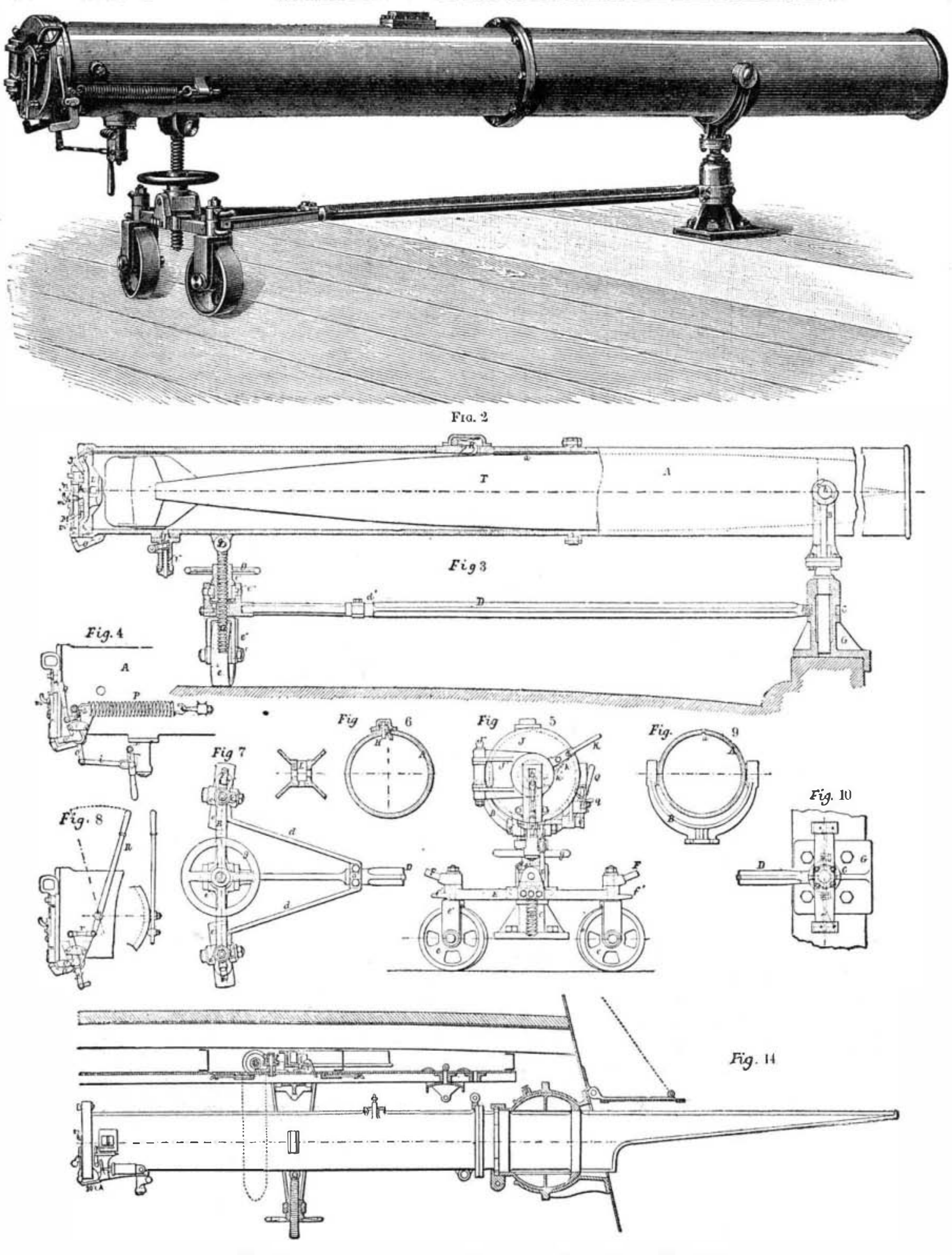
THE CANET SYSTEM OF FIRING TORPEDOES.

