A. MORSE.

Machinery for Ringing Fog Bells.

No. 33,156. Patented Aug. 27, 1861.

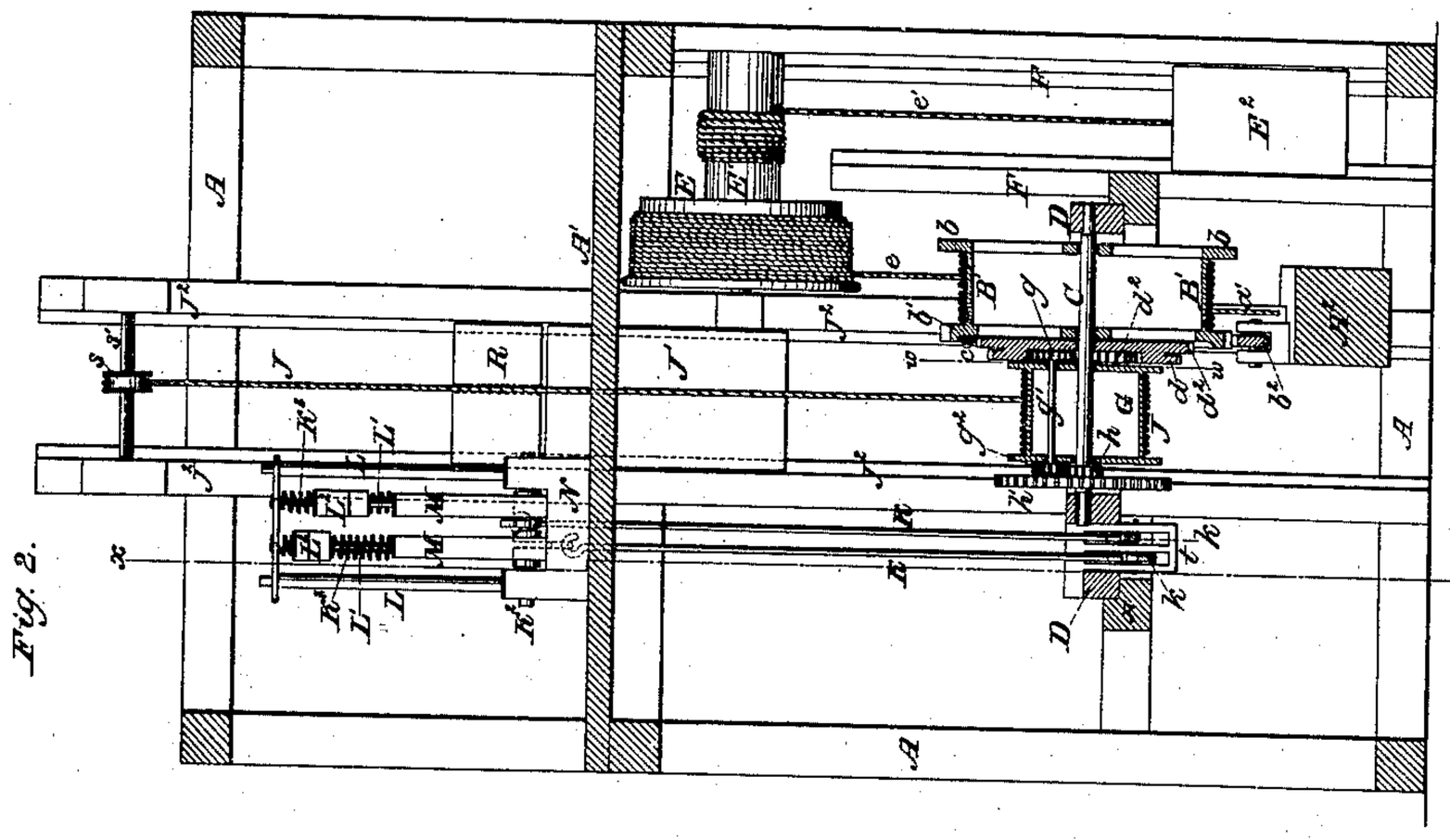

Fig. 2.

