That we have no reason to suspect trickery has already been said. We must also seek some means of communication of which the guides were unconscious. Mr. Bishop claims that he received his impressions by direct mind-reading, or, as it is now often called, telepathy ; and a certain number of persons appeared inclined to accept that explanation. But when Mr. Bishop's arguments are examined, they vanish : and in his replies in the newspapers to his critics he has insidiously and assiduously avoided discussion of any of the real objections to his assertion that his feats are done by genuine mind-reading ; so that we are compelled to think that his real purpose is to make his exhibitions assume a marvellous character in the mind of the public, or else that he really believes in his assertion, which, may we be pardoned for saying frankly, implies a notable ignorance of physiology and psychology, — a degree of ignorance not rare in itself, though rarely coupled with so much audacity of opinion.

The only explanation which we can consider tenable is the simple one of muscle-reading, already advanced by Professor Preyer. As already stated, Mr. Bishop was in every case in contact with his guide, and his feat was to make the motion which the guide knew he ought to make. In accordance with Preyer's view, we think that slight pressures of the guide's hand were exerted, that these were perceived by Mr. Bishop, and sufficed for his guidance. That the explanation is ample is apparently not questioned by any of those who have followed the recent discussions upon muscle-reading. It is now very properly held by, we believe, all qualified judges, that, when there is contact between the performer and the guide, there is no adequate reason to assume the occurrence of true mind-reading. Mr. Bishop, however, thinks the contrary, and says the impressions on his mind are telepathic, and not sensory, in origin. By a common mental flaw, Mr. Bishop, at least in our judgment, assumes a remote and improbable cause, instead of a near and probable one. To our mind it would be a like reasoning which said that love exerts a powerful attraction : stones are not drawn toward the earth by gravity, but by the love they have for the earth.

We may conclude by saying that we consider Mr. Bishop an exceptionally good muscle-reader, and regret that the mysteries with which he seeks to envelop his exhibitions give an effect of charlatanism, entirely distasteful to an honorable lover of scientific truth. We have therefore expressed ourselves more unreservedly than would have been fitting in the discussion of a subject concerning which an honest divergence of opinion were possible among scientific men.

A SUBMARINE VOYAGE.

THE submarine torpedo-boat shown in the accompanying illustration has made frequent trial trips, during the past few months, in the Hudson River, off the foot of 86th Street, this city ; and the degree of success attained has been highly gratifying to her owners, the Submarine monitor company. A brief description and illustration of the boat were given in *Science* of Aug. 27, but several changes have been made in details of her construction and equipment since that date, so that she now presents a somewhat different appearance. A pair of horizontal rudders has been attached at the bow, so that the boat may be submerged ' on an even keel,' that is, in a horizontal position, instead of at an angle, as formerly. The boat can be submerged by means of the rudders only when she is in rapid motion, rising immediately to the surface if the engine stops, or if the rudders are changed from an inclined position, as in the engraving, to a horizontal position. When not in motion, the boat may be submerged or raised to the surface by taking in or forcing out water-ballast.

A fin, or vertical projection, has been attached to the upper part of the boat, amidships, extending ' fore and aft,' so as to guard the manhole and conning-dome or pilot-house from collision with the keel of a ship when passing under its bottom. A depression in the fin, between the manhole and the dome, is intended to afford a sort of resting or holding place for the boat when under a ship's keel while releasing torpedoes. A pair of sleeves or gloves of india-rubber project from the boat abaft the dome, one of which is shown in the picture. By inserting his arm in one of these sleeves, the captain of the boat can release the torpedoes at the proper moment, the torpedoes being attached by tripping devices to the outside of the boat.

The proposed method of using the boat in actual warfare is as follows : she will be submerged by means of the rudders or water-ballast, or both. When at the proper depth, she will approach the vessel to be destroyed, and, as she passes beneath it, two torpedoes will be released, each attached to one end of a rope. The torpedoes will be lightened by cork or an equivalent, so that they will rest against the bottom of the vessel, one on each side of the keel. The boat will then be run ahead a safe distance, and the torpedoes exploded by electricity through wires leading from the boat, There has been no torpedo practice yet with the Peacemaker, as the new boat is called, but the intention of her owners is to make some experiments in that direction soon.

