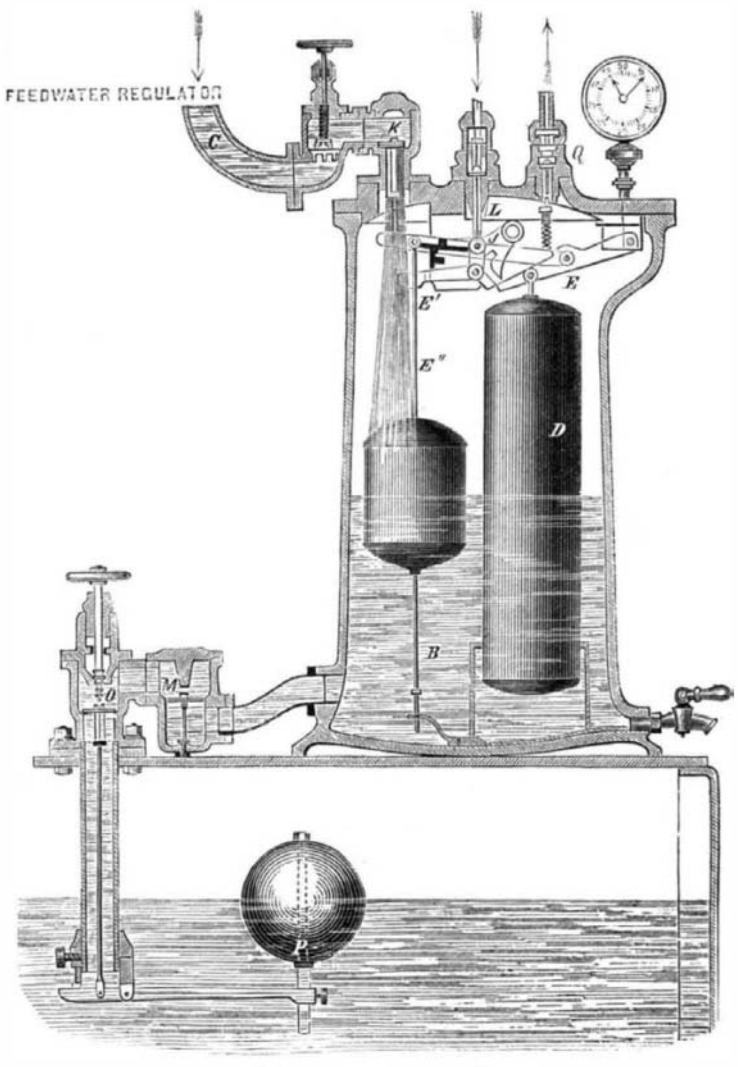
IMPROVED BOILER FEED REGULATOR.

Messrs. Bede & Co.,of Verviers, Belgium, have recently introduced a new device for automatically controlling the supply of water to a steam boiler, which, they claim, insures a uniform hight of water in the boiler, thus avoiding danger of explosion and diminished pressure from too sudden or over feeding. It consists, principally, in the water cistern, B, which communicates with the boiler through check valve, M, and stop valve, O, and it is fed by the pipe, C, through the valve, K. When the water in cistern, B, rises so as lift the smaller float, E'', the extension lever, E', is moved so as to disengage the larger float, D, which has previously been held down by the lever, E; and the float, D, lifting the lever, E, actuates the bell crank, J, to open steam valve, L. The entrance of the steam at L closes the valve, K, shutting off the water supply.

Equal pressure is thus established in the receptacle, B, and the steam boiler, and the water may then pass through the valves, M, O, into the latter. The valve, ●, is regulated by the boiler float, P, so as to be opened or closed, to maintain a uniform hight of the water in the boiler. The smaller float of the receptacle, E'', follows the falling water, and strikes a pin or stop at the lower end of its guide rod when the receptacle is nearly empty. The weight of the small releases the large float, D, which presses on the link, J, closes the valve, L, and opens the water supply valve, K, and an exit valve, Q. The steam escapes through the valve, Q, into the reservoir, where it is condensed, while the water fills the receptacle, B, through valve, K. The supply is thus kept continuous through the alternate action of the apparatus, which is also provided with a registering device, indicating how often the receptacle is emptied and filled, and consequently what amount of water has been used. By comparison with the quantity of fuel consumed, a simple and reliable test of the operation of the boiler and engine is afforded, the control of the engine by the attendant is facilitated, and economy in the use of fuel necessarily follows. The regulator was exhibited et the Vienna Exposition in 1873, and received a premium medal at the Paris Exposition in 1867. A number of these appliances are in use in Europe.



BEDE'S FEED WATER REGULATOR.