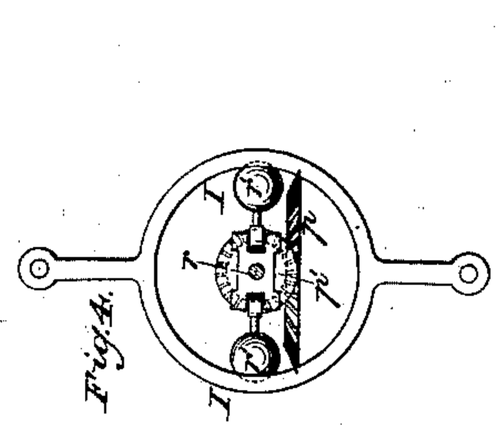

Fig. 4.

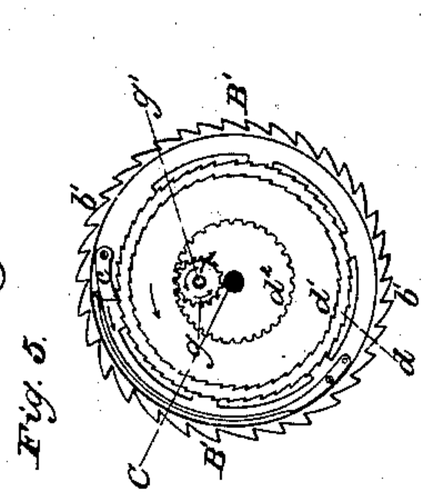

Fig. 5.

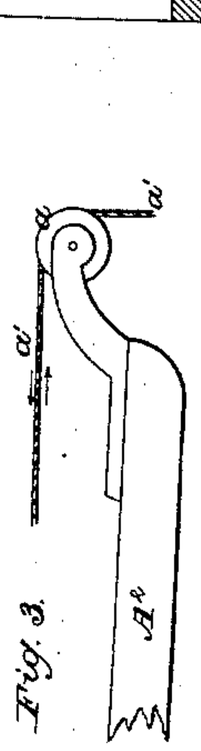

Fig. 3.

