FRESH-WATER SPONGES.

Sponges have long been ranked among the most singular of all aquatic productions, and it is still a question whether they shall be classed in the animal or vegetable kingdom. Linnæus was disposed to place them among the latter, as aquatic algæ; Count Marsili, although of a similar opinion, admits the existence of a certain motion of systole and diastole, like the contraction of the heart, in sponges—a fact in favor of their animal nature. Later investigations confirm this conclusion, and sea sponges are now considered in the light of polypis, like corals, madrepores, etc. M. Lecog has lately made two curious communications to the French Academy on this subject. While boating on the waters of one of the interior lakes of France, he observed certain whitish lines on the surface of the water. On examining them he found that they were trunks of trees or logs floating, and covered with a quantity of *spongillae* or *ephidatiae*, the name given by Lamoroux to the fresh-water sponges. They formed a crust of more than five centimeters, and branched out at intervals like sea-sponges, the whole mass being covered with a slimy substance. Since the sponge is glued to the log by this substance, which is the first to appear, it is supposed that it gives birth to the spongilla. When the sponge is dried up, this slimy substance changes into a thin, transparent membrane, which shines like the track of a snail. Examined with the microscope, numerous grains are discovered, with here and there speculæ of a gelatinous nature, bearing small knots, which M. Locog considers to be germs of the succeeding generation. The manner in which the sea-sponge is propagated is well known: it produces certain grains which are called eggs by those who believe in its animal origin, and seeds by those who think it a vegetable. The spongilla is reproduced in various ways: First by the extension of the slime in which the speculæ are found—in this manner it may spread over a large surface. Second, in its adult state, masses of speculæ are formed carrying a large number of little round globules, which certainly propagate the species, but which, according to M. Lecog, partake more of the seed in cryptogamous plants than of that of eggs. He states further, that he has never found in spongilla of this age the ciliated embryos which, according to Laurent, swim in the water for five or six days. The egg-like grains he has obtained in autumn do no not separate from their parent unless the latter be in a state of decomposition, or exposed to the voracity of certain infusoria. The spongilla are grouped together in great numbers, and so closely, that it is extremely difficult to separate one individual from another. Examined through the microscope, each spongilla displays a vast population of infusoria feeding on slimy matter, and living in complete security.

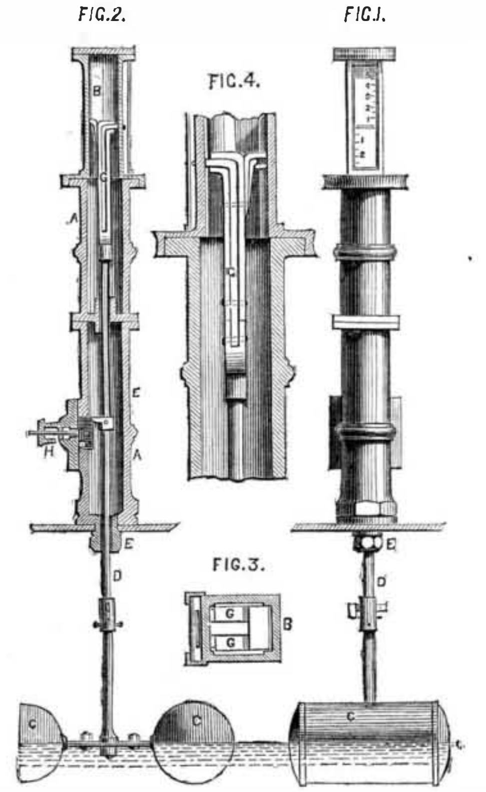
PINEL'S MAGNETIC WATER GAGE.

BY GEORGE PIGGOTT, BIRMINGHAM, ENGLAND.

Most appliances for indicating the hight of water in steam boilers are liable to be inefficient for the purpose, chiefly from undue friction caused by the buoy rod passing through a stuffing-box or packed joint; the packing is often so tight that the float will not move the rod; and if it is packed lightly to dispense with the friction, then there is a leakage of steam, which is very objectionable. The Magnetic Water Gage described in the present paper, the invention of M. Pinel, of Rouen, France, is free from these objections; the chief points to be noticed are, its compactness and simplicity, and the facility of fixing, its exactness in working, and durability, and the very little attention required to keep it in order.

