E. K. MACKINTOSH.

MECHANISM FOR OPERATING A HAND OF A DIAL.

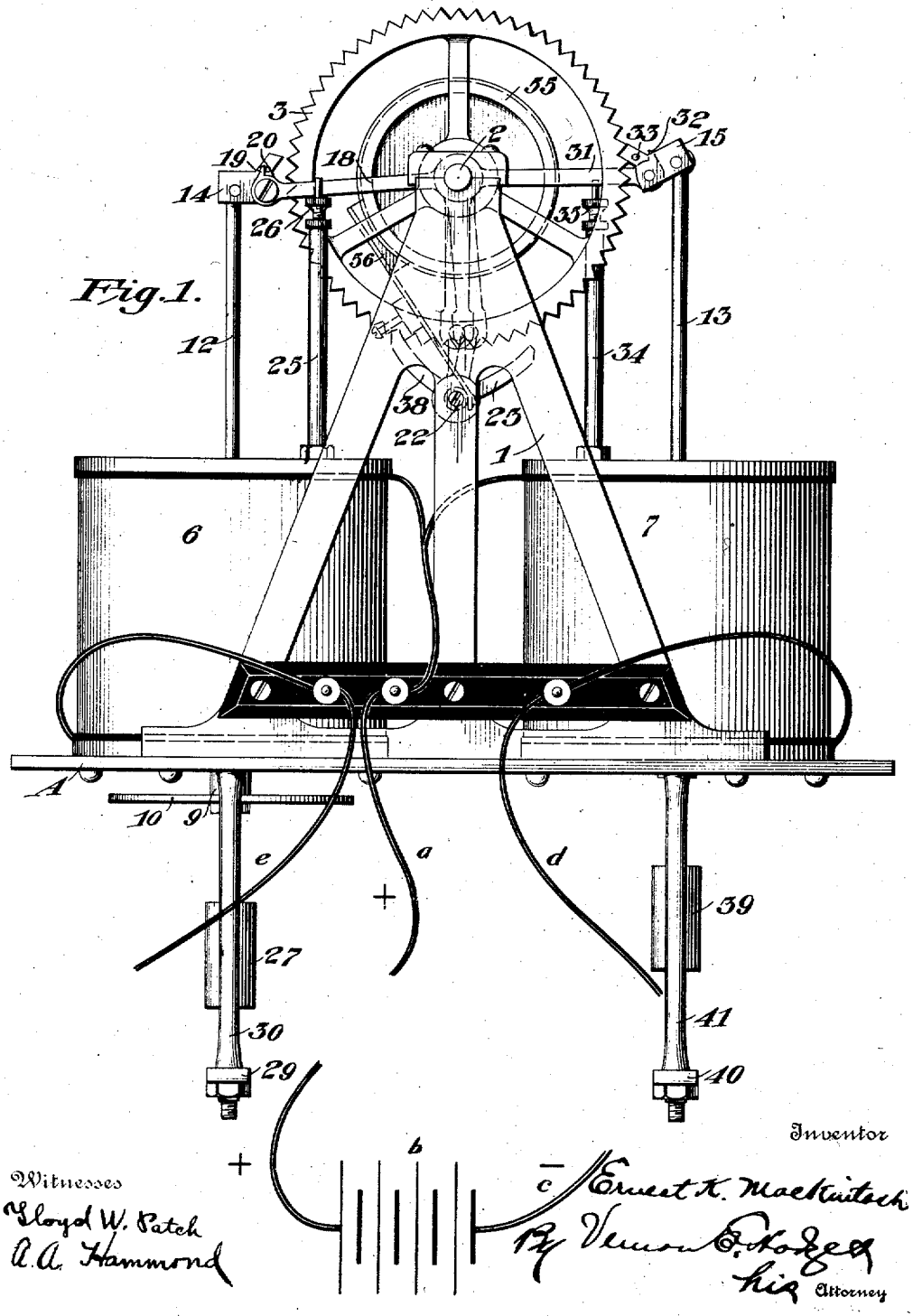
APPLICATION FILED DEC. 16, 1909.