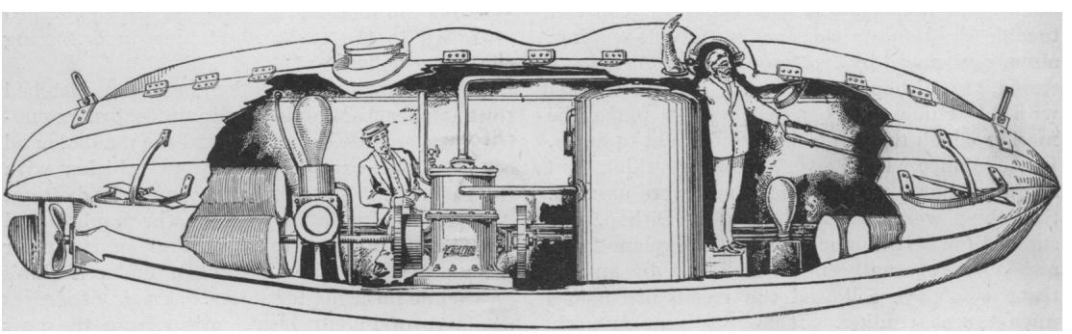
In the illustration the side of the boat is broken

away to show the interior. In the bow are two cylindrical water-tanks, above which are two steering-levers, within easy reaching distance of the captain. There is also a small steam-pump for filling or emptying the tanks. The captain stands with his eyes on a level with the glazed apertures in the conning-dome, whence he has a view all around the horizon while above the surface. When submerged, he shapes his course by a compass. Near the middle of the boat is the steam-boiler, abaft of which is the engine. In the stern are three cylindrical water-tanks similar to those in the bow, and for the same purpose. A large steam-pump stands just forward of the tanks. Several compressed-air pipes, each six inches in diameter, extend along the sides of the boat, near the bottom.

When the boat was first built, electricity was tried as a motive power. The storage-batteries and electric motor, being found inadequate, were removed, and a Honigmann fireless boiler and a fourteen-horse-power steam-engine substituted. With these it is claimed that eight knots an hour for several hours may be maintained with one charge of caustic soda. The speed and steam-endurance depend, of course, upon the capacity of the boiler and the efficiency of the machinery.

The propulsion of the boat by steam power for any great length of time while submerged would not have been possible before Honigmann's invention, a few years ago, of the fireless boiler which bears his name. This invention is based upon the discovery that a solution of caustic soda liberates heat while absorbing steam, which heat may be utilized for the production of fresh steam. The Honigmann boiler, as used on the Peacemaker, is double, the inner part containing water and steam, and the outer surrounding vessel containing a saturated solution of caustic soda heated to within a few degrees of the boiling-point. The steam, after doing its work in the engine, is exhausted into the solution, by which it is absorbed, the process developing heat, which produces more steam in the boiler. This is continued until the solution will absorb no more steam, when the surplus moisture must be driven off before the operation can be repeated.

At a recent trial of the boat, a representative of *Science* was permitted to witness the operation of charging the boiler, and to become a passenger in the boat during her submarine voyage. Water, heated under pressure to above the boiling-point, was pumped from a boiler on the deck of the torpedo-boat's tender to the inner compartment of the boat's boiler, and the outer compartment was filled with the soda solution previously heated to about 260° F. in a tank on the tender. The captain and engineer, accompanied by the *Science* reporter, descended into the boat through the manhole, which was then securely fastened on the inside. The captain took his place at the steering-levers, with his head in the dome, the engineer and reporter stationing themselves at the engine. Light was furnished by two-candle-power electric lamps. The steam-gauge showed eighty pounds pressure. All being in readiness, water was admitted to the ballast-tanks until the dead-lights in the dome — which had up to this time been about a foot above water — were almost even with the surface. The order was then given to go ahead, the engine was started, and the boat shot ahead, showing only her 'fin' above water. The captain guided her movements with ease, describing curves, going straight ahead, or forcing her below the surface, until the pressure-gauge which communicated with the water on the outside showed a depth of forty feet. The steam-gauge showed a steady increase in pressure, from 80 pounds at the start, to 120 when the boat ran alongside the tender a half-hour later. The back-pressure gauge, which was connected with the soda-solution compartment of the boiler,



THE PEACEMAKER.

showed an increase in the same time from 0 to 5 pounds. During this half-hour the air in the boat seemed to be reasonably pure, the heat was not as great as that in the engine-room of an ordinary steam-vessel, and there appeared to be no reason why such a voyage could not be continued for several hours without inconvenience to those on board.

