented a Protector, which consists of a pouch made of leather and provided with straps so that it may be secured to the udder.

An improved Cotton Chopper has been patented by Mr. Sampson N. Camp, of Forksville, La. In the frame between the plows is a rimless wheel, to the spokes of which are attached cups, which cover the plants that are to be left for a stand, and protect them from the soil thrown by the plows.

Mr. James Higgins, of Westfield, N. J., has also devised a new Cultivator. In this machine, by pressing a rod and operating a lever the plows may be raised from the ground or forced down to enter more deeply, as desired. The middle beam, or any desired number of the beams, may be detached as circumstances may require.

A new Reciprocating Churn, devised by Mr. Thos. J. Murphy, of Busti, Iowa, has two dashers connected to an oscillating arm on each side of its fulcrum or pivot. The churn body is divided into two compartments by a vertical partition which has slots formed through it to allow the milk to pass freely from one chamber to the other. Many other ingenious devices are added, improving the general efficiency of the machine.

A new Cultivator, devised by Mr. Reuben H. Slifer, of Holden, Mo., is so constructed that the whiffletrees cannot drop to the ground to injure or break the plants; that it may be adjusted to work to any depth; that the plow beams may have sufficient play to be properly guided, or be raised out of contact with the ground in moving the machine from place to place. It is well suited for farm use.