1,019,065.

Patented Mar. 5, 1912.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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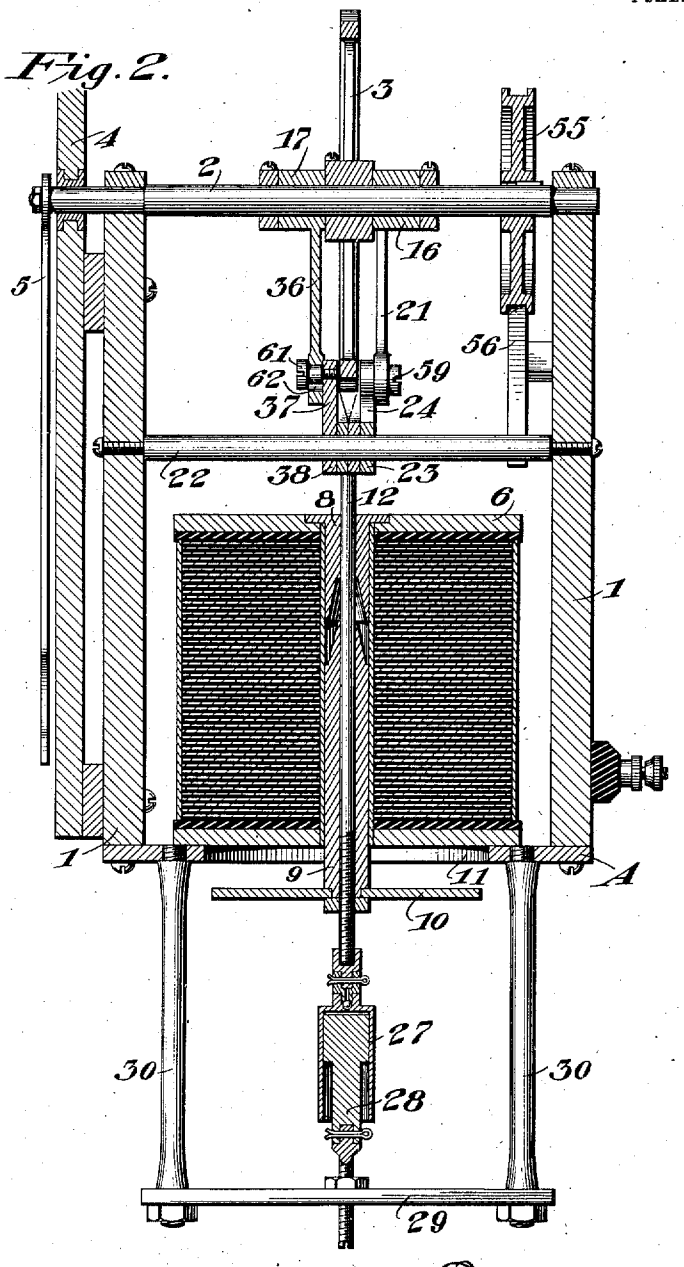
4 SHEETS—SHEET 2.

Fig. 2.



