

P. 52

2

Feb. 5, 1924.

A. B. BUCKLEY

1,482,968

TRANSMITTER FOR ELECTRIC RECORDING AND SIGNALING SYSTEMS

Filed June 14, 1921

6 Sheets-Sheet 1

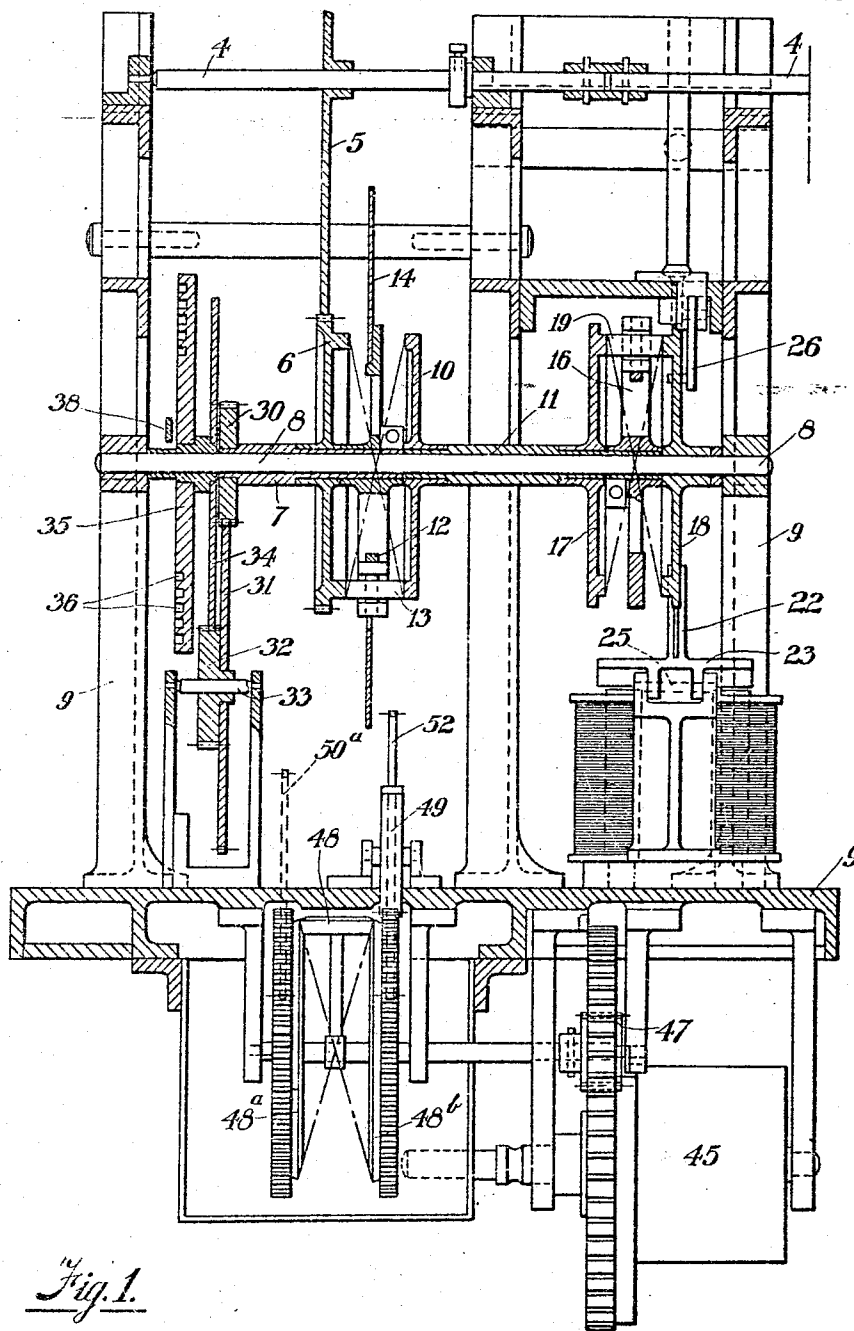


Fig. 1.

Inventor-
Arthur Burton Buckley,
By B. Singer, Attor.

Feb. 5, 1924.