The efficient method of firing torpedoes, either from large vessels or from torpedo boats, is too important a part of modern naval armament to have been overlooked by the Forges et Chantiers de la Mediterranée. This class of ordnance—for it can be fairly classified under the general head of artillery—is chiefly made at the company's works at Le Havre and La Seyne, from the designs of M. Canet. The problem to be solved is not an easy one, as important causes for disturbing the direction to be given to the torpedo have to be reckoned with and overcome. Once free from such influences, the motive power of the torpedo carries it forward with more or less accuracy to the object aimed at. The causes of deviation are of course more serious on large vessels than in torpedo boats, because in the latter the most favorable position can be chosen for discharging the missile, and the surrounding body of water affected by the boat moving rapidly has not so great a mass as that set in motion by a large ship traveling at a high speed. If the torpedo be discharged within this zone of disturbing influence, it is evident that its course will be diverted to a greater or less extent. Torpedoes fired from a moving ship at an angle to its line of advance will of necessity participate in the movement, which introduces another cause of error. The first difficulty can be overcome by projecting the torpedo beyond the belt of troubled water surrounding the ship; when it is not possible to discharge it parallel to the axis of the boat, the general practice is to allow the torpedo to fall upon the water either flat or to enter it at a slight angle, so that it may at once penetrate under the surface waves and so escape any deviating influence they may exert. Both systems are employed in the French navy, and the method is well illustrated by our engraving, which is taken from an instantaneous photograph of a torpedo being discharged from the French war ship Condor, and reproduced in a recent number of *Engineering*, to which we are indebted for our illustrations and the following particulars:

Fig. 2 is a perspective view of the complete gun ready for service; Fig. 3 is a longitudinal section of the breech end of the tube and the back part of carriage, and also a side view of fore part of tube and longitudinal section of front part of carriage; Fig. 5 is a back elevation of the breech end of tube and carriage; Fig. 7 is a plan of the fore part of carriage; Fig. 10 is a plan of back part of carriage; Fig. 4 is a side elevation of firing mechanism; Fig. 8 shows another combination of discharging mechanism; Fig. 9 is a cross section of tube at the trunnion of the fore carriage; Fig. 6 is a cross section of tube showing the starting catch H; Fig. 11 is a section through M N of the powder chamber.

The discharging mechanism consists of a system of



TORPEDO-FIRING APPARATUS, CANET SYSTEM.