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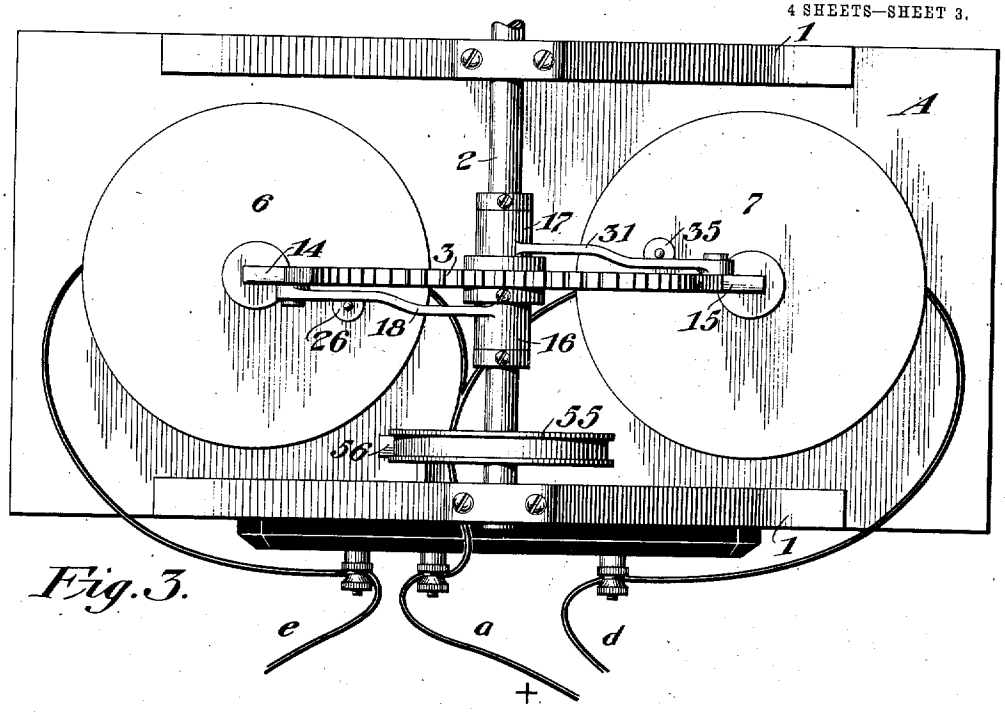

Fig. 3.

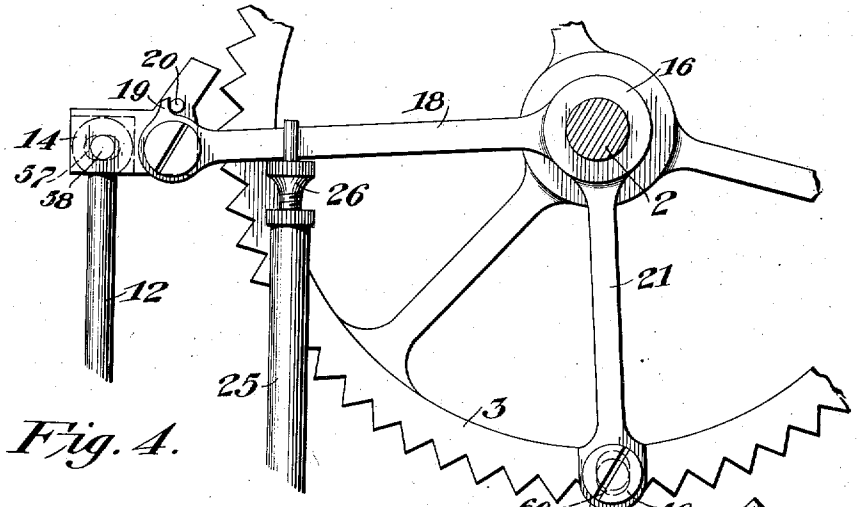

Fig. 4.

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4 SHEETS—SHEET 4.

Fig. 5.

