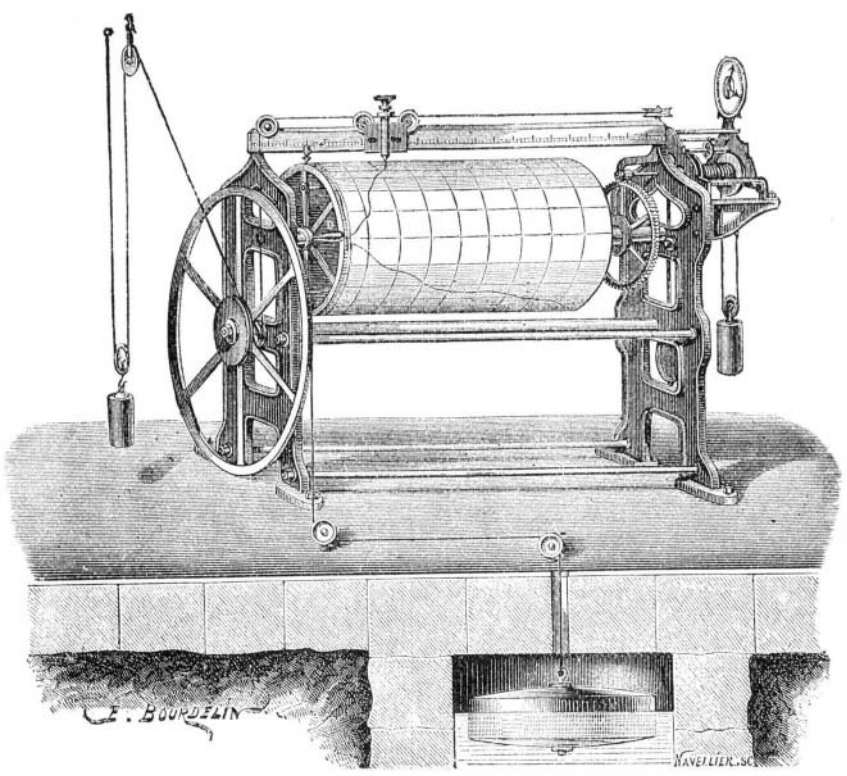
NEW TIDE AND RIVER GAGES.

The study of the variations of level of the ocean, and also of the rises and falls of rivers, canals, and streams, is an important adjunct of meteorological science, and is constantly followed in all countries in which regular observations of the weather and like natural phenomena have been established. We represent in the annexed engravings, for which we are indebted to *La Nature*, two new registering devices, one termed the maregraph, designed for tide measurements, the other the fluviograph, intended for similar examination of river and canal levels.

The maregraph (Fig. 1) is operated by an endless cord which connects with a float located in a suitable reservoir, into which the sea water enters. The changes of level of the water are registered on a large horizontal cylinder which is rotated by clock mechanism once in 24 hours. The cylinder is covered with a sheet of paper, changed fortnightly or monthly, and which is divided into longitudinal divisions, giving, on a reduced scale, the hights of the tides in meters and centimeters. A carriage, mounted on rollers upon a steel rule above the cylinder, carries a pencil, which is pressed against the paper by a spring. The carriage communicates by an endless cord with a small grooved wheel mounted on the shaft of the larger wheel which receives the motion of the float previously referred to.