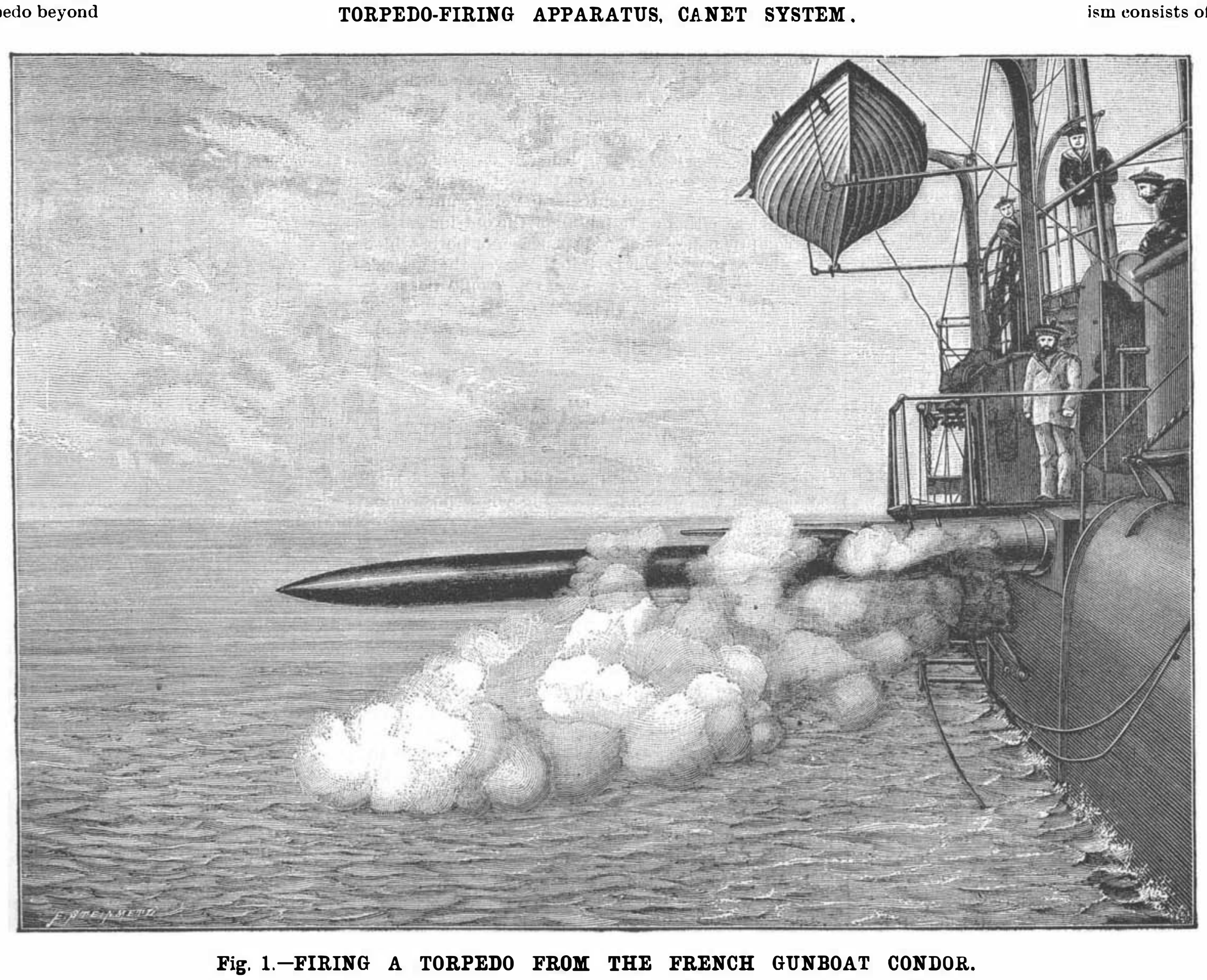


Fig. 1.—FIRING A TORPEDO FROM THE FRENCH GUNBOAT CONDOR.

levers and a spiral spring P that is tightened by acting on the crank lever O'' by means of a hand spike that fits one of the extremities. This lever O^2 is kept cocked by the catch lever Q, the safety pin *q* preventing any sudden release of the mechanism. On the same axis on which is keyed the crank lever O^2 are fixed two other levers; one the lever O^1 that releases the torpedo inside the tube, and the other the lever O that works the firing mechanism.

The actual working of the whole arrangement for launching is as follows:

We will suppose that a torpedo has just been discharged. The gunner, by means of a hand spike fixed at the end of the crank lever O'', Fig. 4, tightens the spring P; he also puts in the safety pin *q*, and then, to open the breech, he catches hold of the small hand lever K, and gives one-sixth of a turn to the screw that closes the breech. The threads of this screw are partly cut away like those of an ordinary breech block, then, on pulling the lever K toward him, the whole of the breech swings round the hinge J'', Fig. 4, and the gun is ready to receive a torpedo, which is introduced carefully into the tube, while the stop bolt I, Figs. 3 and 4, inside the tube, is lowered by means of the hand lever *i* until the torpedo is well home; when the man lets go the hand lever *i*, the spring i'' is liberated, and the bolt I maintains the torpedo inside the tube.

The charge of gunpowder or any other explosive is then put into the powder chamber or cup L; this chamber is pierced with holes radiating from its center, so that the gases rush against the inner surface of the tube, thus preventing any damage to the torpedo.

The breech is closed by swinging it round the hinge J'' till it is home, then by the handle K the screw of the breech is turned one-sixth round, care being taken to release the catch K' in pressing with the thumb on the spring.