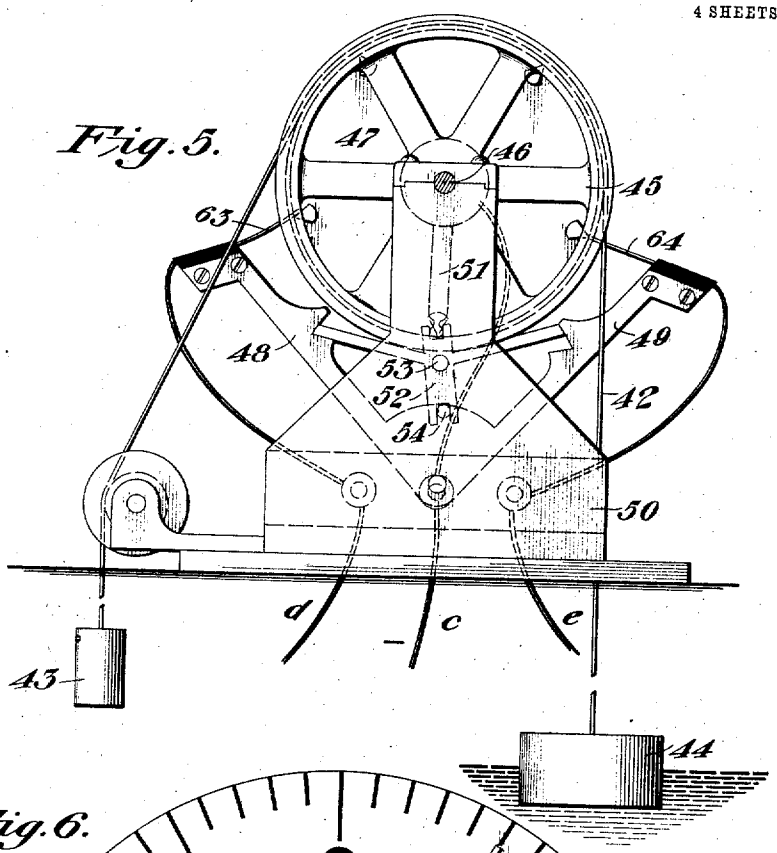
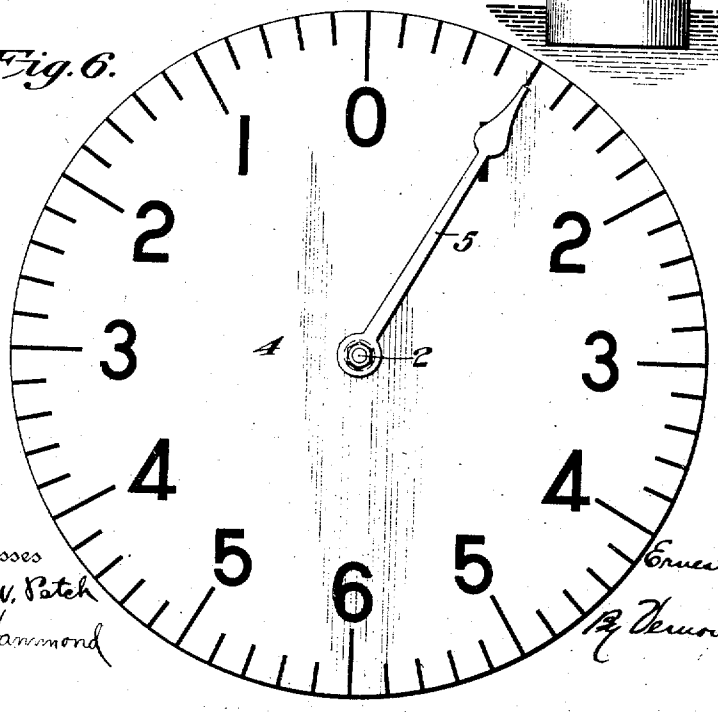


Fig. 6.



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UNITED STATES PATENT OFFICE.

ERNEST K. MACKINTOSH, OF WASHINGTON, DISTRICT OF COLUMBIA.

MECHANISM FOR OPERATING A HAND OF A DIAL.

1,019,065. Specification of Letters Patent. Patented Mar. 5, 1912.

Application filed December 16, 1909. Serial No. 533,319.

To all whom it may concern:

Be it known that I, ERNEST K. MACKINTOSH, a citizen of the United States, residing in the city of Washington, District of Columbia, have invented certain new and useful Improvements in Mechanism for Operating a Hand of a Dial, of which the following is a specification.

My invention relates to an improvement in mechanism for operating a hand of a dial, and the object is to provide means which will cause the hand to be moved upon the dial for indicating the level of a liquid or body which may be at any distance from the dial.

The invention is adapted more particularly to water-ways where it is desired to ascertain the height of the rising or receding water. As the water rises the hand will be caused to move in one direction upon the dial, and as the water recedes the hand will be caused to operate in another direction or in an opposite direction.

