

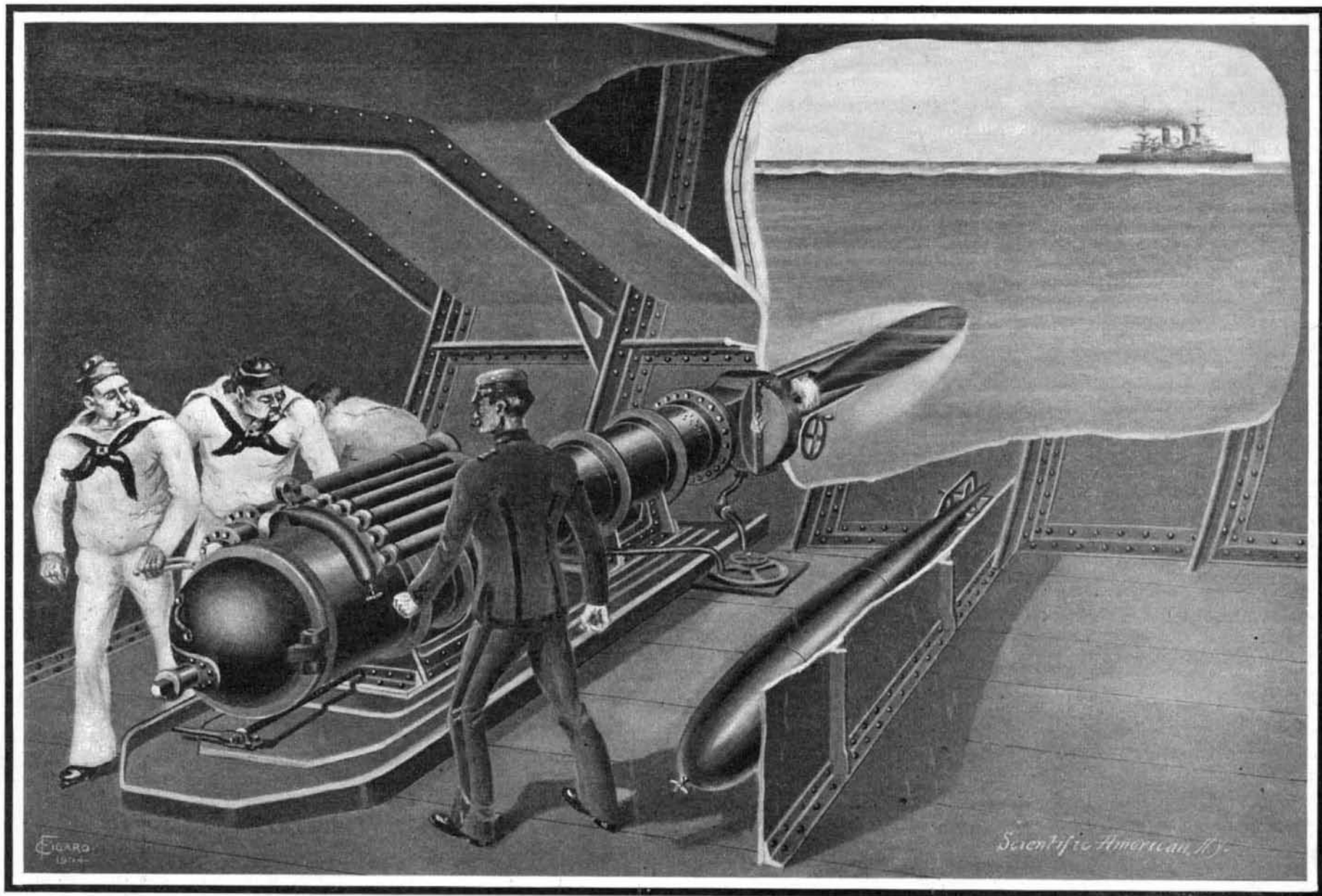
THE SUBMARINE TORPEDO TUBE.

Although there was quite an animated discussion recently in the Board of Construction of the United States navy as to the value of the submerged torpedo tube, in which some eminent naval authorities were strongly opposed to its use in our new battleships and cruisers, the consensus of opinion of the members of the Board was in favor of the tube; and orders were given to install it on many ships now under construction, which were not originally intended to carry the submerged tube. We think that the decision was a wise one, particularly in view of the fact that the other great naval powers are, without a single exception, building such tubes on their later ships. One point urged against the submerged tubes is that their equipment, and the provision of submerged torpedo rooms in which they can be installed and operated, make a serious inroad upon the available space below the protective deck. There is no denying that, as our drawing shows, the torpedo room does monopolize considerable space, extending, as in the present instance, entirely across the width of the ship. On the other hand, the moral and military value of the submerged tube is so great as to quite outweigh any such con-

ered by the torpedo. The center line of the tubes is arranged at right angles to the longitudinal axis of the ship. The tubes themselves are to all intents and purposes smooth-bore guns, of which the torpedoes are the projectiles. They are bolted securely to the floor, and their muzzles are bolted to a massive ring riveted into the plating and framing of the ship's side. The muzzles of the tubes, or the points where they open on the surrounding water, are closed by gates operated by hand-wheels, as shown in our drawing, the gate being normally closed, to prevent the entrance of water within the tube. When the tube is in action, a Whitehead torpedo, with its war-head, containing over 200 pounds of gun-cotton, is picked up from the rack by means of chain slings, suspended from overhead trolleys attached to the deck above, and is brought around on this trolley to the breech of the tube. The breech is provided with a breech-mechanism, consisting of an inner and an outer hinged cover. These are swung open, and the torpedo is thrust home into place and the breech mechanism is locked. The nest of tubes, which will be noticed lying along the breech of the gun tube, are compressed air reservoirs, one end of the nest connecting with the interior of the tube at the

is clear of the ship and fully immersed in the water.

