DEEP SEA SOUNDING BY PIANOFORTE WIRE.

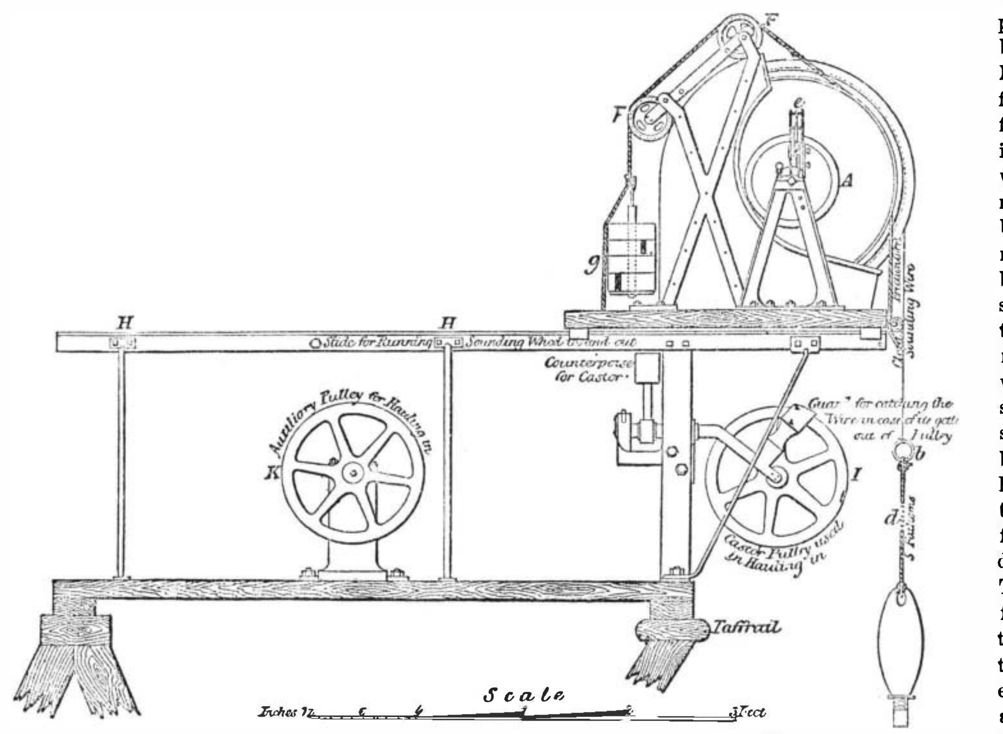
The use of piano wire for deep sea sounding was first successfully carried out by the celebrated physicist and electrician, Sir William Thomson, to whom belongs the merit of its introduction.

Since that first attempt, the pianoforte wire has done excellent service on submarine cable expeditions in various parts of the world; among other places, across the Atlantic, across the Pacific—where Captain Belknap, U.S N., found depths exceeding 500 fathoms—and in South American waters, from Cuba to the River Plate.

The sounding apparatus, as it is now finished and sent out by Mr. White, of Glasgow, Scotland, and as it is has been used by the steamer Faraday on the Direct United States (Messrs. Siemens') Cable expedition, is represented in the accompanying engraving, which we extract from *Engineering*. It consists of a large light drum, A, of galvanized sheet iron, on which the wire is carefully coiled. The free end of this wire terminates in a stout galvanized iron ring, *b*, and to this ring the sinker, *c*, is attached by a hemp line, *d*, several fathoms long. The interposition of the line between the wire and sinker prevents the wire from reaching the bottom, and the ring is heavy enough to keep the wire tight—thus kinking of the wire is avoided. The circumference of the drum is one fathom, and an indicator, *e*, is fixed to the axle to indicate the number of revolutions of the drum. A slight correction, due to the thickness of wire on the drum, has therefore only to be applied to the indicated number of turns in order to give the amount of wire paid out, or depth of the sounding in fathoms.

In order to stop the drum immediately on the sinker reaching the bottom, the brake, F F, is employed. It consists of a friction cord attached at one end to the framework of the apparatus, and passing over a secondary groove on the circumference of the drum, A, the other end being weighted at *g*. By means of this break the increased pull on the wire, due to the amount of it paid out, is to be more than counteracted, so that the drum will revolve by a pull on the wire due to something less than the weight of the sinker. For, in this case, when the sinker is supported by the bottom, there will be a friction on the drum, bringing it to rest. The weights, *g*, have, therefore, to be applied gradually, as the wire runs out. The rule adopted in practice is to apply resistance, always exceeding by 10 lbs. the weight of the wire out. Then, the sinker being 34 lbs., we have 24 lbs. weight left for the moving force. This is amply sufficient to give a very rapid descent, so that in the course of half an hour the bottom will be reached at a depth of 2,000 or 3,000 fathoms. The person in charge watches a counter (the indicator, *e*), and for every 250 fathoms (that is, every 250 turns of the wheel) he adds such weight to the brake cord as shall add 3 lbs. to the force with which the sounding wheel resists the egress of the wire. That makes 12 lbs. added to the brake resistance for every 1,000 fathoms of wire run out. The weight of every 1,000 fathoms of wire in air is 14½ lbs.