The invention consists of certain novel features of construction and combinations of parts which will be hereinafter described and pointed out in the claims.

In the accompanying drawings:—Figure 1 is a view in elevation; Fig. 2 is a vertical sectional view; Fig. 3 is a top plan view; Fig. 4 is a side elevation showing the manner of mounting the pawls which are adapted to engage the ratchet wheel; Fig. 5 is a view in elevation of the switch mechanism; and Fig. 6 is a view of the dial.

A represents the base, and 1, 1, are standards mounted thereon, upon which is journaled a shaft 2. Securely mounted upon the shaft 2 is a ratchet wheel 3. A dial 4 is mounted upon the upright 1, through which the shaft 2 extends, and a hand 5 is mounted upon the shaft, which is adapted to move upon the face of the dial 4 as the shaft is caused to rotate by the movement of the ratchet wheel 3.

Mounted upon the base A are solenoids 6 and 7, each of which is provided with a stationary core 8 and a movable armature 9. The base or lower end of the stationary core is recessed to receive the tapered end of the armature 9. This formation affords a greater attraction between the stationary cores and the armatures. Connected to the base of the movable armature is an iron disk 10 which adds to the attractive force of the solenoid, thereby affording means for assisting the armature in carrying the load, the disk 10 being received through openings 11 formed in the base A. Mounted in the movable armature, and extending through the stationary core of the solenoid 6 is an adjustable armature rod 12, and a similar adjustable armature rod 13 is mounted in the movable armature of the solenoid 7. The upper end of the armature rod 12 is provided with a slot 57. A pawl 14 is mounted upon the rod 12 and a pin 58 passes through the pawl and slot 57, in the rod 12, for forming the pivotal connection between the rod and pawl. The slot is disclosed in Fig. 4, and the object is to allow for the slight lateral movement of the pin 58 upon the operation of the pawl.

Loosely mounted upon the shaft 2 and on each side of the ratchet wheel 3, are hubs 16 and 17. The hub 16 is provided with an arm 18 which is pivotally connected to the pawl 14. An abutment or lug 19 is formed on the arm 18 which engages a pin 20 on the pawl 14 for limiting the rearward movement of the pawl 14, and for insuring the downward movement of the arm 18. As the pawl 14 is caused to be lowered or withdrawn from the ratchet wheel 3, pin 20 will engage the lug 19 and cause the arm 18 to be drawn downwardly. An arm 21 is connected to the hub 16 and extends approximately at right angles to the arm 18. A shaft 22 is mounted upon the standards 1, and mounted thereon is a pawl 23, which is provided with a shank 24 which is connected to the arm 21 by a screw or pin 59 which passes through a slot formed in the arm 21, the slot being shown in dotted lines in Fig. 4 at 60. A rod 25 is mounted upon the solenoid 6 and is provided with an adjustable head 26, upon which head the arm 18 rests, and the adjustment of the head 26 regulates the movement of the arms 18 and 21. The armature rod 12 is connected at its lower end to the cylinder 27 of the dash-pot, the piston 28 of which is adjustably supported upon a bar 29, which bar is supported upon a base A by rods 30, 30. The dash-pot acts as a cushion for the armature rod on the downward stroke and to prevent hammering on the upward stroke of the armature rod. The armature rod 12 has a screw-threaded engagement with the armature 9 for the purpose of adjusting the stroke of the rod 12. The adjustment of the piston 28 of the dash-pot, and the adjust-

ment of the armature 9 on the rod 12, admits of the regulation of movement of the armature rod 12, therefore a corresponding adjustment must necessarily be made with the head 26 of the rod 25.