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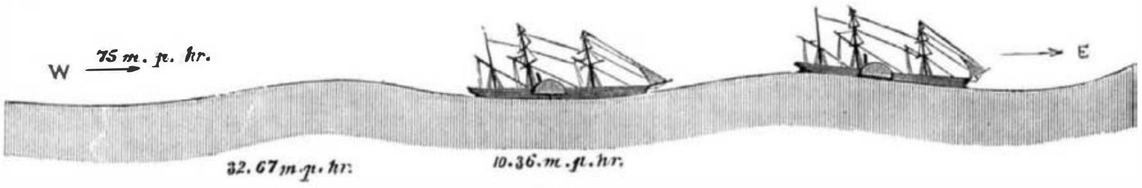
HIGHT OF WAVES.

J. W. Black, in a recent letter in *Nature*, says: "Dr. Scoresby's observations in the North Atlantic record 24 feet, 30 feet, the highest 43 feet, and the mean 18 feet in westerly gales; and the frigate Novara, 20 to 30 feet off the Cape Promontory. French observers in the Bay of Biscay state a hight of wave of 36 feet; Capt. Wilkes, U.S.N., writes of 32 feet in the Pacific, and Sir J. Ross of 22 feet in the South Atlantic. Hights of waves in N.W. gales off the Cape of Good Hope were computed at 40 feet, those off Cape Horn at 32 feet, in the Mediterranean Sea at 14 feet 10 inches, and in the German Ocean at 13½ feet; but in British waters they are only found to average 8 to 9 feet. The velocity of ocean storm waves was observed by Dr. Scoresby in the North Atlantic to be about 32 miles per hour; Capt. Wilkes recorded it at 26½ miles in the Pacific, and French sailors in the Bay of Biscay at 60 miles an hour. Dr. Scoresby has estimated the distance between or breadth of his Atlantic storm waves at about 600 feet from crest to crest, which is only about half of that stated in the letter, and with a proportion of only $\frac{1}{20}$ for hight to breadth. Dr. Scoresby states that his waves of 30 feet in hight move at the rate of 32 miles per hour.

The accompanying diagram is constructed according to Dr. Scoresby's scale of measurements, 600 feet breadth, 30 feet hight, and 220 feet vessel, with rates of wind, wave, and vessel; and from it one may ponder on what small dimensions these terrific-looking waves are constructed, and that a ship after all looks only like a cork or chip on the great seas."



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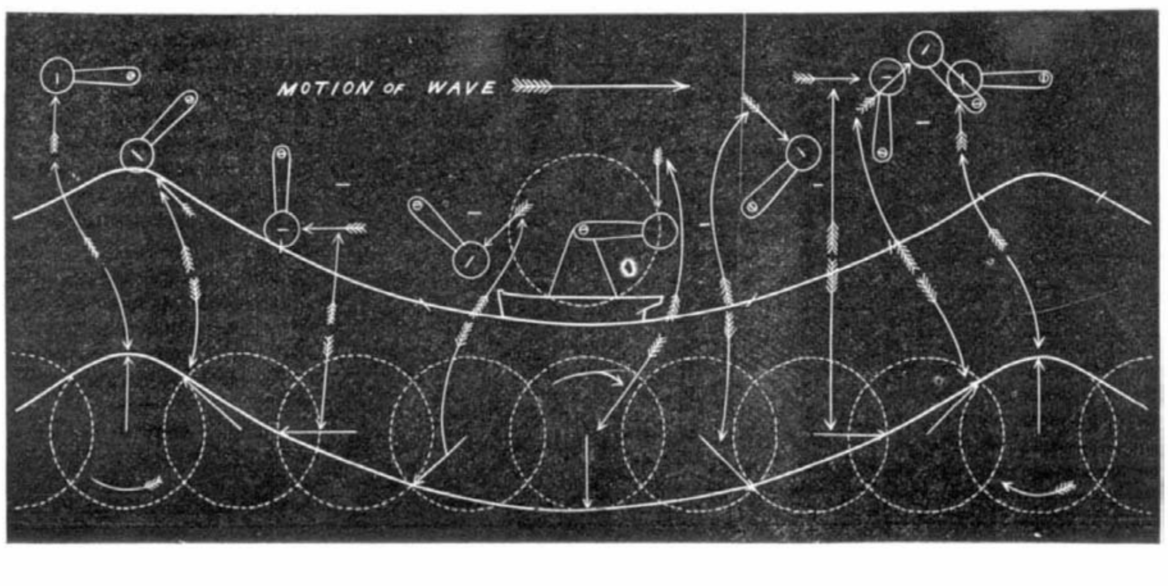
MOTIVE POWER FROM WAVES.

At a recent meeting of the Institution of Naval Architects a paper was read by Mr. B Tower, on a method of obtaining motive power from wave motion. He said that this inquiry originated with Mr. Deverell, whose proposition was to suspend a heavy weight on board a ship by means of springs, and to obtain motive power by the oscillation of this weight through a distance not exceeding the hight of the waves.