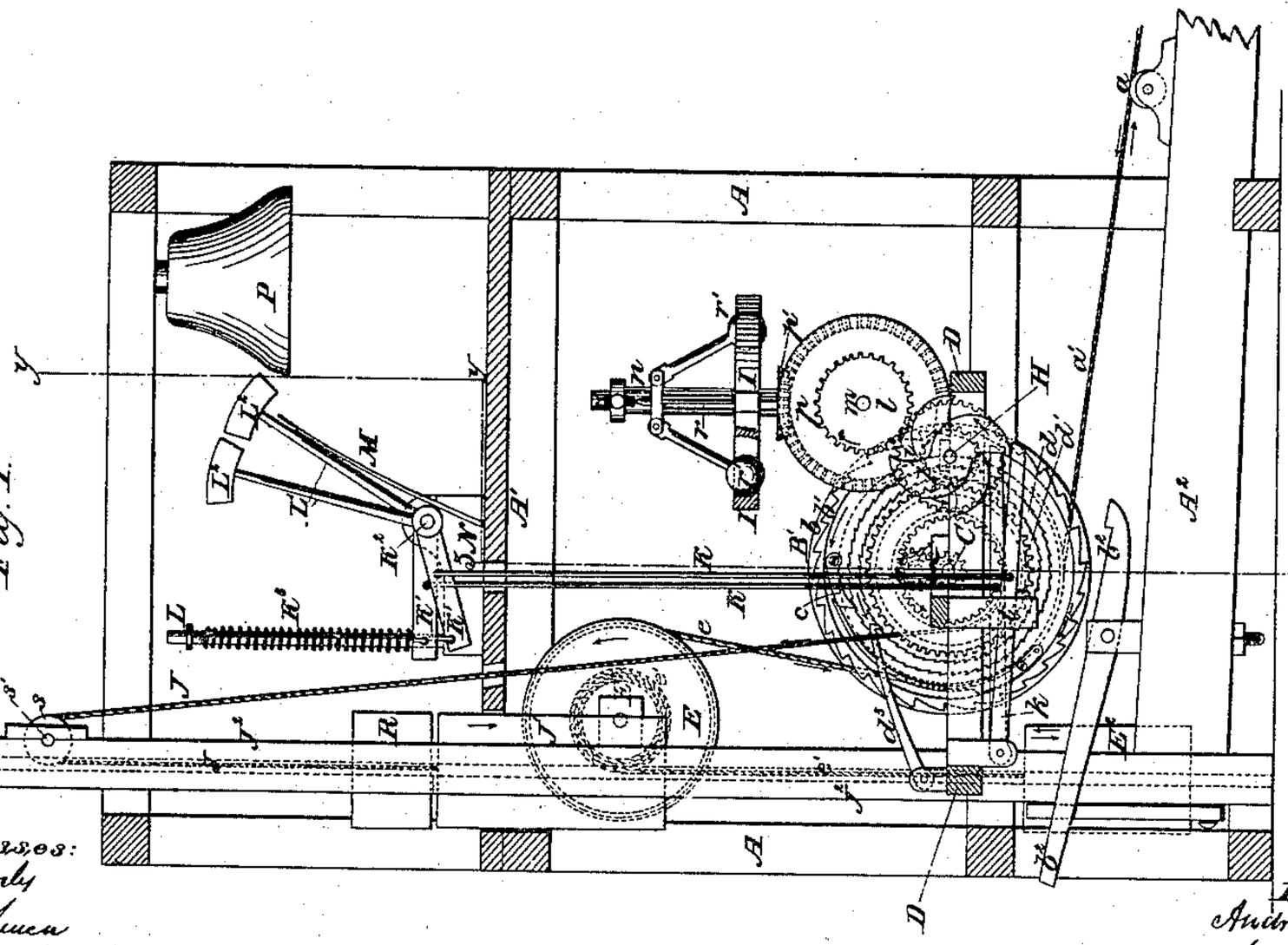

Fig. 1.

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ANDREW MORSE, OF PORTLAND, MAINE.

IMPROVEMENT IN MACHINERY FOR RINGING FOG-BELLS.

Specification forming part of Letters Patent No. **33,156**, dated August 27, 1861.

To all whom it may concern:

Be it known that I, ANDREW MORSE, of Portland, in the county of Cumberland and State of Maine, have invented certain new and useful Improvements in Machinery for Ringing Fog-Bells; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a transverse section through the machinery and the frame-work thereof, taken in the vertical plane indicated by the red line *x x* in Fig. 2. Fig. 2 is a longitudinal section through the same, taken in the vertical planes indicated, respectively, by the red lines *y y* and *z z* in Fig. 1. Fig. 3 shows the buoy and the buoy-rope hanging from the extreme outer end of a beam which is carried out some distance from the machine. Fig. 4 is a plan view of the governor and concentric ring within which it revolves in detail. Fig. 5 is a cross-section taken in the vertical plane indicated by red line *w w* in Fig. 2.

Similar letters of reference indicate corresponding parts in the several figures.

The object of this invention is to keep up a continued ringing of one or more bells by certain mechanism hereinafter to be described, which is operated by the conjoint action of a buoy or float that rises and falls with the surging motion of the waves and certain weights which are wound up by this operation of the buoy, and which are used as a reserve power to ring the bells when the sea is calm and the buoy ceases to act. The bell or bells, together with mechanism for ringing them, are to be properly housed in, so as to be protected from the weather, and the whole will be situated on elevated points on or near dangerous shoals and reefs along the sea-coast to serve as a warning to approaching mariners in foggy weather.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A A represent a frame-work, which is made of a suitable capacity and strength to contain and support the bell and the mechanism for ringing it. Said frame is divided by a floor A′ into an upper and a lower story. The former contains the bell and bell-hammers, and the latter the wheel-work, &c., which operates the hammers. The connection between the bell-hammers and the wheel-work being simply two vertical rods, it will be seen that the bell story or loft may be conveniently carried up a great height above the wheel-work. A strong beam A^2 is carried out from the base of frame A a suitable distance to allow a large buoy B to swing unobstructed from its extreme end in the water below. This beam A^2 is inclined from the frame A toward the water, and at intervals along its upper edge are secured pulleys *a a a*, having grooved peripheries, over which pulleys passes the rope or chain *a′*, which is fastened at one end to the buoy B and at the other to a large flanged barrel B′. The grooves in pulleys *a a a* keep the rope *a′* on the pulleys, and these pulleys allow the rope *a′* to move freely over them as the buoy is made to rise and fall by the surging of the waves.