NEW JERSEY SANITARY ASSOCIATION.

THE New Jersey sanitary association held its twelfth annual meeting at Trenton on the 19th and 20th of November. There were in attendance about one hundred members. The meeting was regarded by all as the most interesting and valuable the association has ever held.

We can give but brief mention of the proceedings. A paper on 'Disposal of house-sewage in districts not provided with sewers' was read by C. P. Bassett, C.E., of Newark. In the state of New Jersey there are only about a dozen of the towns which have any system of sewerage, and several of these are in a miserable condition. After denouncing the methods in vogue in places where no sewers exist and privy-vaults and cesspools abound, he referred to the advantages of the movable pail system in use in Birmingham, England, where 40,000 pails, representing 250,000 people, are collected weekly and carried to the dumping-station, where the contents are placed in a tank, treated with sulphuric acid, dried, and bagged for sale. The net cost is less than a cent a head annually. He next referred to the dry-earth system, but believed it could not secure wide popularity, the difficulties connected with the procurement of a proper supply of earth and the proper subsequent management of the waste being very great. The 'sub-irrigation' system was then described.

Shippen Wallace, Ph.D., of Burlington, read a paper on 'Preserved foods.' There are at the present time 800 factories in the United States engaged in the canning of foods. In these factories 500,000,000 cans are packed annually: of these, 50,000,000 are salmon, 72,000,000 tomatoes, and 25,000,000 corn. Although much has been said in the public press and elsewhere about the possible danger of poisoning from the contents of these cans, he believed there was no case on record of poisoning, either fatal or otherwise, where the materials were sound when packed. In discussing this paper, Professer Wilbur of Princeton college thought more attention should be paid to the cleanliness of the surroundings of canning-factories. He had examined one where the premises were in the most filthy condition. Dr. Davis said he had occasion to examine a large number of operatives in canning-factories, and had found sores on their arms, and had reason to believe this was not uncommon. For this reason he thought that the sanitary authorities should make periodical visitations and inspections in all canning-factories. Dr. Quimby of Jersey City thought this sanitary supervision could be advantageously exercised over bakeries, sugar-houses, and candy-manufactories. Dr. Amering, president of the Society of American analysts, called attention to the sophistication of foods and drugs. In Philadelphia it was a common practice to use gelatine in cream-puffs, ice-cream, and charlotte russe, and the putrefaction of this had caused sickness in the consumers.

Dr. D. Benjamin of Camden followed with a paper on 'The relation between drinking-water and typhoid-fever.' He regarded the two as so intimately connected as to make it hardly ever worth the while to think of any other source for typhoid-fever. Dr. Baldwin of New Brunswick believed that it might be contracted in other ways; and Dr. Raymond of Brooklyn thought that it not infrequently was spread through the sewers, the infected discharges having been thrown into the soil-pipes without disinfection, and, through defects in the plumbing, sewer-air carrying the germs of the disease found its way into other houses. He regarded the two most important adjuncts in the eradication of typhoid-fever from towns or cities where the water-supply was good, and indeed for all places, as being a thorough disinfection of the discharges, and the correcting of all defects in the waste-pipes and traps. The total abolition of pumps in the city of Brooklyn had not produced much effect on typhoid-fever in that city, where it has existed with more or less prevalence from the time of the earliest records.

Other papers read were, 'Trap ventilation and the fresh-air inlets thereto,' by J. C. Bayles of Orange; 'The physical laws of pipes and fixtures and their contents,' by C. F. Brackett of Princeton; 'The duties of local inspectors, how best performed, and details of method,' by Henry Mitchell of Asbury Park; 'The work of the present and the immediate future for New Jersey health boards,' by Ezra M. Hunt; 'The physiological side of education,' by James M. Green of Long Branch; 'Physical restraint and relaxation in the schoolroom,' by Charles Jacobur of New Brunswick; 'The work of the plumber and the modes of conveying and disposing of sewage,' by J. J. Powers of Brooklyn; 'The chief points in sanitary administration, and the requirements as to vital returns and the notification of disease,' by J. H. Raymond of Brooklyn; 'What boards of