It however appeared to Mr. Tower that, since the centrifugal force of wave motion in a vertical direction is alternately added to and subtracted from the force of gravity, thereby causing a virtual variation of the intensity of that force, the question might be broadly stated as follows: Supposing the force of gravity to vary in intensity at regular intervals, that is, to become alternately greater and less than its normal amount, what is the best means to obtain the maximum amount of energy from a given weight oscillating under the influence of these variations? For example, supposing the force of gravity to be for three seconds one fifth greater, and for the next three seconds one fifth less, than its natural intensity, and suppose that we have a weight of five tuns suspended by a spring, with an infinitely open scale, so that the spring will continue to exert a uniform upward force of five tuns, no matter how far the weight moves up and down, it is clear that, during the three seconds' interval, during which gravity is one fifth more than its normal intensity, the five-tun weight will virtually weigh six tuns, and will thus exceed the upward force of the spring by a downward force of one tun; in the same way, when the force of gravity is one fifth less, the weight will only weigh four tuns, and the spring will then exert an unbalanced upward force of one tun. Now, as energy or power is defined as force moving through distance, it is clear that the quantity of energy or power to be obtained by this system will depend on the distance through which this weight is caused to move during each successive variation of gravity. Thus, supposing that during the *plus* interval it moves downwards through one foot, and during the *minus* interval it moves upward through one foot, it is clear that during each of these intervals it will exert a force of one tun moved through one foot, that is, one foot tun; but if, instead of one foot, it moves through ten feet, it will exert ten times the power—that if, ten foot tuns; or if moved through one hundred feet, it would exert one hundred foot tuns during each interval of three seconds.

The first experiments Mr. Tower made, with a model apparatus constructed on these principles, showed him that the best arrangement would be to put a weight on the end of a revolving arm, whereby the centrifugal force of the wave motion might be utilized as well as the rising and falling motion.

The diagram shows the position of the vessel and of its revolving arm at all parts of a wave; the arrows show the direction of the centrifugal force of the wave motion according to the generally received theory. This force is upwards at the crests, downwards in the hollows, and horizontal midway between the crests and hollows. If the weighted arm is compelled to assume successive angular positions, so that it is always at right angles to the force, it is evident that the force will be continually acting to cause the arm to rotate. It is easy to see how the work is taken out of the waves; for when the vessel is descending, the weight is performing the upper half of its revolution, and is consequently exerting an upward centrifugal force; and when the vessel is ascending, the centrifugal force is pushing down and resisting the vessel's ascent, so that the revolving weight affords a resistance against which the vessel can push just as if it were a fixed point in space. The shaft of the revolving weight can be made to turn a screw in the stern of the vessel by means of a proper system of gearing; and by a delicate arrangement of electric brakes and hydraulic accumulators, Mr. Tower proposes to regulate the revolving arm so as always to keep it at right angles to the centrifugal force of the waves.



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New Asphalt Paving.

A specimen of street paving has just been laid in Glasgow, the material employed being the rock asphalt which is obtained in the Val de Travers, near Neufchatel, in Switzerland. During last autumn several portions of wood paving, on the same system, were done in Glasgow by a London company; and as they were well executed, they seemed to give very general satisfaction. Profiting, apparently, by the experience gained by witnessing the system of wood paving in operation, the Scottish Val de Travers Paving Company determined upon attempting something similar.

According to this system, a foundation is first formed of Portland cement concrete, about 9 inches in depth, and on this the paving proper is laid. The rock asphalte from the Val de Travers, the material employed in the paving, contains about 12 or 13 per cent of bitumen, and the remainder of the rock consists almost entirely of hard limestone, through which the bitumen is very uniformly diffused. This material is first broken into pieces of convenient size in a crushing mill, and is subsequently put into a disintegrator, in which it is reduced to a very fine state of division. When it has been treated in this way, the asphalt is thrown into a revolving cylinder, in which it is subjected to a temperature of about 260° Fah., which brings it almost to a pulverulent condition. While it is in the state of hot powder it is filled into cast iron molds, in which it is pressed and made to assume the form of bricks, about nine inches long by four inches broad and two inches in thickness. The tendency of its particles to cohere is very great at that temperature. The cast iron molds are so formed that the bricks cast in them have a chamfer or bevel about half an inch broad imparted to them, all round what is intended to become the upper surface: and thus, when the bricks are placed in the causeway, they are separated above by a series of grooves, by means of which an excellent bite is secured for the feet of the horses passing over it. When the cement concrete, forming the substratum, is sufficiently well set, the asphalt bricks are laid in a manner somewhat similar to that of ordinary causewaying with dressed granite or whinstone setts. Instead of bedding them in sand, however, they are laid in a thin stratum of liquid rock asphalt, just as ordinary bricks are laid in mortar, bottom, sides, and ends all being coated with the agglutinating material. The bricks are placed about a quarter of an inch apart, and the space thus left is filled in with a hot liquid, which consists of Trinidad pitch and crude shale oil, and which long remains very tough and elastic, in addition to which it most effectually prevents any water from passing through the pavement.

The portion of roadway executed in Glasgow in the above manner seems to give satisfaction, and will apparently be very durable. Of course there is no actual information avail-