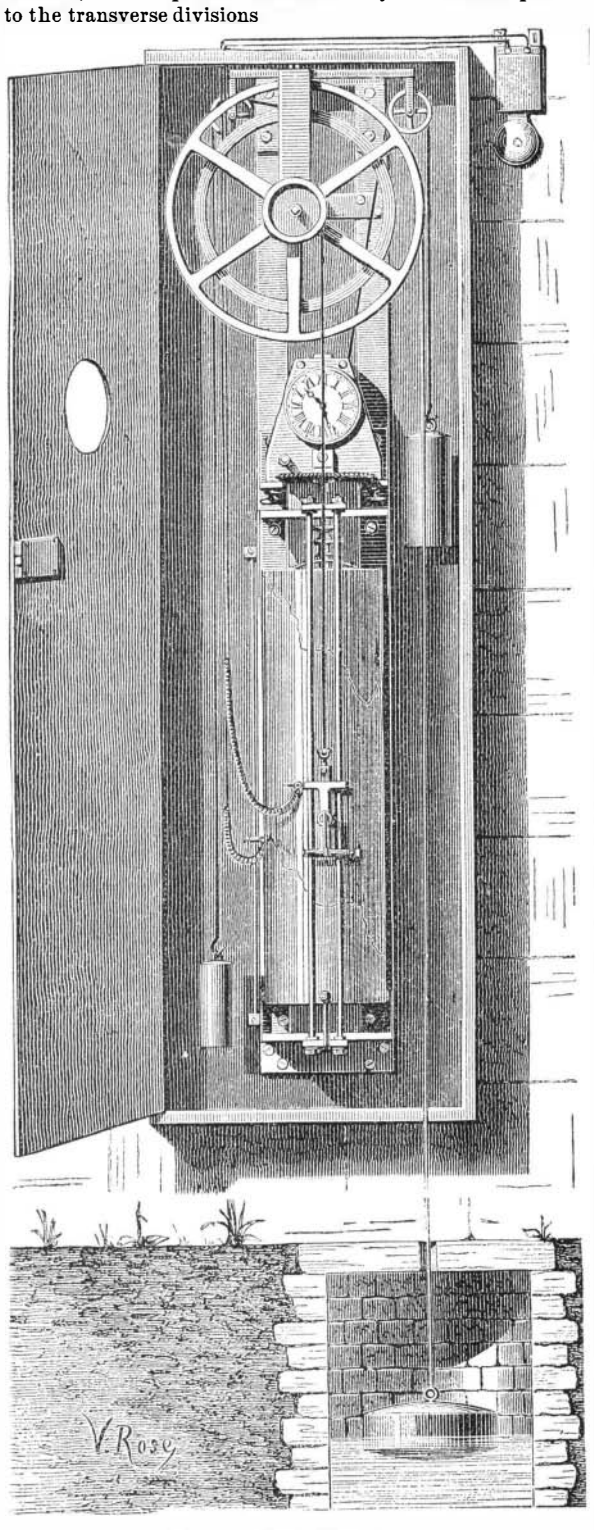
On a third wheel, of medium diameter, is wound a cord, which is drawn by a weight in an opposite direction to that of the cord of the float. When, therefore, the float rises, the effect of the weight is to remove the shaft so as to take up the slack of the cord so that the latter is always kept taut. The pencil carriage is similarly actuated, and traces on the cylinder a mark of which the extremity is the maximum hight of the water. If the level is constant, the carriage remains motionless, and the pencil traces on the cylinder a line parallel to the transverse divisions



THE MAREGRAPH.—Fig. 1.

point, comes in contact with the indicator, the effect is to sound a bell.

The fluviograph (Fig. 2) is more compact in form than the instrument just described, owing to the cylinder being placed horizontally. By mechanism very similar to that of the maregraph, it registers, on marked paper, variations of level of the water, which, on a canal, may be used to indicate the passages of boats through locks. It also has an electric attachment for indicating certain levels, and also may be used as a watchman's time detector, by locking the door of the case and causing the watchman to press a button which makes a mark on the paper on certain divisions corresponding to the hours shown by the clock above. This apparatus has been successfully tested. It doubtless would prove valuable as a means of showing coming floods, and giving timely warning of the same.

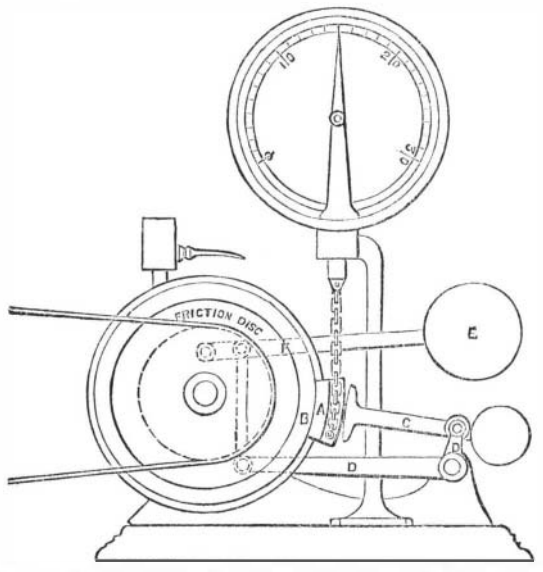


THE FLUVIOGRAPH.—Fig. 2.

A dial placed above the mechanism shows the hour, and at the same time serves to regulate the changing of the pa-

IMPROVED FRICTION METER.

A friction meter and oil tester has recently been invented by Mr. Napier. This is a very delicate and accurate instru-



ment for ascertaining the lubricating properties of any material. The illustration above shows the general arrangement of these machines. The block, A, is pressed against the periphery of the wheel by an arm, C, which is a segment of a roller, balanced and pivoted on the short arm of the bell crank, D D, the long end of which is connected by a link to the lever, F, which has a weight, E, on the outer end of it; and a chain connects the friction block, A, to a spring balance. The wheel is to be made to turn to the right at any desired velocity of circumference, by means of a band from a lathe or otherwise, when the friction of the wheel on the friction block will tend to carry the latter along with the former; but it is prevented from doing so by the chain to the spring balance, which indicates the amount of the tendency of the block to move along the wheel, or, in other words, the total amount of friction on the rubbing surface.