The hub 17 is provided with an arm 31 which is pivotally connected to the pawl 15. The pawl 15 is similarly mounted upon the armature rod 13 as the pawl 14 is mounted upon the armature rod 12, whereby the pawl 15 will be capable of the same action as the pawl 14. An abutment or lug 32 is formed upon the arm 31 which is adapted to engage the pin 33 on the pawl 15 for limiting the outward movement of the pawl, and for insuring the downward movement of the arm 31. The pawl 15 will be caused to move out of engagement from the ratchet teeth of the wheel 3 upon the lowering of the rod 13, and as the rod continues to move downwardly, the pin 33 on the pawl will be engaged by the lug 32 on the arm 31, and the arm caused to be drawn downward as the pawl continues to move in a downward direction. A post 34 is mounted upon the solenoid 7, and is provided with an adjustable head 35 for supporting the arm 31 when the pawl 15 is out of engagement with the ratchet wheel 3. An arm 36 is connected to the hub 17, and extends practically at right angles to the arm 31. The arm 36 is connected to the shank 37 by a pin or screw 61 which passes through a slot 62 in the arm 36. The shank 37 is mounted upon the shaft 22 and is provided with a pawl 38 which is adapted to engage the ratchet teeth of the ratchet wheel 3. The slot 62 allows the arm 36 to have a slight lateral movement for insuring the pawl 38 engaging the ratchet teeth. The armature rod 13 is provided with a similarly constructed dash-pot as that disclosed in Fig. 2, which is applied to the armature rod 12, the dash-pot 39 of the armature rod 13 being supported upon a base 40 connected to rods 41, 41, which are connected to the base A.

A friction wheel 55 is mounted upon the shaft 2, and engaging the wheel is a spring 56 which acts as a brake for holding the ratchet wheel in the position to which it has been moved by the operation of the armature rods 12 and 13.

In Fig. 5 I have shown a switch mechanism which can be used in connection with the above described device for causing the proper operation of the rods 12 and 13. A belt 42 is connected to weight 43 and float 44, the belt 42 passing over a pulley wheel 45 which is mounted upon a shaft 46. Mounted upon the shaft 46 is a contact disk 47. Brush arms 48 and 49 are pivotally mounted upon the frame 50 which supports the shaft 46, and an arm 51 which is mounted upon the shaft 46 is adapted to actuate the plate 52 for causing the brush arms 48 and 49 to be operated, the plate 52 being pivotally mounted upon the shaft 53 and engaging the pin 54 upon the brush arms 48 and 49, the arm 51 engaging the upper end of the plate 52 for causing the movement of the plate. A positive wire *a* leads from the solenoids 6 and 7 to a battery *b*, and a negative wire *c* leads from the battery *b* to the contact disk 47. A wire *d* leading from the solenoid 7 connects with the contact brush 63 of brush arm 48, which brush is insulated from the arm 48, and wire *e* leads from the contact brush 64 of brush arm 49 to the solenoid 6.

Assuming that the water is receding, and that the brush 63 of brush arm 48 is in engagement with a contact of the contact wheel 47, an electric circuit would be completed from battery *b* through the wire *c* to the disk 47, thence through brush 63 of brush arm 48, through the wire *d* to the solenoid 7 and to the battery *b* by conductor *a*. As the current passes through the wires *c*, *a*, and *d*, the armature 9 and disk 10 of the solenoid 7 would be attracted, causing the armature rod 13 to move upward, forcing the pawl 15 into engagement with a tooth of the ratchet wheel 3. As the armature rod 13 continues to move, the ratchet wheel 3 will turn until the stroke of the rod 13 is completed. When arm 31 of the hub 17 is raised, a corresponding movement of the arm 36 causes the pawl 38 to engage the ratchet teeth of the wheel 3 for preventing the further movement of the wheel due to the momentum acquired. As arm 36 moves in conjunction with arm 31, its movement begins after the pawl 15 has engaged a tooth of the ratchet wheel 3, and as a further impulse or movement of the armature rod 13 causes the ratchet wheel to move, and arm 31 is caused to rise, the movement of arm 36 actuates the pawl 38, causing the pawl to engage a tooth of the ratchet wheel 3, affording a positive stop for the ratchet wheel at the conclusion of the stroke of armature 10. The pulley wheel 45 moving by the weight of the float will draw the contact point of disk 47 out of engagement with contact brush 63 of brush arm 48. This will break the circuit, release the armature rod 13, causing the pawl 15 to be withdrawn from the teeth of the ratchet wheel, the arm 31 to fall upon the head 35 of the rod or post 34, and pawl 38 to be disengaged from the ratchet wheel. Arm 31 now rests upon the head 35. Pawls 15 and 38 are both out of engagement with the ratchet wheel 3, and to prevent the shaft 2 from accidental rotation, the spring 56 which engages the friction wheel 55 will hold and retain the shaft in the position in which it has been turned by the movement of the ratchet wheel. The movement of the shaft has caused the hand 5 of the dial 4 to be moved for indicating the depth of the water.