To prevent the escape of gases the breech presses a ring of leather or asbestos let into the internal face of the breech. In order to introduce a new fuse, the hammer *m*, Figs. 3 and 4, must be pulled out and pushed down the inclined planes, and the fuse is then put in. The gun so loaded is ready for a new discharge. If the breech is not well closed, the end of the lever O will not enter into the slot of the hammer, and the fuse could not be exploded. This mechanism is therefore also a safety arrangement. To fire, the gunner pulls out the safety pin *q*, and by exerting a slight effort toward him with the handle of the catch lever Q, he releases the spiral spring P. The rotary motion imparted to the axis that carries the three-crank levers before described removes first the stop bolt I, inside the tube, and immediately afterward explodes the fuse. The exploding of the fuse is produced as follows: On the slide piece *m'*, Fig. 5, is fixed the hammer *m*, which carries on each side a stud. The slide piece is pushed upward by the lever *o*. This tightens the spring m'', and when the studs are at the summit of the inclined planes the hammer is released, and strikes the fuse, which explodes. Inside the tube, and fixed at a proper distance, is the usual spring catch H, Fig. 6, which acts on the starting valve of the engines inside the torpedo itself as it is shot from the tube. The above arrangement has been described for a percussion fuse. In some cases an electric fuse is used, and it is by the sliding up of the piece *m* that the circuit is closed and the charge exploded. The construction of the carriage is as follows:

The front part of the carriage consists of a crosshead B, bearing the trunnions B, Figs. 3 to 9; this crosshead turns round on a pivot resting on a strong bracket C, so that it can be fixed for firing either at the fore or aft part of the ship or broadside.

The hind part or breech end of the carriage consists of a V-shaped frame E *d d*, Figs. 3 to 7, which rests on two rollers *e*, that may turn when required in any vertical position. The front beam E of this frame has a hole in its center to let the elevating screw G pass through it.

This screw G is fastened to a lug under the tube, and it is worked up and down by the nut e'', cast with the handwheel *g*. The nut itself turns in two half bearings e'', provided with horizontal trunnions working in the front beam E.

The front and rear parts of the carriage are kept together by means of the connecting rod D. This rod at its front end turns horizontally round the bracket C, and is attached to it by means of the collar *c*. At its rear end the rod is attached to the V-shaped frame by means of the collar d^2, and the extreme end of the connecting rod turns in a socket provided in the beam E.

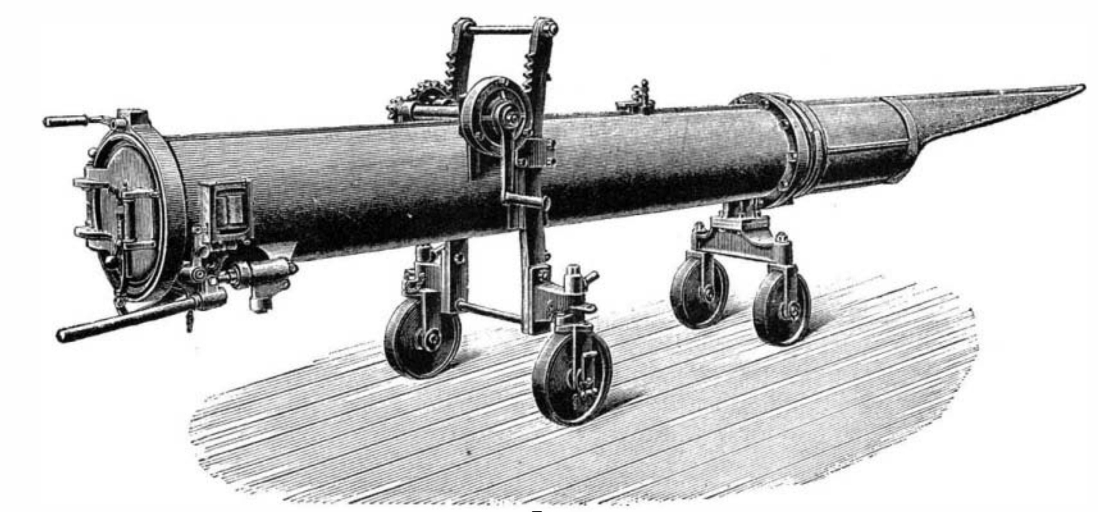


FIG. 11.