A. B. BUCKLEY

1,482,968

TRANSMITTER FOR ELECTRIC RECORDING AND SIGNALING SYSTEMS

Filed June 14, 1921

6 Sheets-Sheet 2

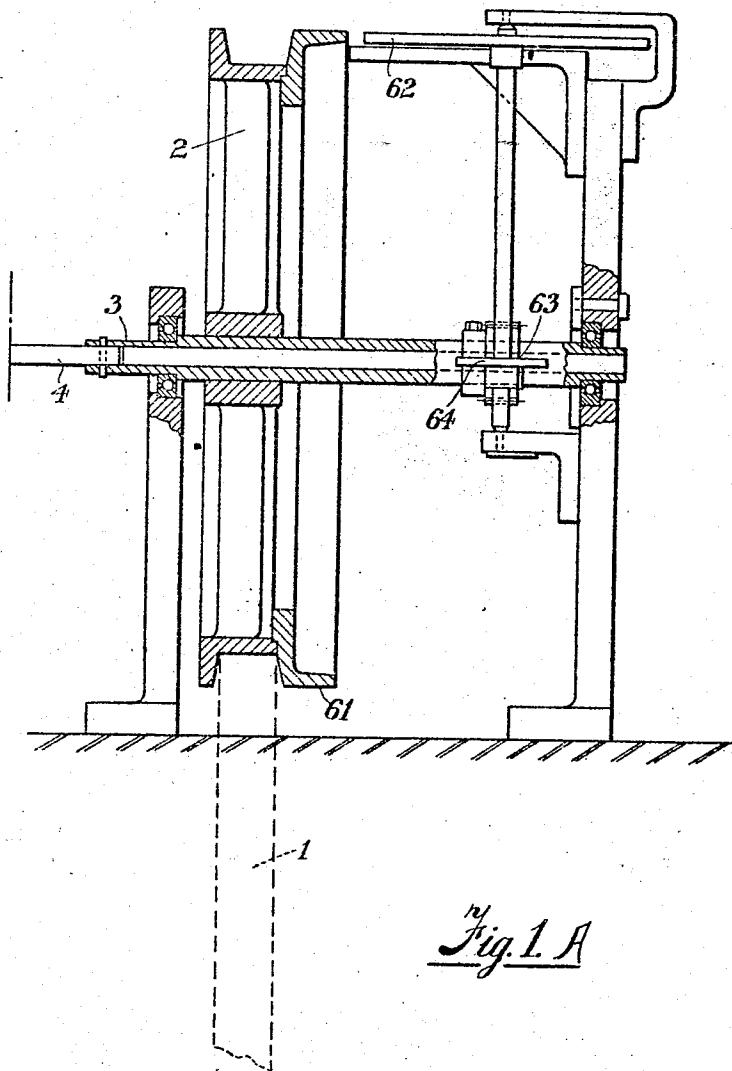


Fig. 1 A

Inventor.
Arthur Burton Buckley.
By B. Singer, Atty.

Feb. 5, 1924.