The gage is shown in Figs. 1, 2, and 3, and consists of an upright cast-iron pipe, A, on the top of which is fixed a brass box, B, square in section, as shown in the plan, Fig. 3. A hollow cylindrical float, C, proved to stand a pressure of ten atmospheres is attached to an iron rod, D, passing through the bush, E, without any packing, and also through the guide, F, perfectly easy and free. To the upper end or this rod is fixed a strong horse-shoe magnet, G, shown enlarged in Figs. 4 and 5, the poles being bent forwards at right angles to the body of the magnet, which falls or rises in the brass box, B, with the fall or rise in the boiler. On the exterior face of the box is an isolated iron needle, held merely by the attraction of the poles of the magnet, which it follows in all its movements, rolling on the face of the box as the magnet rises or falls according to the hight of water in the boiler. The face of the box is silvered and graduated, so that the least movement of the needle is perceptible; it is covered with glass to protect it from dust and injury. On the side of the upright pipe, A, a shrill whistle, H, is fixed, closed by a valve kept shut by the internal pressure of steam; when the float is nearly at the lowest limit of its range, a small stud, I, on the rod, D, presses on a lever, which immediately opens the valve, and allows the steam to sound the whistle; this at once makes known the want of water.

The fixing of the gage is exceedingly simple, and does not allow any leakage of steam, which is not only a waste, but often injures the plates of a boiler. A hole about 1¼ inch diameter is drilled in the top of the boiler at the required place, and the gage is fixed upright, the joint being made with india-rubber and a nut screwed



on inside the boiler. The length of the buoy rod is adjusted to suit the hight of water it is usual to work at, the float being weighted to sink just half way in the water, so that the adjustment is reduced to a mere matter of measurement; the needle points to zero when the water is at its proper working hight, and the water level may then be lowered 2½ inches before the whistle sounds; but if it exceeds this limit by ⅛ inch, the whistle will sound the alarm, and will continue to whistle till the water level is raised again. The gage is sometimes constructed with two whistles, for high and low water. The buoy rod is limited in its motion both upwards and downwards; when the water is raised six inches above the proper working hight, the coupling of the buoy rod comes in contact with the bush, E, which prevents the magnet from being forced against the top of the gage; and when the water falls more than three inches below its proper level, the brass coupling which joins the magnet to the buoy rod rests on the top of the guide, F, holding the buoy suspended till the water is raised high enough to float it again; this prevents the magnet from moving out of the brass box. Neither of these cases ought to occur, but the provision is made in case of their occurrence. The brass box is planed on the back and front, and for a portion of the width on each side, forming a guide for the magnet to slide in. On the back of the magnet is fixed a brass bar, bearing only on the planed surface on each side of the box, by which the magnet is made to slide perpendicularly; immediately under this bar a light spring is fixed to the back of the magnet, also bearing only on the back of the box, which keeps the poles of the magnet slightly pressing against the face.

The water gage indicates the hight of water so exactly, and the absence of friction renders it so sensitive, that the writer has noticed, when it has been put just over the fireplace of a double flue boiler with brisk fires going, that the needle rises and falls with the fluctuation of the water caused by the quick ebullition. The gage requires scarcely any attention and the inconvenience of constantly greasing and watching that the float acts is entirely done away with. The silvered face is kept clean by washing with soap and water two or three times a year; this is all the attention it requires.

The total number of these gages now at work is 3,500, sixty-five of which are in England and the remainder principally in France; all of which are working with as much accuracy as when first put up, and some of them have now been nine years at work. The rubbing of the magnet againt the brass box gives it a polish that renders the wear inappreciable; its magnetic power must necessarily be weakened in time from the effects of rust, and it would then require renewal, but at present its durability has not been impaired in any way. As there is no passage of steam through the gage, the interior is not liable to any incrustation of deposit. Magnetic gages were put up at the Paris mint in 1855, and have never been touched since that time; they have also been adopted extensively in the French government workshops and in manufactories.

After the reading of the paper, a discussion took place, in the course of which Mr. W. Richardson said he had used a different construction of magnetic water gage on a boiler working up to 50 pounds pressure situated in a forge, where he was afraid of a glass gage being exposed to injury, and wanted a gage that would not be too high up to be easily seen. It consisted of a copper float about seven inches diameter fixed on a lever, the horizontal spindle of which passed freely through the front of the boiler into the casing of the gage without any stuffing-box or packing and carried at its outer extremity a bar magnet fixed at right angles to the spindle and parallel to the float lever, working within the casing of the gage; outside the casing was a steel indicating finger, working loosely on a pin in the same center line as the spindle of the magnet, which showed the hight of water on a dial plate. The magnet and indicating fingor both rotated on the center point of their length, so that both were completely balanced, and the finger was propelled by each end of the magnet. This gage has now been at work for eighteen months, and continued perfeetly correet; when first put up, immediately over the fire, its sensitiveness was so great from the violent ebullition that the index was very unsteady, and in order to keep the surface of the water quiet, a piece of sheet iron had to be fixed horizontally, inside the boiler, sufficiently below the surface of the water not to interfere with the range of the float.