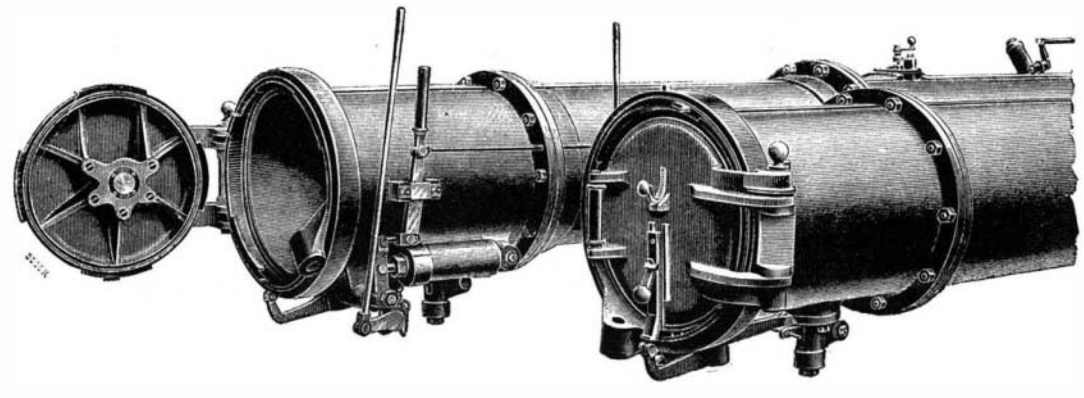


FIG. 12.

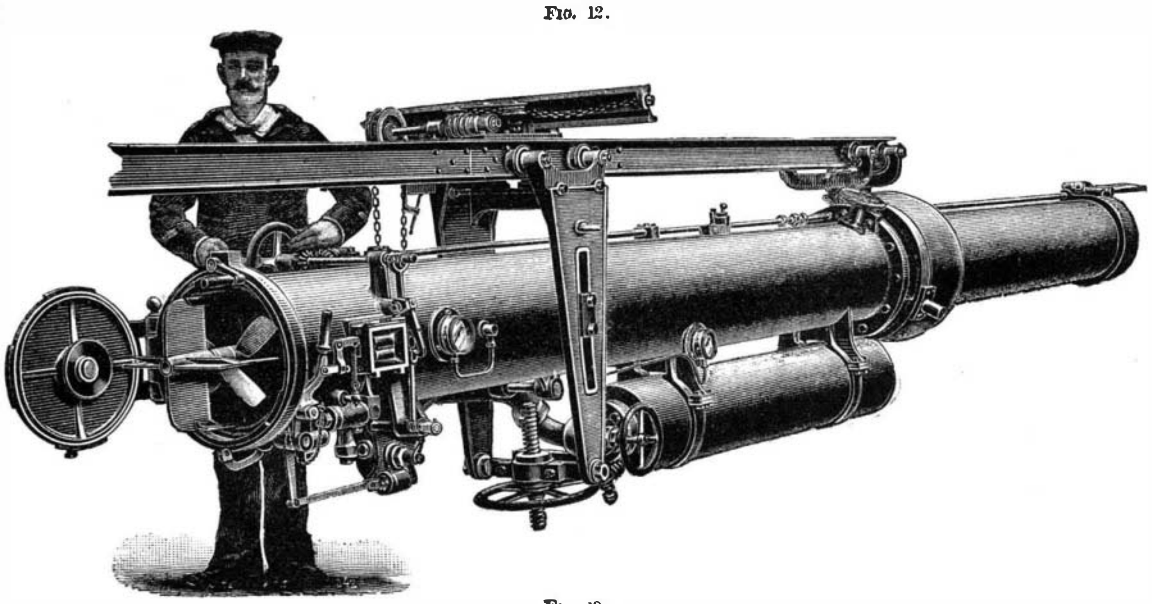


FIG. 13.

TORPEDO-FIRING APPARATUS, CANET SYSTEM.