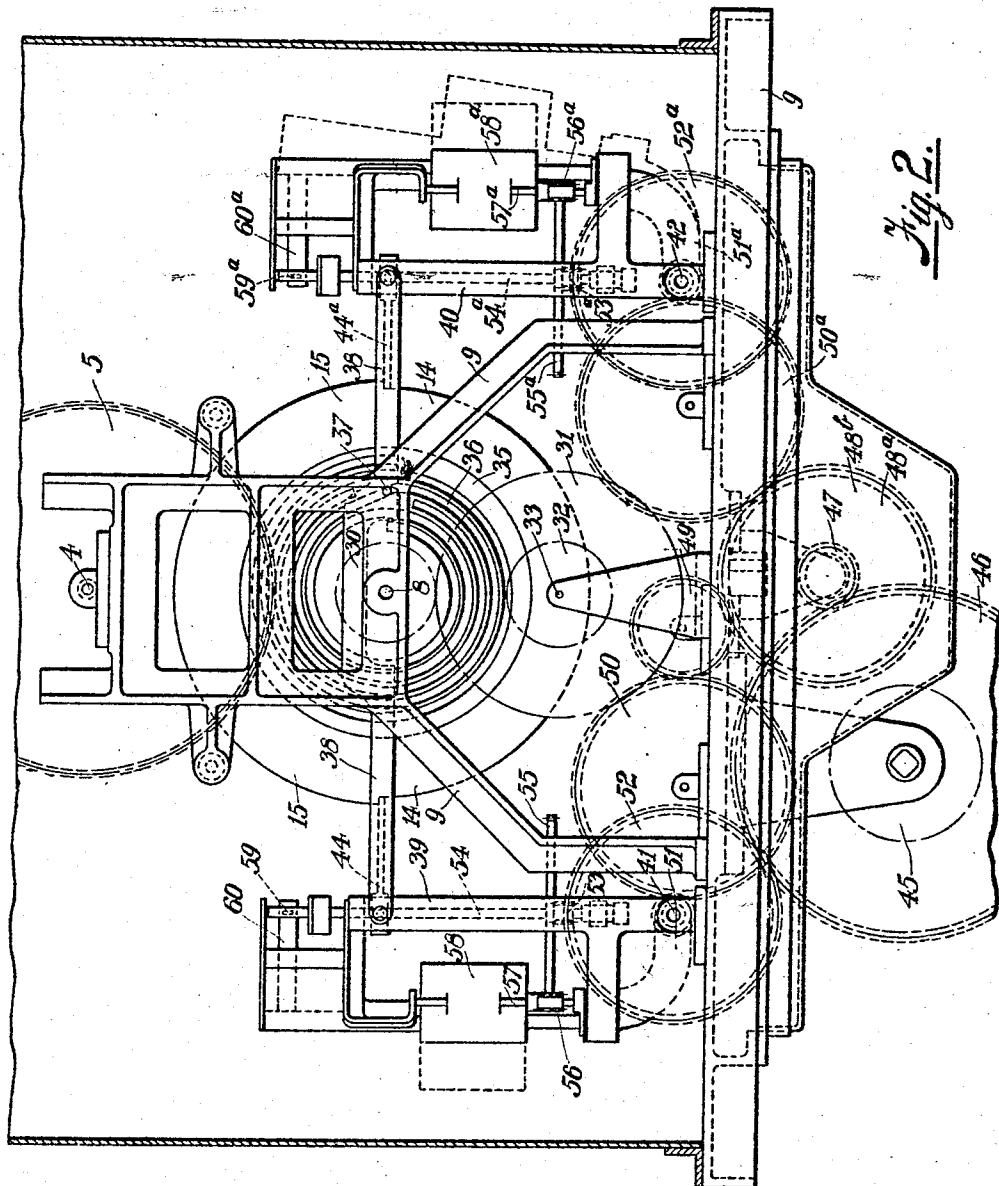
A. B. BUCKLEY

1,482,968

TRANSMITTER FOR ELECTRIC RECORDING AND SIGNALING SYSTEMS

Filed June 14, 1921

6 Sheets-Sheet 3



Inventor-
Arthur Burton Buckley
By B. Snijer, Att.

Feb. 5, 1924.

A. B. BUCKLEY

1,482,968

TRANSMITTER FOR ELECTRIC RECORDING AND SIGNALING SYSTEMS

Filed June 14, 1921

6 Sheets-Sheet 4

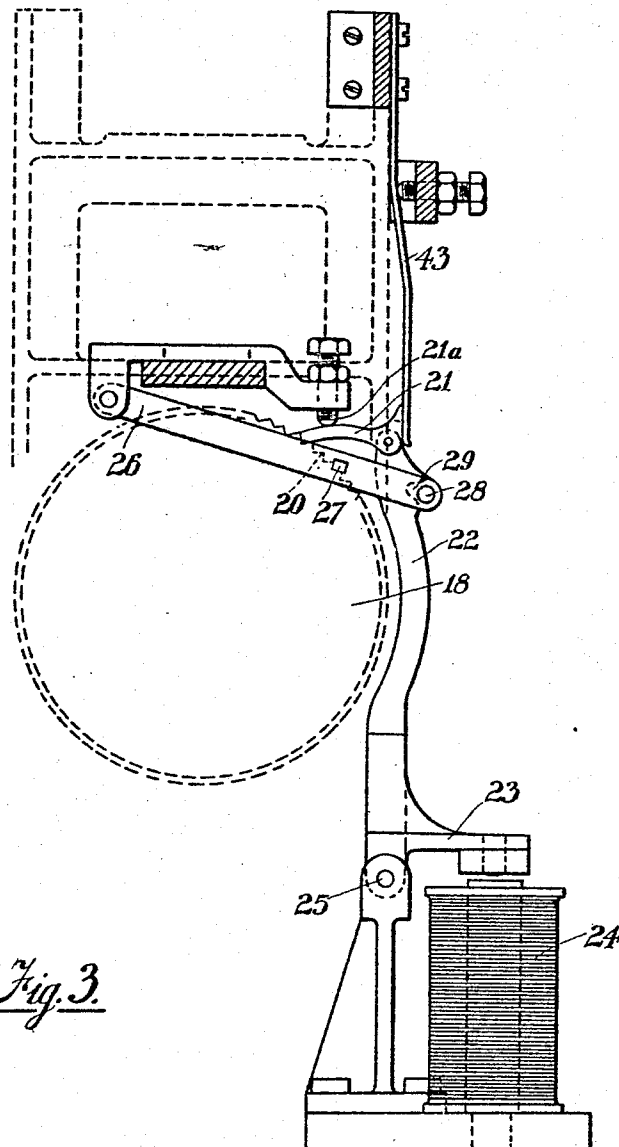


Fig. 3.

Inventor
Arthur Barton Buckley
By S. Singer
Att'y

Feb. 5, 1924.