In water, therefore, the weight is about 12 lbs.; so that if the weight is added at the rate indicated, the rule will be fulfilled. So it is arranged that, when the 34 lbs. weight reaches the bottom, instead of there being a pull, or a moving force of 24 lbs. on the wire, tending to draw it through the water, there will suddenly come to be a resistance of 10 lbs. against the motion. A turn or two and the drum comes to rest. The instantaneous perception of the bottom, even at so great a depth as 4,000 fathoms, when this rule is followed, is very remarkable. The sounding apparatus is best fixed so as to project beyond the bow or stern taffrail. In order to take a sounding, the drum, A, is run out to the end of the rails, H H, where it admits of the sinker dropping sheer into the sea. The sinker is then gently lowered by turning the handle of the drum until it touches the water, when the indicator is set at zero. Everything being ready and the ship at rest, the handles of the drum are then unshipped, the check pawl of the drum is unlocked, and the wire runs rapidly out. When bottom is reached, the indicator is read off, and the hauling up is set about at once. The wire is first supported from the framework by a yarn stopper, or is held by a couple of men with canvas or leather protection for their hands. The drum is then run inboard again, and the wire is led over ½ circumference of the caster pulley, I, then passed over the auxiliary hauling-in pulley, K, so as to make ¾ or 1¾ turns before it is coiled on the drum.



WHITE'S DEEP SEA SOUNDING APPARATUS.

The tube in the end of the sinker, if fitted with a valve door, brings up a specimen of the bottom. As the wire comes in, it may be partially dried by rubbing it with a piece of canvas; and as it is being coiled on the drum, to preserve it from rusting it is drenched occasionally with oil. When not in use the drum is kept in a bath of oil. It was formerly the custom to apply a solution of caustic soda in the same way, but the oil has superseded it.

This is the complete apparatus for deep sea sounding, but a simpler affair will suffice for soundings of even 1,000 fathoms, and especially for flying soundings from telegraph or mail steamers approaching land. With the wire three men can do the work in a small fraction of the time; the sounding is surer, for the wire goes down very sheer; and difficult manœuvering of the ship in rough tides, to keep her over the line, is avoided during hauling in, because the lateral friction of the wire to its passage through the water is so small compared to that of the hempen line. A sounding in 2,500 fathoms, which would engage several men and a donkey engine, require very alert handling of the ship, and occupy from four to five hours, can now be done by three men in the space of about forty minutes.

Breaking of a Fire Ladder.

By the breaking of a patent fireman's ladder machine in this city, during a recent drill of the fire department, three men lost their lives. The machine consists of a combination of ladders, which, by the turning of winches, are quickly elevated to an angular or perpendicular position, the ladders sliding out one beyond the other. The unfortunate men were on the upper ladder, ninety feet from the ground, when one of the lower ladders gave way, and they were precipitated to the pavement. Cause—bad material and bad workmanship.