Mr. C. W. Siemens had seen a magnetic water gage brought over from America about fifteen years ago, similar to the gage just referred to, having a radial needle worked by a magnet attached to the float, but had not seen it put into operation.

A THRILLING NARRATIVE OF THE ESCAPE OF THE STEAMER "ARABIA."

We find in the Springfield *Republican*, the following thrilling account of the escape of the *Arabia* from sudden and terrible wreck on Fasnet Rock.

Steamship *Arabia*, 11 A.M.,
Friday, Aug. 3, 1860.

In the midst of life we are in death. Just half an hour ago, while standing on the bows, the ship running 14 knots an hour under steam and sails, in a thick fog, I heard a loud shout "land ahead!" I turned toward the captain, or rather had my eye on him at that moment. His face could not have expressed more horror if he had seen hell's gates opened. He sprung to the engine bell, at the same time shouting "hard a-port your helm." A counter order of "starboard" was given. The captain leaped from his footing, shouting so that his voice was heard above the escaping steam, "hard a-port in God's name." His order was obeyed. Then turning forward among a hubbub of voices, shouting "we are lost," "God have mercy on us," &c., &c., I saw the rocks from the ship's bows. On their top was a lighthouse. As we swung around, it seemed as if we should every moment feel the shock of striking. The huge swell of the Atlantic was reverberating and the spray flying all around us. The sails took aback, heeling us over so that the deck stood up like the roof of a house. Women were screaming, seamen running to and fro, and above all the captain and lieutenants shouting so as to be heard above the shrill escaping steam "hard a-port, hard, hard!" "Brace around the foreyard!" "Let fly the halyards and sheer fore-and-aft!" I stepped abaft the foremast to be out of the way of its fall and waited for the shock. But

"There is a sweet little cherub who sits up aloft
And looks after the life of poor Jack."

We approached as all agree within ten feet of the rock, and then began to recede. Just realize that there was only ten feet between us and eternity. It is the opinion of sea-faring men on board, that the ship if she had struck, would have sunk in five minutes, for it is a sharp ledge of rocks, six or seven miles from any shore, and deep water all around. The boats could not have been got ready, and if they could, they never could have lived in the heavy surf. No—if she had gone ten feet farther we should have been almost instantly precipitated into a raging sea, where six or seven miles from land, in a dense fog, few of us would have escaped. We should have all perished as miserably as did those in the *Hungarian*. Three seconds more would have tolled the death-knell of most, if not all of us, for we were so enveloped in fog, and far from land, and also no boat at the lighthouse, that if we had seized fragments of the wreck they would have been torn from our grasp by the sea boiling as in a cauldron over the sunken reefs, hours before our fate could have been known. I knew there was no time to run below for life-preservers —which are hung up by each berth—and so contented myself with just stringing up my nerves for a buffet with the waves. For three minutes, I can assure you, man showed what he is when expecting the "King of Terrors." Two or three ladies took it heroically and seemed to draw in strength from the scene around them. It was a terrible moment for the captain—Captain Stone of the Royal Navy—for as we swung around, the sails taken aback and heeling us over, everybody expected to feel the grinding crash beneath their feet. I felt for him, for all his great rashness, and gladly say that to his decision inour hour of need we owe our lives. The rock is called Fasnet Rock, and upon it is the Cape Clear lighthouse. A subscription is now being taken up among the passengers for the seaman who first shouted "breakers ahead." I shall never forget to my dying day the face of the captain when he heard that wild shout. I have seen distress and pain in all their forms, but never a face like that, so full of horror perfect agony, and crushing responsibility. The cry "breakers ahead," the stopping of the engines, the escape of the steam, and the shifting of the helm, all occured in one second. It seemed at the instant as if it was utterly impossible to stop the ship's way in time to save us; but God rules. He put forth His hand, and the vessel, trembling as if with mortal fear, yielded to her powerful engines, receded from the rock, and we were saved.

ROTARY DYNAMOMETER.

[Translated from Armengaud's Genie Industriel.]