This mode of connecting the rod to the rear part of the carriage allows the V frame and rollers to follow the slope of the deck without interfering with the laying of the tube.

Figs. 11 to 14 illustrate the latest types of the Canet torpedo-firing tubes; Figs. 11 and 14 are elevations of that form of tube designed with the special object of forcing the projected missile to fall flat on the surface of the water, instead of at an angle. The firing tube, which is of light section and made of either bronze or steel, is prolonged above with a spoon-shaped extension. A T-shaped groove is made in the top of the bore, for the greater part of its length, and in this groove slides a projection formed in the upper side of the torpedo. The groove is made of such a length that when the projection is free from it, the torpedo is guided only by the extension of the tube, and is in a horizontal position; it is then free to fall flat on the water.

A PATENT has been taken out in France for an electric furnace for the rapid incineration of human remains.

Illusion of Woodpeckers and Bears.

Mr. J. D. Pasteur, Inspector of the Post and Telegraph Service at Java, communicated to Dr. F. A. Jentink, in July last, the following very curious and interesting facts about woodpeckers, who, under the illusion that the buzzing sound so apparent on applying the ear to telegraph poles is caused by the vigorous efforts of gnawing or boring insects, make large holes in the timber, on a hopeless chase after such. He incloses a piece of telegraph pole made of teak wood, with two woodpeckers (*Picus analis*), from the Kediri Residency, Java. The wood, which is of iron hardness, is perforated with rather large holes near the place where the insulators had been attached. Although Inspector Pasteur passes thousands of telegraph poles under view each year, only in a very few cases has he found any damage done to them by woodpeckers, and, until now, the damage done has always been on the living kapok trees (*Eriodendron anfractuosum*), which are used in Java for this purpose. The piece of telegraph pole now sent is the only instance known to him of damage being done to the sound and very hard poles of the teak (*Tectona grandis*). Besides the above mentioned woodpecker, from time to time the rare little *Picus moluccensis* was seen also among the others at work. Mr. Pasteur remarks on the great rarity of such a phenomenon; in the Paris electrical exhibition of 1881 there was exhibited, as a great curiosity, a telegraph pole sent from Norway, which was perforated by a hole of 7 centimeters in diameter. The Norwegian administration was for a long time uncertain to what cause to ascribe this damage done to poles which were otherwise quite sound, till a mere chance at last revealed woodpeckers at work. In Norway, too, another equally remarkable case of damage had been noted as done to telegraph poles by the large stones, which are heaped round their base to insure their stability in the ground, being removed and scattered, apparently without any reason. This, which was for a length of time inexplicable, was at last found to be the work of bears, who apparently mistook the sound in the timber for the buzzing of a swarm of bees. It is too much to expect of either bears or woodpeckers that they should be versed in the ways of modern science.—*Leyden Museum Notes.*

Foreign Honors to Professor Newcomb.

The Copley medal of the Royal Society, London, has been awarded to Professor Simon Newcomb, Superintendent of the American Ephemeris, Washington, D. C., for his contributions to gravitational astronomy. The medal was first given by the society in 1753, to Dr. Benjamin Franklin. The University of Tokio, Japan, also has presented Professor Newcomb with two fine, large bronze vases, finished specimens of Japanese art, in recognition of his aid in selecting a suitable person to construct a photo-heliograph for the University.

A present from Russia by order of the Czar is also tendered to Professor Newcomb on account of esteemed services rendered in procuring, for the government, the great 30 inch telescope, a few years ago mounted at Pulkowa. This gift is a large jasper vase on a marble base.

A GERMAN statistician says that there are 3,985 paper mills in the world, and that of the 1,904,000,000 pounds of paper turned out annually, half is used for printing, 600,000,000 pounds being required for newspapers alone, the consumption of which has risen by 200,000,000 pounds in the last decade. He alleges that on an average an Englishman uses annually 11½ pounds of paper, an American 10¼, a German 8, a Frenchman 7½, an Italian or an Austrian 3½, a Spaniard 1½, a Russian 1⅛, and a Mexican 2.