The barrel B′ has its bearings and turns on a horizontal shaft or axis C, which has its bearings in each side of a strong metal frame D. Frame D is firmly bolted down to horizontal beams of frame A A. Barrel B′ has flanges *b b′* projecting from its periphery on each side, and in the edge of flange *b′* ratchet-teeth are cut, as shown in Figs. 1, 2, and 5, into which a pawl or hooked lever b^2 engages, which is pivoted to the frame A under the barrel B. This pawl b^2 is brought into gear with the ratchet-teeth *b′* only when it is desired to stop the machinery. When it is desired to start the machinery, pawl b^2 must be held in the position shown in Fig. 1. This barrel B′ carries on one side a spring pawl or dog *c*, which engages it with a double-spurred wheel when the barrel is rotated in the direction indicated by the dark arrows in Figs. 1 and 5 of the drawings, as will be hereinafter explained. The rope *a′* passes several times around barrel B′ in the direction shown in Fig. 1 and is secured to this drum. Another rope or chain *e* passes several times around barrel B′, and one end of this rope *e* is fastened to the barrel. The other end of rope *e* is carried up and passed several times around the large wheel E in the direction shown in Fig. 1, and this latter end is made fast to the wheel E. Wheel E is keyed to and turns with an axle E′, which is of less diameter than wheel E, and this axle E′ has its bearings in the frame A, as shown in Figs. 1 and 2 of the drawings. A rope *e′* is secured at one end of axle E′ and passes several times around it,

and the other end of this rope e' is fastened to weight E^2, which has a vertical movement between guides F F. An alternate rotary motion is now imparted to the barrel B′, first, by the rising of the buoy B and the gravity of E^2 acting upon the barrel through the ropes e e' and wheel and axle E E′, then by the depression of this buoy, when the wave subsides, acting upon the barrel B′ through rope a'. The barrel B′ is thus rotated in one direction (indicated by red arrow in Fig. 1) by the weight E^2, when buoy B rises, and in an opposite direction by the weight of the buoy B, when it is allowed to fall. The buoy B should be heavy enough to wind up the weight-cord e' on axle E^2 when it falls, so that when the buoy is raised the weight E^2 will fall a proportionate distance. Now from this description it will be seen that as long as the waves operate upon the buoy B the alternate rotary motion of the barrel B′ will be kept up, and when the sea is calm the motion of barrel B′ will stop.

It is now desired to combine with the barrel B certain mechanism through which this barrel will operate upon the bell-hammers when the sea is rough, and which will at the same time be wound up and its power reserved until the barrel B′ ceases to operate, when said reserved power will then commence to act upon the bell-hammers and ring the bell until the sea becomes rough again. This reserved power will then be again accumulated by the rise and fall of the buoy, thus keeping up a continued ringing of the bell, unless the sea is becalmed, such a length of time as will allow the reserved power to expend itself. To effect these objects I combine with the barrel B′ the following mechanism: The double ratchet-wheel consists of a circular plate with two ratchet-surfaces d d' and the inside gearing d^2. (Shown in Figs. 2 and 5 of the drawings.) This plate or double ratchet-wheel is allowed to turn loosely on its shaft C. The teeth of the smaller wheel d' engage with a pawl d^3, which is pivoted to the frame A, and with the teeth of wheel d engages the pawl or dog c, as before described.