The construction of this dynamometer is based on the property of gear-wheels with oblique or helical teeth, to exert a lateral pressure which is in direct proportion to the power transmitted by the wheels and to the inclination of their teeth.

This dynamometer is represented in the accompanying engraving, where Fig. 1 represents a side elevation and Fig. 2 is a plan or top view, and it consists of two parallel shafts, which have their bearings in four boxes that are firmly secured to a suitable bed or frame.

Each of these shafts bears a cog-wheel with oblique teeth and a pulley for receiving or transmitting the action of a belt. The pulleys and the wheels are firmly keyed to the shafts, and they are precisely of equal diameters, so that they rotate with equal velocities.

The shaft of the wheel, A, rotates perfectly free in its journals, and it is prevented from moving in a longitudinal direction by two projections, which confine the ends of the shaft.

The wheel, B, on the other hand is mounted on a shaft with long cylindrical journals, and the wheel, A, is considerably wider than the wheel, B, so that the latter can assume a motion in a longitudinal direction of the shaft without being thrown out of gear with the wheel, A.

The end of the shaft, B, is provided with a steel point, which presses against the plate, F, that is made of one or more leaves of spring steel, according to the power which it has to sustain. The ends of the plate, F, are connected to the frame, E, by means of links, G, which form the support for said plates.

The small rod, K, one end of which is connected with the plate, F, at about the middle of its length, is attached with its other end to the index, I, and causes the same to sweep over the sector, H, which is provided with a scale, and which is secured to the frame, E, in such a manner that it can easily be observed while the device is in motion.

The rod, K, is provided with a right and left hand screw, so that its length can be adjusted, and that the index can be set to the starting point on the scale.

In order to use this device for the purpose of measuring the power required by some working machine, it is fastened down to the floor in such a position that the

Fig. 1

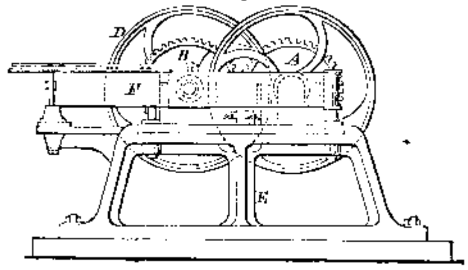
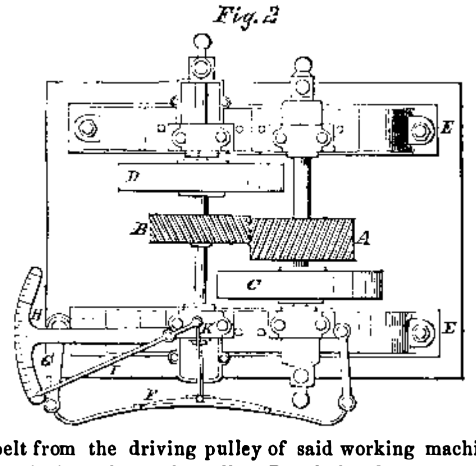


Fig. 2



belt from the driving pulley of said working machine can be brought on the pulley, D, of the dynamometer. Another belt from the pulley, C, transmits the power to the spindle of the working machine under observation.

As soon as the motion of the spindle of the working machine meets with a resistance, the index, I, will be seen to move on the sector, H, and if the resistance to be overcome by the working machine is pretty uniform, the index will maintain its position with slight oscillations.

The point indicated by the index on the scale, H, is noted, and the number of revolutions of the pulley, C, per minute are counted, and by multiplying the two figures thus obtained, the number of foot-pounds per minute required to drive the working machine in question is found.

The scale on the sector, H, is obtained by actual experiment. A brake is applied to the pulley, C, while motion is imparted to the pulley, P, and the power exerted by an arm of known length which extends from the brake, and which connects with a spring balance, is noted. The force consumed is equal to the sustained weight multiplied into the space traveled over by the surface to which the brake is applied, and it will be easily understood how the device above described furnishes the elements necessary to determine the power required to drive a certain working machine.

The weight to be applied to the spring plate, F, for the purpose of indicating one foot-pound per second, can be determined by calculation.

If the angle, a, indicates the inclination of the cogs towards the axle of the wheel, the power, Q, applied to the circumference is decomposed into two components—one, R, perpendicular to the direction of the axle and one, P, parallel to the axle of the wheel, and the component, P, is equal to Qx sin. a.

The spring plate, F, the reaction of which balances the component, P, is bent in the form of a parabola, so as to increase the sensibility of the device and to obtain a scale with equal graduations for equal powers. Consequently, if

P, the weight applied to the circumference of the pulley, B = 1 lb.

a, the angle of the cogs with the direction of the axle = 22° 30′.