A. B. BUCKLEY

1,482,968

TRANSMITTER FOR ELECTRIC RECORDING AND SIGNALING SYSTEMS

Filed June 14, 1921

6 Sheets-Sheet 5

Fig. 4

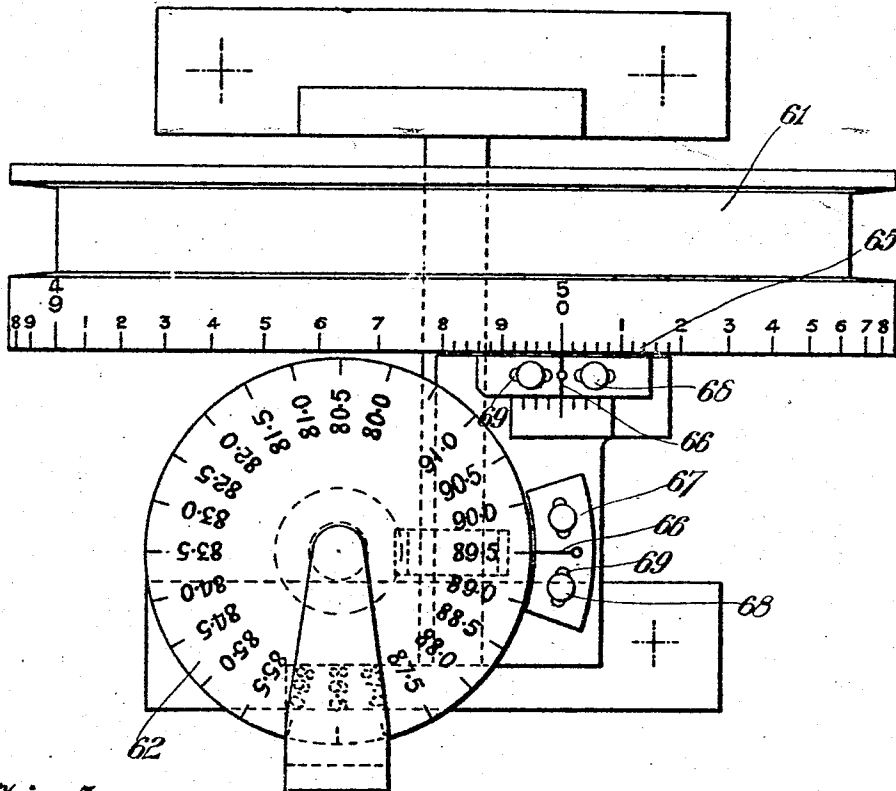
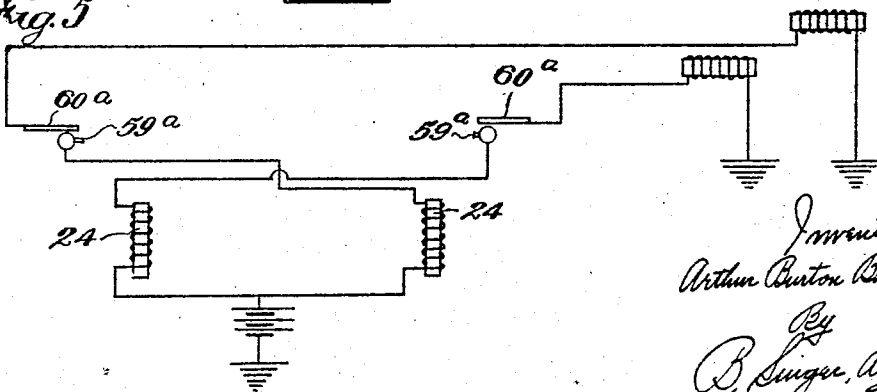


Fig. 5



Inventor.
Arthur Benton Buckley
By
B. Singer, Att'y.

Feb. 5, 1924.

A. B. BUCKLEY

1,482,968

TRANSMITTER FOR ELECTRIC RECORDING AND SIGNALING SYSTEMS.

Filed June 14, 1921

6 Sheets-Sheet 6

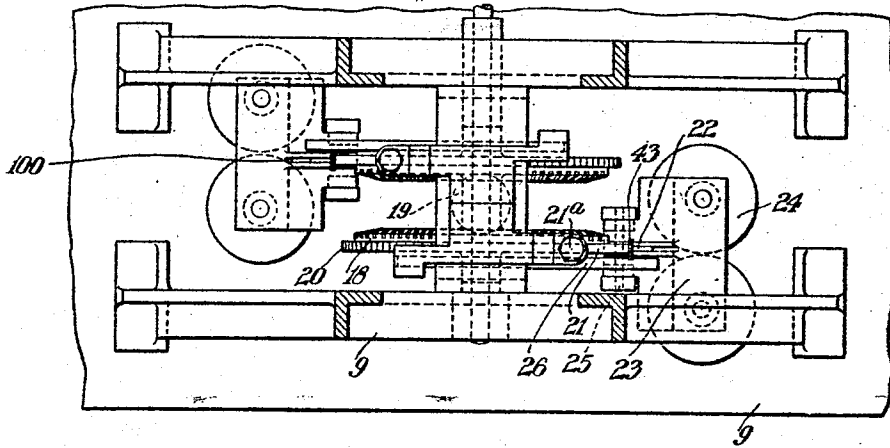


Fig. 6.