The inside gear-teeth d^2 engage with a pinion spur-wheel g, keyed to a shaft g', which passes eccentrically through the heads of a drum G and carries on its opposite end a pinion g^2, which is of the same diameter as pinion g, as clearly shown in Fig. 2. The drum G has its bearings on shaft C, and this shaft passes loosely through the axis of the drum G. The pinions g g^2 revolve around this shaft C. Pinion g^2 engages with a pinion spur-wheel h on shaft C, and this latter spur-wheel h is secured to and gives motion to a large spur-wheel h', which is also on shaft C. Spur-wheel h' engages with and drives a pinion i, which is keyed to a cam-shaft H, arranged parallel with shaft C and having its bearings in journal-boxes on the frame D. Cam-shaft H carries on one end two sets of cams j j, which are keyed to their shaft and operate alternately upon levers k k, as will be hereinafter described. The large spur-wheel i', which is keyed to cam-shaft H, engages with a spur-wheel l, keyed to a horizontal shaft m, which has its bearings in posts secured to and projecting up perpendicularly from frame D. Horizontal shaft m carries a large bevel spur-wheel p, which engages with a bevel-pinion h' on the spindle r of a ball-governor. (Shown in Figs. 1 and 4 of the drawings.) The governor-balls r' r' are secured to the lower ends of jointed arms in the usual manner, and the balls are allowed to have a free motion when spindle r is rotated. Concentrically with the axis of the governor-spindle r and arranged in a horizontal plane with the balls r r is a ring I, which is secured in a stationary manner to posts n. The inner edge of concentric ring I is concave, and the balls r' r' are thrown against this interior surface of the ring I by their centrifugal action and bear against this ring in their revolution with a force proportionate to the speed of the spindle r. The friction of these balls against the concave surface of ring I will thus increase or diminish, according to the speed imparted to the spindle r, and this friction will equalize and control the motions of the drum G and its train of wheel-work.

J is a rope or chain, one end of which is secured to drum G and the other end to a weight J′. Rope J passes several times around the drum G in the direction shown in Fig. 1 and is carried up through floor A′ as high as it may be found desirable and passed over a grooved pulley s, turning loosely on a horizontal bar s', which is secured across the top of two vertical guides J^2 J^2, between which the weight J′ works up and down. These guides J^2 J^2 may be carried down below the base of the frame A A as far as it is found convenient, the object being to give as much scope as possible to the vertical movement of weight J.

Levers or arms k k work up and down in a guide-box t, and to these arms k the lower ends of long connecting-rods K K are pivoted, as shown in Figs. 1 and 2 of the drawings. These rods K K are carried up through holes through floor A′ and connected to arms K′ K′, which are secured to a rock-shaft K^2. To arms K′ K′ springs K^3 K^3 are attached, the upper ends of which are attached to a cross-bar of upright frame D. These springs K^3 K^3 keep the free ends of the arms k k under frame D up against the cams j j and give a quick upward movement to the arms K′ K′.

L′ L′ are the hammer-rods which are secured to shaft K^2, and L^2 L^2 are the hammers on the uppermost ends of rods L L.

M M are straight springs which are secured to metal frame N at a point under shaft K^2. These springs are in an inclined position, and their upper ends approach very near to the bell P. The hammer-rods L′ L′ strike against the ends of springs M M, and these springs are so arranged that the hammers L^2 L^2 can-

not strike the bell without first striking them and causing them to yield toward the bell. The springs M M will thus allow the hammers to strike the bell; but they will cause them to rebound instantly from the bell to allow the bell to make a loud and full sound.