The dial which I have disclosed has a scale of two-tenths of a foot of water per division, and the hand is now indicating, as shown in Fig. 6, the measurement upon the side of the dial which indicates the receding or lowering of the water. If the water continues to recede, another contact point of disk 47 will be brought into engagement with the brush of the brush arm 48, and the above action repeated, causing the hand to move upon the dial another two-tenths of a foot. Assuming that the water should rise, the float would move upward, causing the pulley wheel 45 to move in the opposite direction, thereby rotating the shaft 46. The rotation of the shaft 46 would move the arm 51, which would actuate the plate 52, and the plate 52 would cause the brush arm 48 to be moved away from the disk 47 and the brush 64 of the brush arm 49 to be moved into engagement so that the brush would engage the contacts of the disk 47 as the disk is rotated upon the rotation of the shaft 46. We will therefore assume that the brush 64 is in contact with one of the contact points of the disk 47. The circuit would then be completed through the wires *c*, *e*, and *a*, giving electrical impulse to the solenoid 6. The armature 9 and disk 10 of the solenoid 6 would be attracted, causing the rod 12 to be moved upwardly, causing the pawl 14 to engage a tooth of the ratchet wheel 3. The armature 12 continuing to move upward would cause the wheel 3 to be turned, and arm 18 of the hub 16 to be raised, which would cause the arm 21 of the hub 16 to be moved for actuating the pawl 23, causing the pawl to engage a tooth of the ratchet wheel. The shaft 2 has now been rotated a sufficient amount to cause the hand to be moved a point upon the dial, indicating that the water is rising. The pulley wheel 45 continuing to move will break the contact between the contact points and the brush 64. This will cause the armature rod 12 to drop, thereby releasing the pawls 14 and 23 from engagement with the wheel 3. The pawl 14 will not engage the ratchet wheel again until the brush 64 comes in contact with a contact point of the disk 47, when the same operation will be repeated.

From the foregoing, it will be seen that the pawls 14 and 15, as well as the pawls 23 and 38 are actuated upon the movement of the armature rods 12 and 13. The pawl 14 is caused to engage the ratchet wheel 3 for rotating it when the water is rising, and the pawl 15 engages the ratchet wheel for moving it in an opposite direction when the water is receding. It is therefore desirable that after the ratchet wheel has been moved, it should be caused to stay or remain in the position to which it has been forced upon the actuation of the armature rod 12 or 13. To illustrate, we will assume that the water is rising, and that the armature rod 12 has received an electrical impulse, causing it to move upward. The pawl 14 has a loose pivotal connection with the armature rod 12, and a pivotal connection with the arm 18, which allows the pawl to engage a tooth before the arm 18 is moved. After the pawl 14 has engaged a tooth of the ratchet wheel and as armature rod 12 continues to move upward, the arm 18 and wheel 3 are caused to move. The movement of the arm 18 causes the arm 21 to move. The arm 21 having a loose pivotal connection with the shank 24, causes the shank to be moved for throwing the pawl 23 into engagement with a tooth of the ratchet wheel to retard the rotation of the ratchet wheel.

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

1. In an indicator, the combination with electro-magnets having armature rods, said rods having slots formed in the upper ends thereof, of a shaft, a wheel mounted on the shaft, pawls, pins connected to the pawls received in the slots in the rods for pivotally and loosely connecting the pawls to the armature rods, said pawls adapted to engage the wheel for causing the shaft to be rotated, and indicating means operated upon the rotation of the shaft.