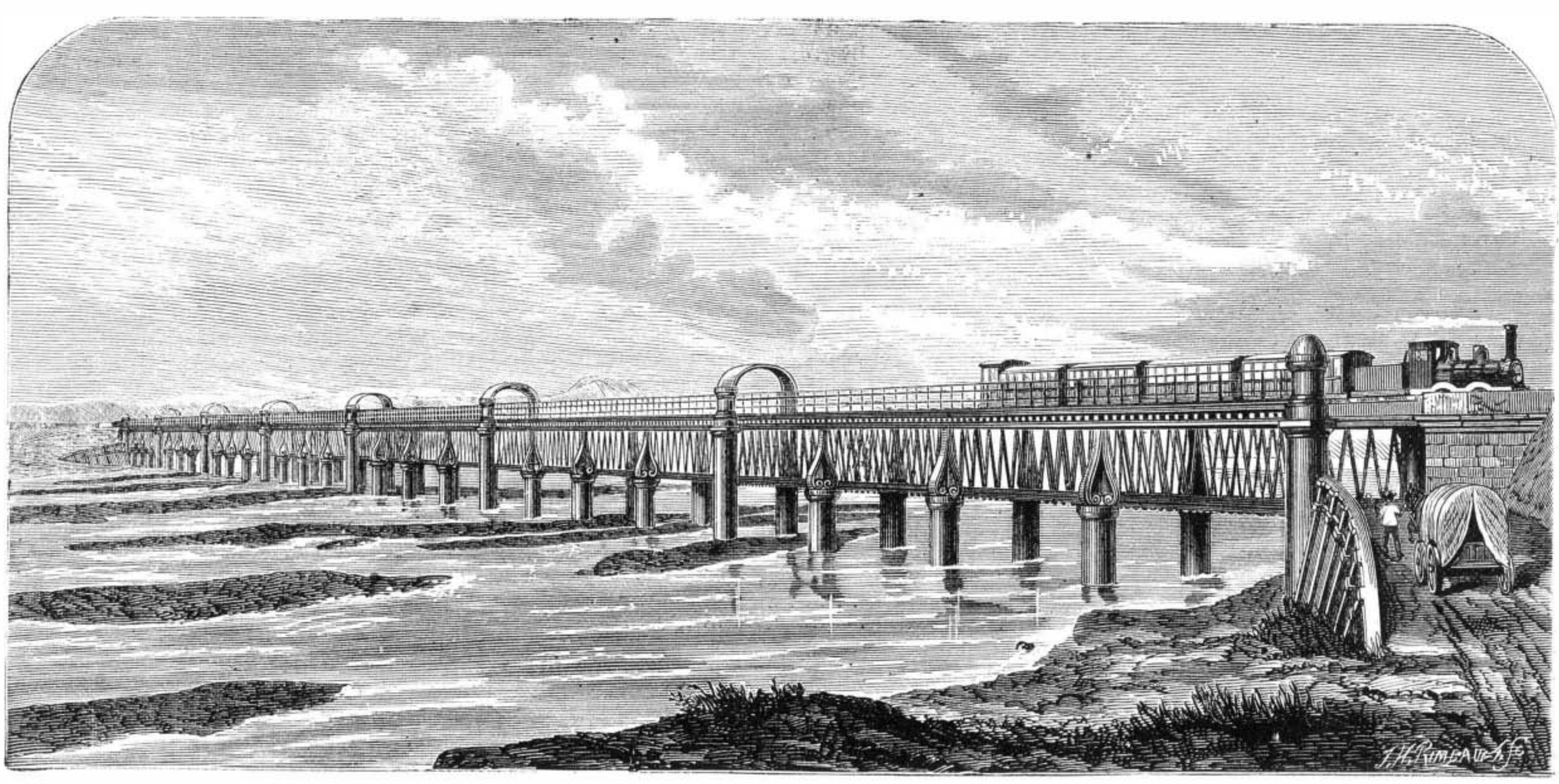
Dietetic Effects of Water.

Certain experiments made by a French *savan*, with the view of ascertaining how far the phosphate of lime in bone may be replaced by other phosphates, have been used by Mr. W. J. Cooper to illustrate how profoundly the bodies of animals are influenced by the waters they drink. This is an aspect of the water question which will be new to most people; but there is no doubt that the composition of the body is materially influenced by the mineral constituents of the fluids we habitually drink. The active effects of several mineral waters upon the functions are well known; it is not so generally known that water from artesian wells, so pure from organic pollution, sometimes contains sulphate of magnesia and other salts to such a degree as to be positively injurious. On the other hand, in some districts in Holland where there is only rain water to be obtained for drinking purposes, softening and distortion of the bones are frequent. That, as shown by the experiments referred to by Mr. Cooper, the use of natural waters may tend to alter the structure of our bodies, introduces another element into the much vexed question as to the proper source whence to draw the supplies of potable water for towns, by showing that the inorganic impurities of water are of more importance to health than they have been usually considered; while it lends support to the opinion that the same conditions have something to do with the goitre and other glandular affections endemic over certain regions.

ENGINEERING IN NEW ZEALAND.

We publish herewith a view of a bridge, designed by Mr. J. Millar, of Dunedin, New Zealand, to carry the Otago Great Northern Trunk Railway over the Waitaki, a river of great width, and liable to considerable variation in depth of water. The bridge consists of 28 bays, each of 132 feet from center to center of piers. On one side an extra span of 45 feet leads the general road traffic upon the bridge, as shown, the rail level being on the top, and the road level at the bottom, of the Warren girders, which compose the long structure. The river, which is, in times of low water, reduced so much in volume that the bed is exposed in banks of shingle, as shown in the engraving, is greatly flooded at the season when the snow melts from the mountains, and passes down in torrents. At such times the width of the river is increased to a mile, and the water rises to a level within 5 feet of the level of the bridge.

HAIR should never be put in mortar until a few days before the material is used, as the lime will soon destroy it.



BRIDGE OVER THE WAITAKI NEW ZEALAND.