The operation of the entire machine above described is as follows: Let it be supposed that buoy B is rising and falling by the surging motion of the waves. As the buoy rises the weight E^2 falls by its own gravity and causes the wheel E to wind up rope *e* and unwind this rope from barrel B′, thus rotating this barrel B′ in the direction indicated by red arrow in Fig. 1 and causing it to wind up the slack in rope *a′*. When the waves allow buoy B to fall, its weight, which is greater than that of E^2, will unwind rope *a′* from barrel B′ and wind up weight *e′*, thus rotating barrel B′ in the opposite direction, or that indicated by the dark arrow in Fig. 1. These two motions of barrel B′ will continue as long as the waves give the rising and falling movement to the buoy B. The small pawl (lettered *c*) and shown clearly in Figs. 1 and 5 of the drawings engages the barrel B′ with the double ratchet-wheel *d d′* and turns this wheel when the barrel is turned in the direction indicated by the black arrows in Figs. 1 and 5—that is, when the barrel B′ is turned in the opposite direction (when buoy B rises) the stationary pawl d^3 prevents the double ratchet-wheel *d d′* from turning with the barrel. The pinion spur-wheel *g* engages with the inside gearing d^2 on wheels *d d′*, and the pinion-spur g^2 on the opposite end of shaft *g′* engages with and transmits motion to the wheels *h* and *h′* on the shaft C. The axle *g′* passes through and has its bearings in the heads of drum G, as before described, and when the wheel *d d′* is rotated by the pawl *c* on barrel B the pinions *g* g^2 will revolve around the shaft C and turn the drum G in the same direction as the wheel *d d′* and the barrel B turn. This will wind up the rope J upon drum G and raise weight J′ a certain distance. Now when the buoy B rises and the barrel B′ is rotated by the action of weight E^2 upon it the wheel *d d′* is not acted upon by pawl *c*, but remains stationary, it being held by pawl d^3. The drum G is now acted upon by the weight J′, and this drum turns slowly as the weight descends. Wheels *g* g^2 now revolve around shaft C, and the wheel g^2 will rotate wheels *h h′*, which in their turn give motion to the spur-wheel *i′* and cam-shaft H, and the pinion *i′* on shaft H gives motion to the governor-spindle *r* through the medium of wheels *l*, *p*, and *p′*, as before described. As the cams *j j* alternately depress levers *k k* and release them, springs K^3 K^3 lift these levers quickly. The springs K^3 K^3 also act upon the bell hammers L^2 L^2 through arms K′ K′ and rock-shaft K^2, as before described, and the bell is thus sounded four times to each revolution of cam-shaft H. When the block J′ has been wound up to a certain height, its weight is augmented by a secondary block R to such a degree as to suspend the buoy B to the top of the highest swells. Consequently the machinery is being operated directly from buoy B, which will not settle down sufficiently into the trough of the sea to be much exposed before the top of the next swell will elevate it again. Block R also serves to protect block J′ from coming in contact with the cross-girt above too suddenly.

It will be seen from the above description that drum G is constantly acted upon by the weight J′, and that this weight also acts through the medium of drum G upon spur-wheels *g* g^2 and *h h′* and causes them to turn the cam-shaft H, the speed of which shaft is equalized by the friction of ring I on governor-balls *r′ r′*. When barrel B′ turns in the direction indicated by black arrow in Figs. 1 and 5 faster than the governor will allow drum G to turn, the cord J will be wound upon the drum G, and at the same time the wheels *g* g^2 will be rotated by the gearing d^2 of wheels *d d′*. The weight J′ is in this manner kept in motion, and a certain amount of the cord J is wound upon drum G at every downward movement of the buoy B. Then when buoy B rises the weight J′ acts upon drum G and descends a short distance. The relative movements of the wheels and drums are so regulated, however, that weight J′ is kept in a very elevated position, so that should the buoy cease to operate upon it this weight will continue to keep the bell movements in motion for a proper length of time, if possible, until the buoy B is again put in motion by the surging of the waves. When the buoy commences to operate weight J′ will soon be wound up to the secondary weight R again. In this manner and by the above-described mechanism I am enabled to keep a bell constantly ringing, unless the sea is becalmed such a length of time as will allow the weight J′ to run entirely down; but as the scope of movement of the weight J′ can be made very great and as this weight moves down very slow the machine can be constructed to run several days, if not weeks, by the operation of the weight J′ alone.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. Combining with the barrel B′, buoy B, cord *a′*, cord *e*, wheel and axle E E, and weight E^2 the double ratchet-wheel *d d′*, pawls *c* d^3, inside gear d^2, pinions *g* g^2, drum G, and weight J, all arranged and operating substantially as herein described for maintaining a constant motion of the bell movements.

2. The secondary weight R, in combination with weight J′, operating as and for the purposes described.

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