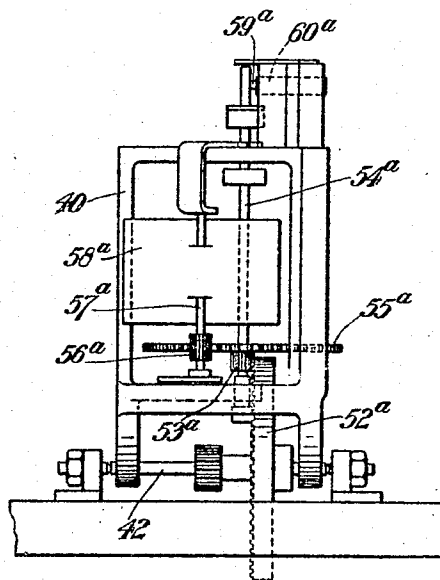


Fig. 7.

Inventor
Arthur Guston Buckley
by B. Singer
Atty

UNITED STATES PATENT OFFICE.

ARTHUR BURTON BUCKLEY, OF CAIRO, EGYPT.

TRANSMITTER FOR ELECTRIC RECORDING AND SIGNALING SYSTEMS.

Application filed June 14, 1921. Serial No. 477,549.

To all whom it may concern:

Be it known that I, ARTHUR BURTON BUCKLEY, a subject of the King of Great Britain, residing at Ma'adi, Cairo, Egypt, have invented new and useful Means in or Relating to Transmitters for Electric Recording and Signaling Systems (for which I have filed an application in Great Britain, February 20, 1920, No. 5173, patented September 20, 1920, #163,773), of which the following is a specification.

This invention relates to apparatus for transmitting indications of movement to a distance electrically for signaling or recording purposes and finds a particular although not exclusive application in transmitting and recording variations in the level of a fluid, for example the level of water in a river or canal.

The object of the invention is to provide an indicating and recording apparatus with means to prevent the transmitting device from getting out of agreement with a distant recorder or receiver through failure in the electric current, the construction being such that the devices which receive the movements or impulses to be transmitted continue to function until upon resumption of the current or current supply a correct signal is transmitted.

The invention consists, briefly stated, in a transmitting device for electric recording and signaling systems in which are provided electrical circuit closing devices released for operation by mechanism adapted to receive impulses or movements to be transmitted, the circuit when completed also serving to position or set mechanical means for restoring the release mechanism to a neutral position.

The accompanying drawings illustrate the application of the invention to apparatus for transmitting variations in the level of a fluid. In the drawings:—

Fig. 1 is a part sectional elevation showing the release disc and its operating gear.

Fig. 1^A is a part sectional elevation which forms a continuation of Fig. 1, and shows the float and float drum.

Fig. 2 is a front elevation of the apparatus shown in Fig. 1.

Fig. 3 is a detail view showing the means employed for restoring the parts to neutral position.

Fig. 4 is a detail plan view of the float

drum and graduated wheel shown in Fig. 1^A.

Fig. 5 is a circuit diagram of the apparatus shown in the preceding figures.

Fig. 6 is a fragmentary plan view showing the Nos. 16-17-18 and the magnetic operating means for 17 and 18.

Figure 7 is a side view elevation of the modification illustrated in Figure 2.

A float on the surface of the water, the rise and fall in the level of which is to be measured, is connected by a metal tape 1 Figure 1^A or equivalent means to a drum 2 which is caused to turn in either direction by such rise or fall in water level. The drum 2 is mounted on a sleeve or shaft 3 connected as shown to a shaft 4 or formed integral therewith, which shaft carries a gear wheel 5 meshing with peripheral teeth on a bevel wheel 6 forming part of a differential gear, said wheel 6 being free to turn on a sleeve 7 concentric with a spindle 8 carried in a suitable framework 9 which also supports the shafts 3 and 4.

The differential gear above referred to comprises in addition to the bevel wheel 6 a second bevel wheel 10 on a fixed sleeve 11 and an intermediate wheel 12 fixed to the sleeve 7 and carrying one or more spindles on which bevel pinions 13 are free to turn as well as a disc 14 (hereinafter referred to as the release disc) having a projecting circular rim 15 for rather more than half its circumference (see Figure 2).

The spindle 8 also carries a second differential gear its intermediate wheel 16 being secured upon the sleeve 11 upon which bevel wheel 17 is free to turn whilst bevel wheel 18 is loosely mounted on spindle 8. The wheel 16 is provided with bevel pinions 19 whilst the periphery of wheel 18 is formed with ratchet teeth 20 (see Figure 3) adapted to be engaged by a pawl 21 pivotally mounted on an arm 22 formed integral with or carrying an armature 23 operated by an electro-magnet 24 adapted to be actuated by the same electric current by which an impulse is sent to the distant recording gear as hereinafter explained. The arm 22 and armature 23 are pivoted at 25 to a portion of the framework 9 another portion of which carries a leaf spring 43 bearing against the pawl 21, normally urging the latter in a direction to impart rotary movement to the wheel 18 and pressing the pawl 21 against the stop screw 21^a to lock the

wheel 18 against counter clockwise rotation.