The torpedo tube is operated in the torpedo room by three men and an officer. In most cases, the torpedo will be fired from the deck above; for it is manifest that the officer in the torpedo room cannot possibly sight the gun himself. In firing by this method, sights will be arranged on the upper deck in the same vertical plane as the axis of the torpedo, and parallel with the same. Since the torpedo tube is built rigidly into the structure of the ship, it is evident that the tube must be traversed by steering the ship itself, until the tube is brought to bear in the desired direction. When the ship's course has been altered sufficiently to bring the enemy's ship in line, the proper corrections for respective speeds of the ship, etc., having been made, the officer on deck having received word by telephone from the torpedo room that the torpedo is loaded and ready for firing, closes an electrical circuit, and the torpedo is fired. The torpedo is provided with automatic means for preserving it at the desired depth of about 10 feet, at which it is designed to travel; and for steering the little submarine, there is arranged within the torpedo a 3-inch gyroscope wheel, which is attached to a steering engine that acts directly upon



The tube opens through the side of the ship at a depth of about 10 feet below the surface. The torpedo room is situated immediately below the protective deck, the sloping side of which, and the waterline belt armor beyond, are shown broken away.

SUBMERGED TORPEDO ROOM OF A MODERN BATTLESHIP.

siderations of economy and space. Its moral effect will be to keep the enemy at a distance, even when the ship itself may have been so damaged by the enemy's fire as to tempt the enemy to run in and sink it by heavy gun fire at close range or by using the ram, while the ship itself, during the varied maneuvers and favorable opportunities in sea fight, may find itself in a position where it can use its submerged tube with a good probability of hitting the enemy.

The torpedo tube shown in our engraving is of the type that is used on the battleship "Maine." The torpedo room is located in the forward part of the ship, below the protective deck, and its floor is therefore about 10 or 12 feet below the water-line. It is entirely shut off from the rest of the ship by two transverse watertight bulkheads. Two torpedo discharge tubes are mounted within the compartment, the one firing through the port side, and the other, as shown in our engraving, to starboard. The two tubes are not arranged centrally within the compartment, but are staggered, one being near the aft bulkhead, and the other near the forward bulkhead. Carried in racks attached to the aft bulkhead are a half dozen Whitehead torpedoes, three for each tube. In the drawing this bulkhead is broken away to show a torpedo in place; the rack that holds it is not visible, being cov-

breech, and at the other end with a small firing-chamber containing a charge of gun-powder. The torpedo is discharged as a projectile by firing this charge of powder, and the object of the nest of tubes is to provide a pneumatic cushion between the powder gases and the base or rear half of the torpedo, the purpose being to insure that the acceleration of the torpedo shall be gradual, and that it shall not receive any heavy shock from the explosion of the powder, the powder gases acting to compress the air in the tubes, and the air being driven from the tubes against the torpedo.

Before the torpedo is fired, however, the gate or valve at the muzzle of the tube is, of course, opened, and at the instant of firing, a half-round shield or mouthpiece is automatically carried into the water on the forward side of the axis of the torpedo tube. This serves to stop the rush of water past the mouth of the tube, and enables the torpedo as it is fired to get clear of the side of the ship's hull before it strikes the water. As the torpedo passes out of the tube, a latch on the former is released by engaging a suitable projection on the tube, and this latch opens a connection between the compressed-air chamber and the engines of the torpedo, thereby insuring that the engines are running and ready to assist the flight of the torpedo, by the time it

the rudders. By setting the gyroscope on the exact course required, this wonderful little device takes charge of the steering, and will bring the torpedo, even should it be momentarily deflected, back to the true course, and keep it there as long as the torpedo is running.

A Huge Cableway.

A huge cableway, which when completed will be the longest in the world, is to be constructed on the Argentine side of the Andes Mountains by the engineering firm of Adolf Bleichert & Co., of Leipsic (Germany). This cableway is to extend from the Chilecito station of the Argentine Northern Railroad for a total distance of 32 miles. Its termination at this end will be 14,933 feet above sea level, and the engine station that will be erected at this point of the cableway will be the highest in the world. No less than 87 miles of rope will be required for the cableway. The project will necessitate many remarkable engineering difficulties being surmounted, since at one or two points the cableway will have to span gorges 2,800 feet wide by 650 feet deep. The cableway is to have a carrying capacity of 44 tons of ore per hour, and cars each containing 1,100 pounds of ore are to be dispatched at intervals of 45 seconds.