R, the radius of the pulley, C.

R′, the radius of the pitch circle of the cog-wheels, A B.

P′, the effect exerted on the spring plate by the end of the axle of the wheel, B; and it is found

$$P' = P \times \sin a \times \frac{R}{R'}$$

$$= 1 \times \frac{0.38268 \times 0.245}{0.153} = 0.613 \text{ lbs.}$$

The number 0·613 expresses the effect exerted on the spring plate by applying one pound to the circumference of the pulley, B, and it is only necessary, therefore, to apply multiples of this number to the spring plate in order to find the effect of two, three or more pounds applied to the circumference of the pulley.

In order to obtain, in foot-pounds per second, the effect measured by this device, it is necessary to count the number of revolutions of the pulley per minute, multiply this number with the number given by the index and divide by 60.

For instance, if the index shows 15 lbs. and the number of revolutions is 70, the result will be

$$\frac{70 \times 15}{60} = 17{\cdot}50 \text{ foot-pounds per second.}$$

In order to be able to find the result without a calculation, a table has been prepared, giving the effect in foot-pounds per seconds or the effect of from 5 to 75 lbs., as indicated by the index, and for velocities of from 10 to 100 revolutions per minute:—

Indications of the scale.	Revolutions per minute. 10	20	30	40	50	60	70	80	90	100
	Foot-pounds per second.									
5	0.83	1.67	2.50	3.33	4.17	5.00	5.83	6.67	7.50	8.33
10	1.67	3.33	5.00	6.67	8.33	10.00	11.67	13.33	15.00	16.67
15	2.50	5,00	7.50	10.00	12.50	15.00	17.50	20.00	22.50	25.00
20	3.33	6.67	10.00	13.33	16.67	20.00	23.33	26.67	30.00	33.33
25	4.17	8.33	12.50	16.67	20.83	25.00	29.16	33.33	37.50	41.67
30	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
35	5.83	11.67	17.50	23.33	29.17	35.00	40.83	46.67	52.50	58.33
40	6.67	13.33	20.00	26.67	33.33	40.00	46.67	53 33	60.00	66.67
45	7.50	15.00	22.50	30.00	37.50	45.00	52.50	60.00	67.50	75.00
50	8.33	16.67	25.00	33.33	41.67	50.00	58.33	66.67	75.00	83.33
55	9.17	18.33	27.50	36.67	45.83	55.00	61.16	73.33	82.50	91.67
60	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00
65	10.83	21.67	32.50	43.33	54.17	65.00	75.83	86.67	97.50	108.33
70	11.67	23.33	35.00	46.67	58.33	70.00	81.67	93.33	105.00	116.67
75	12.50	25.00	37.50	50.00	62.50	75.00	87.50	100.00	112.50	125-00

The advantages of this device are, that it is extremely simple in its construction; that it indicates the effect on a scale which is not affected by the motion of the machine, and which allows of observing the index with the greatest convenience; and that it indicates pretty large effects without requiring a very strong spring, and that the resistance of the spring can be regulated by using gear-wheels with cogs of more or less inclination.

IMPROVEMENTS IN THE COTTON PLANT.

MESSRS. EDITORS:—I have, for over two years, endeavored to graft or bud the *Asclepias Syrica* (or silk weed) on to the *Gossypium* (or cotton plant), but have failed in my efforts, which I attribute to a want of experience.

Should any of your numerous readers be able to inform me of the best time and manner to operate on those plants, I should feel obliged, as I am now located in a cotton growing country, and am anxious to solve the problem as to whether it is possible to grow cotton in other than Southern States. My theory is, that it can be done by raising a hybrid which will combine the qualities of the silky down of the silk weed—which grows in every State—with that of the cotton plant. If it is possible to do this, no estimate could be formed of the benefits which would accrue to the United States, commercially and politically.

The *Asclepias Syrica* differs from other species of *Asclepias*, in having large purple flowers, sharp thorns, and pods which contain a large quantity of silky-like thread, and has often been used in filling beds and pillows. In cultivating and drying these, I have succeeded in obtaining a fine, strong silk, weighing 3 oz. to the stalk. I intend, next Spring, to plant Western silk-weed *seed* with cotton *seed*, and anticipate getting a hybrid seed from them. What say your horticultural readers? Shall I succeed or not? ALBANY PECKHAM, D.D.S.

Whitesville, Ga., Sept. 1, 1860.