A lever 26 is also pivoted to the framework 9 and has a dog 27 adapted to prevent backward clockwise movement of the wheel 18, this lever also having a stud 28 adapted to be engaged by a notch 29 in the arm 22 whereby upon the outward movement of said arm 22 it engages and holds the stud 28 thus locking the lever 26 and dog 27 so that wheel 18 is prevented from turning in either direction while pawl 21 is drawn away. The movement of arm 22 pulls the pawl 21 outwards against the spring, far enough for it to pass to the next or some succeeding tooth and on the termination of the electric impulse the spring 23 through the pawl 21 turns the wheel 18 the corresponding number of teeth.

The wheel 17 is also provided with peripheral ratchet teeth and is adapted to be operated in a direction the reverse of the wheel 18 by means precisely similar to those employed for the wheel 18 and indicated generally at 100 in Figure 6. Either wheel 17 or 18 is actuated according to whether an indication of a rise or fall of the float is to be transmitted to the distant recording gear.

The sleeve 7 carries at the end remote from the wheel 12 a pinion 30 meshing with a wheel 31 fast with a pinion 32 on a spindle 33, said pinion 32 meshing with a wheel 34 fast with a scroll plate 35 carried by the spindle 8. The scroll plate 35 has a spiral groove 36 cut therein in which engages a pin 37 on a rod 38 pivotally connected at its outer ends with two rocking frames 39 and 40, pivoted respectively at 41 and 42 in the main framework 9.

The rocking frame 39 is provided with a fly arm 44 normally restrained from movement by engagement, as shown in Figure 2 with the rim 15 of the release disc 14. This fly arm is constantly urged to rotate by independent actuating mechanism, in the present instance clockwork, through connections now to be described.

A clockwork motor 45 carried in the base of the frame 9 drives whichever of the fly arms 44 and 44^a is free from the release disc 14. A preferred form of driving connection between the motor 45 and the fly arms is shown in the drawings wherein a wheel 46 on the motor shaft meshes with a pinion 47 on a shaft carrying the intermediate wheel 48 of a differential gear, the bevel wheels 48^a and 48^b of which have peripheral teeth meshing respectively with a pinion 49 and a wheel 50^a. The pinion 49 meshes with a wheel 50 which in turn drives a pinion 51 fast with a wheel 52 having laterally projecting teeth engaging a pinion 53 on a spindle 54 which carries the fly arm 44. The spindle 54 also carries a gear 55 meshing with a pinion 56 on a spindle 57

provided with a wind vane 58 rotation of which tends to retard the movement of the fly arm. At the top of the spindle 54 is mounted a projection 59 which is arranged to make rubbing contact with a contact spring 60 as the fly arm rotates to close the electric circuit which operates the distant recording gear.

The rocking frame 40 is of precisely similar construction to the rocking frame 39 above described and the various parts thereof having been designated by similar reference numerals to those used for the parts of frame 39 with the addition of the letter "a," further description is not deemed necessary except in regard to the drive which takes place from the wheel 48^b, through gear 50^a and pinion 51^a.

The float drum 2 may be provided with a flange 61 having graduations to indicate directly the rise or fall of water level whilst a graduated wheel 62 also is provided driven by a worm 63 on the shaft 3 and worm wheel 64 on the spindle of the wheel 62. In this arrangement the flange 61 may be graduated in centimeters for example and wheel 62 in meters.

As shown in Figure 4, the wheel 62 is calibrated at intervals corresponding to a rise in water level of 5 decimeters and each calibration is marked with a number giving the water level in meters. Intermediate values are read off the flange 61 which is calibrated at intervals corresponding to a rise in level of 1 centimeter. These calibrations are numbered 1 to 50 and are arranged to be read in conjunction with the calibrations on the wheel 62 to give the water level in meters to two decimal places. The divisions on the flange 61 may be further subdivided into divisions corresponding to a rise in water level of 1 millimeter, thus allowing the water level to be read in meters to three decimal places. Part of the scale is shown thus subdivided at 65. Each of the scales is read against a fixed reference line 66 marked on an adjustable block 67, which is held in adjusted position by means of set screws 68 passing through slots 69 in the block.

The operation of the apparatus above described is as follows:—

Assume the float drum 2 to have been moved by an amount equivalent to the unit of rise or fall the apparatus is designed to indicate. This movement of the drum 2 will be communicated through shafts 3 and 4, wheel 5 to gear 6 the movement of which will cause wheel 12 and release disc 14 to rotate.