2. In an indicator, the combination with electro-magnets having armature rods, said rods having slots formed in the upper ends thereof, of a shaft, a wheel mounted on the shaft, pawls, pins connected to the pawls received in the slots in the rods for pivotally and loosely connecting the pawls to the armature rods, said pawls adapted to engage the wheel for causing the shaft to be rotated, indicating means operated upon the rotation of the shaft, and means for transmitting motion to the armature rods, whereby upon the operation of one armature rod, the shaft is moved in one direction, and upon the operation of the other armature rod, the shaft is moved in a reverse direction.

3. In an indicator, the combination with electro-magnets, having armature rods, of a shaft, a wheel mounted upon the shaft, pawls pivotally and loosely mounted on the armature rods adapted to engage the wheel for causing the shaft to rotate, indicating means operated upon the operation of the shaft, means for transmitting motion to the armature rods whereby upon the operation of one armature rod, the shaft is moved in one direction, and upon the operation of the other armature rod the shaft is moved in a reverse direction, and means for holding the shaft against movement only when the pawls are out of engagement with the wheel.

4. In an indicator, the combination with

electro-magnets having armature rods, of a shaft, a wheel upon the shaft, indicating means operated by the shaft, means upon the armature rods for rotating the wheel, and means operated by the armature rods for engaging the wheel to limit the forward rotation of the wheel.

5. In an indicator, the combination with electro-magnets having armature rods and pawls on the rods, of a shaft, a wheel engaged by the pawls for rotating the shaft, indicating means operated by the shaft, an arm mounted on the shaft connected to the armature rod, and a pawl on the arm adapted to engage the wheel upon the operation of the armature rod for limiting the forward movement of the wheel.

6. In an indicator, the combination with electro-magnets having armature rods and pawls on the rods, of a shaft, a wheel mounted on the shaft engaged by the pawls for rotating the shaft a predetermined distance, means operated by the armature rods for engaging the wheel for retarding the forward movement of the wheel, and indicating means operated upon the operation of the shaft.

7. In an indicator, the combination with electro-magnets having armature rods and pawls on the rods, of a shaft, a wheel mounted upon the shaft adapted to be engaged and operated by the pawls, and means operated by the armature rods for engaging the wheel to limit the forward rotation of the wheel.

8. In an indicator, the combination with electro-magnets having armature rods, of a shaft, a wheel mounted upon the shaft, pawls pivotally connected to the armature rods adapted to engage the wheel for operating the shaft, arms connected to the pawls, and pawls connected to the arms for limiting the movement of the wheel.

9. In an indicator, the combination with electro-magnets having armature rods, of a shaft, a wheel mounted on the shaft, pawls on the armature rods adapted to engage the wheel for causing the shaft to be rotated, and means for engaging the wheel for limiting the rotation of the wheel, said means adapted to engage the wheel after the pawl has engaged the wheel and the wheel has been caused to move.

10. In an indicator, the combination with a shaft having a ratchet wheel thereon, of electro-magnets having armature rods, pawls on the rods adapted to engage the wheel for causing the rotation of the shaft, hubs mounted on the shaft, arms on the hubs, one arm of each hub engaging an armature rod, and a pawl connected to each of the remaining arms which said pawls are adapted to engage the wheel to limit the movement of the wheel, and posts for supporting the arms when idle.

11. In an indicator, the combination with a shaft having a ratchet-wheel thereon, of electro-magnets having armatures, pawls on the armatures adapted to engage the wheel for causing the rotation of the shaft, hubs mounted on the shaft, a plurality of arms on the hubs, one arm of each hub connected to an armature, and pawls connected to the remaining arms of each hub to limit the movement of the wheel.

In testimony whereof I affix my signature, in the presence of two witnesses.

ERNEST K. MACKINTOSH.

Witnesses:
C. A. NEALE,
WATTS F. ESTABROOK.