IN the best work, slates are secured by copper nails. Iron nails dipped in boiled oil to prevent their corroding may be used. The nails should have large heads, thin and flat, so that they may not prevent the slates from lying close. Every slate should be secured with two nails; and in fastening, care should be taken not to bend or strain the slates, or they will crack and fly under sudden changes of temperature

CAPTAIN WEBB'S GREAT SWIMMING FEAT.

We have already chronicled Captain Webb's second attempt to swim across the British Channel, which was successful, being probably the greatest feat ever accomplished by a swimmer; and we publish herewith a portrait of the hero, and a chart showing the course of both attempts. The following facts are taken from *The Field*:

On the first occasion, when Webb left the water (see chart), he had been swimming 6 hours, 38 minutes, and 30 seconds, and had gone over 13½ miles of ground, and had been carried 9¾ miles to the eastward of his course by the N. E. stream. On his successful voyage, he started 3¾ hours before high water, which gave him 1¾ hours of the S. W. stream, wherein he made 1½ miles of westing; 5⅓ hours N. E. stream caused him to make 8¼ miles easting; 7½ hours S.W. stream took him 2¾ miles to the westward of his course, and 7 hours N.E. stream drifted him 7¼ miles to the eastward. It will thus be seen that he occupied three tides, in addition to 1¾ hours S.W. stream at starting, and about ¾ hour slack water at the finish under Calais pier, which protected him from the S.W. stream, then just beginning to ebb. His point of landing was 21¼ miles distant, and the length of ground swum over was 39½ miles. Boyton, in his successful trip, paddled over about 29 miles of ground in 1 hour 33 minutes longer than Webb took to swim 10 miles further. As a performance of pluck and endurance, Boyton's is completely put in the shade by Webb's, though, on the score of utility, both may be placed on a par, as Boyton's suits are too expensive and require too much stowage room to come into general use, while swimmers of Webb's physique and courage will ever be *raræ aves*. Boyton took repeated rests on the occasion of his first attempt, although only 15 hours in the water, while Webb hardly rested at all, in fact never for more than a minute or two at a time, and that only while treading water to take refreshment.

CAPTAIN MATTHEW WEBB.

Captain Webb is eminently a salt water swimmer. He progressed with a slow and steady breast stroke, on an average of twenty to the minute throughout, which would make him take about twenty-six thousand strokes during the 21¾ hours. He possesses marvelous power in the legs and loins, while at the end of each stroke the soles of his feet emerge out of water. In fact, he altogether swims very high in the water, and his style would delight an Eton swimming master. The most extraordinary part of the feat is that the swimmer never complained of want of blood circulation

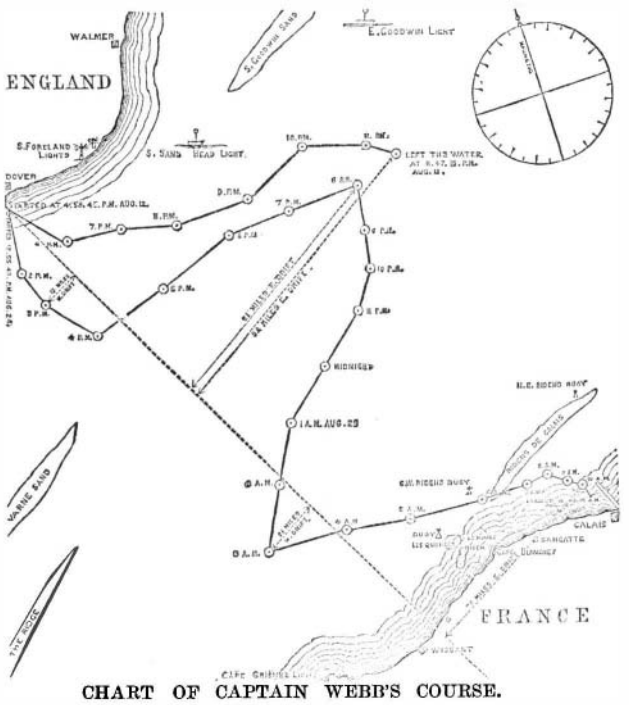


CHART OF CAPTAIN WEBB'S COURSE.

even at the last, after 21 hours immersion, but only of drowsiness from want of sleep and fatigue from prolonged ex