In Figure 2 the release disc 14 is shown in the neutral position both fly arms being held inoperative and this slight movement of the release disc 14 allows one of the fly arms say 44^a to revolve under the influence of the

clockwork motor 45 through the gearing above described, electrical contact being made between the projection 59^a and spring 60^a by which an impulse is sent to the distant recording or receiving apparatus. The electric impulse however, also energizes the electro-magnet 24 drawing the armature 23 downwards and drawing the pawl 21 backwards through the space of one tooth. As the fly arm continues to turn, contact between the members 59^a and 60^a is broken and the electro-magnet de-energized allowing the spring 43 to act on the pawl 21 and move the wheel 18 in an anti-clockwise direction (Figure 3) through the space of one tooth. This movement is communicated through the intermediate wheel 16 and sleeve 11 (wheel 17 being held stationary) to wheel 10 which moves the release disc 14 back to the position which it occupied before the fly arm was released. As the fly arm takes an appreciable time to make one revolution owing to the action of the wind vane 58^a the release disc 14 will be able to resume normal position before the fly arm completes a revolution and stops further rotation until the water level has changed through another unit.

The scroll plate 35 and the rocking frames 39 and 40 connected thereto are utilized to provide against a sudden change in level causing the mechanism to be put out of gear by the release disc 14 being turned through half a revolution or more so that the opposite end of projecting edge 15 of said disc would come into the path of one of the fly arms and prevent it rotating when it should be free to do so. The scroll plate 35 is free to turn on spindle 8 and is rotated in the same direction as the release disc 14 but more slowly through the gearing 30, 31, 32 and 34. The effect of this arrangement is that should the release disc 14 continue to be revolved in the manner already described the co-operation of the groove 36 and pin 37 will cause the rocking frame 40 to be pushed to the right towards the position indicated in dotted lines (Figure 2) so that when the opposite end of the projecting rim 15 of the release disc comes opposite the fly arm 44^a the latter will have been pushed out to clear the disc and will continue to revolve. The case is similar in regard to the opposite fly arm 44. It is to be observed that as one rocking frame is pushed outwardly the opposite one is pulled inwardly and the fly arm on this opposite frame cannot turn when the projecting rim 15 is rotated out of engagement with it as the action of the rod 38 draws this rocking frame inwards so that its fly arm is prevented from rotating by the body of the disc 14. This effect is produced by the steep part of the groove in which the pin 37 is shown in Figure 2 wherein the release disc is in its neutral position. The

rest of the groove 36 can also engage the pin 37 so that should the water level continue to rise or fall through the whole range of the apparatus no part thereof would be thrown out of agreement as the continued making of contacts by the members 59 and 60 or 59^a and 60^a would have the effect, ultimately, of notching the gear 18 or 19 back until the scroll plate 35 and disc 14 returned to their neutral positions.

The invention possesses the advantage that the contact making device actuated by either fly arm need not keep pace with the float drum 2 which may be turned rapidly through a distance equivalent to a sudden rise or fall in water level whilst the fly arm giving an impulse equivalent to one unit of rise or fall at each revolution operates at its normal definite speed. For this reason and also owing to the fact that conditions may be such as to cause the drum 2 to oscillate, the transmitting gear may get momentarily out of agreement with the actual level, but the fly arm will rotate and eventually send the necessary number of electric impulses before the disc 14 is notched back to neutral position.

A further advantage of apparatus constructed in accordance with the present invention is that any failure in the electric current due to bad contact or defective battery does not throw the transmitter and distant recorder or receiver out of agreement since it is the same electric current which actuates the recorder or receiver as causes the wheel 18 and disc 14 to be returned to neutral position, and the electric receiving mechanism at the distant station may be made so that a current just too weak to operate one will also be too weak to operate the other. For example should a rise or fall in level occur during a temporary failure in the current supply, the fly arms and contacts would continue to rotate but no signals would be transmitted nor would any action take place tending to restore the disc 14 to neutral position, and the scroll plate and release disc would rotate by an amount corresponding to the rise or fall. Upon resumption of the current supply, however, one of the fly arms would continue to revolve and send a sufficient number of signals to bring the scroll plate and release disc back to their neutral positions and both transmitter and receiver would remain in agreement.

I claim:—

1. In a device for transmitting the movements of an object to a distant indicator, a pair of independently driven intermittent current impulse transmitters, a device having means co-operating with said transmitters whereby both of said transmitters are restrained from movement when said device is in normal position and whereby one

or other of the transmitters is released for movement when the device is moved in one direction or the other, a connection between said device and said object whereby the object moves the device and means controlled by the impulses transmitted to the distant indicator and co-operating with said device for returning said device to normal restraining position.

2. In a device for transmitting the movements of an object to a distant indicator according to claim 1, a clockwork motor for driving said intermittent current impulse transmitting devices.

3. In a device for transmitting the movements of an object to a distant indicator, a pair of intermittent current impulse transmitters, driving means therefor a release disc movable in two directions and having means co-operating with said transmitters whereby both of said transmitters are restrained from movement when said disc is in normal position and whereby one or other of said transmitters is released for movement when the disc is moved in one direction or the other, a differential gear comprising a planet wheel carrier in driving connection with said disc a sun wheel in driving connection with said object and a second sun wheel, a second differential gear comprising a planet wheel carrier in driving connection with the second sun wheel of the first mentioned differential gear, and a pair of sun wheels, and means controlled by the impulses transmitted by one or other of said transmitting devices for turning one or other of said last-mentioned sun wheels.

4. In a device for transmitting the movements of an object to a distant indicator, a pair of intermittent current impulse transmitters, driving means therefor horizontal arms mounted to rotate about a vertical axis and drivingly connected with said intermittent impulse transmitting devices a release disc rotatable in two directions and having a projecting circular rim for a part of its circumference normally disposed in the path of movement of said horizontal arms but movable to release one or other of said horizontal arms whereby one or other of said intermittent current impulse transmitting devices is released for operation when said disc is moved in one direction or the other, a scroll plate mounted to rotate coaxially with said release disc and having a spiral groove a pin engaging in said spiral groove and co-operating with said horizontal arms to move one or other of said horizontal arms clear of the circular rim of said release disc and to move the other horizontal arm into engagement with the body of said disc when said release disc is rotated through more than one revolution in one direction or the other and means controlled by the impulse transmitted to the distant indicator and co-

operating with said release disc for returning said release disc to normal restraining position.

5. In a device for transmitting the movements of an object to a distant indicator according to claim 1 electro-magnetic devices in circuit with said intermittent current impulse transmitting devices and co-operating with said member for returning said member to normal restraining position.

6. In a device for transmitting the movements of an object to a distant indicator a pair of intermittent current impulse transmitters, a clock-work motor for driving said intermittent current impulse transmitting devices, horizontal arms mounted to rotate about a vertical axis and drivingly connected with said intermittent impulse transmitting devices, a release disc rotatable in two directions and having a projecting circular rim for a part of its circumference normally disposed in the path of movement of said horizontal arms but movable to release one or other of said horizontal arms whereby one or other of said intermittent current impulse transmitting devices is released for operation, when said disc is moved in one direction or the other pivotal mountings for said intermittent current impulse transmitting devices and horizontal arms, a scroll plate mounted to rotate coaxially with said release disc and having a spiral groove, lever connected to said pivoted mountings and carrying a pin engaging in said spiral grooves to move one or other of said horizontal arms clear of the circular rim of said release disc, and to move the other horizontal arm into engagement with the body of said disc, when said release disc is rotated through more than one revolution in one direction or the other, a differential gear comprising a planet wheel carrier in driving connection with said disc, a sun wheel in driving connection with said object and a second sun wheel a second differential gear comprising a planet wheel carrier in driving connection with the second sun wheel of the first mentioned differential gear, and a pair of sun wheels, and means responsive to impulses from said transmitters to operate one or the other of said last named sun wheels to restore said release disc to normal position.

7. In a device for transmitting the movements of an object to a distant indicator, a rotatable member connected to said object whereby the object moves the member, a pair of intermittent current impulse transmitting devices and means for driving same, a release device movable in two directions and having means co-operating with said transmitters whereby both of said transmitters are restrained from movement when said device is in normal position and

whereby one or other of the transmitters is released for movement when the device is moved in one direction or other, a connection between said device and said rotatable member whereby the member moves the device and means controlled by the impulses transmitted to the distant indicator and co-operating with said device for returning said member to normal restraining position.

8. In a device for transmitting the movements of an object to a distant indicator a pair of independent rotary current impulse transmitters, driving means therefor a release device having means co-operating with said transmitters whereby both of said transmitters are restrained from movement when said device is in normal position, and whereby one or the other of the transmitters is released for movement when the device is moved in one direction or the other, a connection between said device and said object whereby the object moves the device and electromagnetic means energized by the transmission of impulses for returning said device to normal restraining position.

9. In a device for transmitting the movement of an object to a distant indicator a rotatable member connected to said object whereby the object moves the member, a pair of intermittent current impulse transmitters and means for driving same, a release device movable in two directions and having means co-operating with said transmitters whereby both of said transmitters are restrained from movement when said

device is in normal position and whereby one or the other of the transmitters is released for movement when the device is moved in one direction or the other, driving connections between said rotatable member and said release device whereby the member moves the device and including differential gear elements and means controlled by the impulse transmitted to the distant indicator and co-operating with said differential gear elements for returning said device to normal restraining position.

10. In a device for transmitting the movements of an object to a distant indicator a rotatable member connected to said object whereby the object moves the member, a pair of transmitting circuits, a pair of rotary devices for making and breaking said circuits, a device movable in two directions and having means co-operating with said rotary devices whereby both of said circuit closing devices are restrained from movement when said release device is in normal position and whereby one or the other of said rotary devices is released for movement when the release device is moved in one direction or the other, a connection between said release device and said rotatable member whereby the member moves the device and means controlled by the breaking of the transmitting circuit and co-operating with said release device for returning release device to normal restraining position.

In witness whereof I affix my signature.

ARTHUR BURTON BUCKLEY.