J. ROSSINI.

WATER PUMP CONTROLLING DEVICE.

APPLICATION FILED JAN. 7, 1919.

1,347,408.

Patented July 20, 1920.

4 SHEETS—SHEET 1.

Fig. 1.

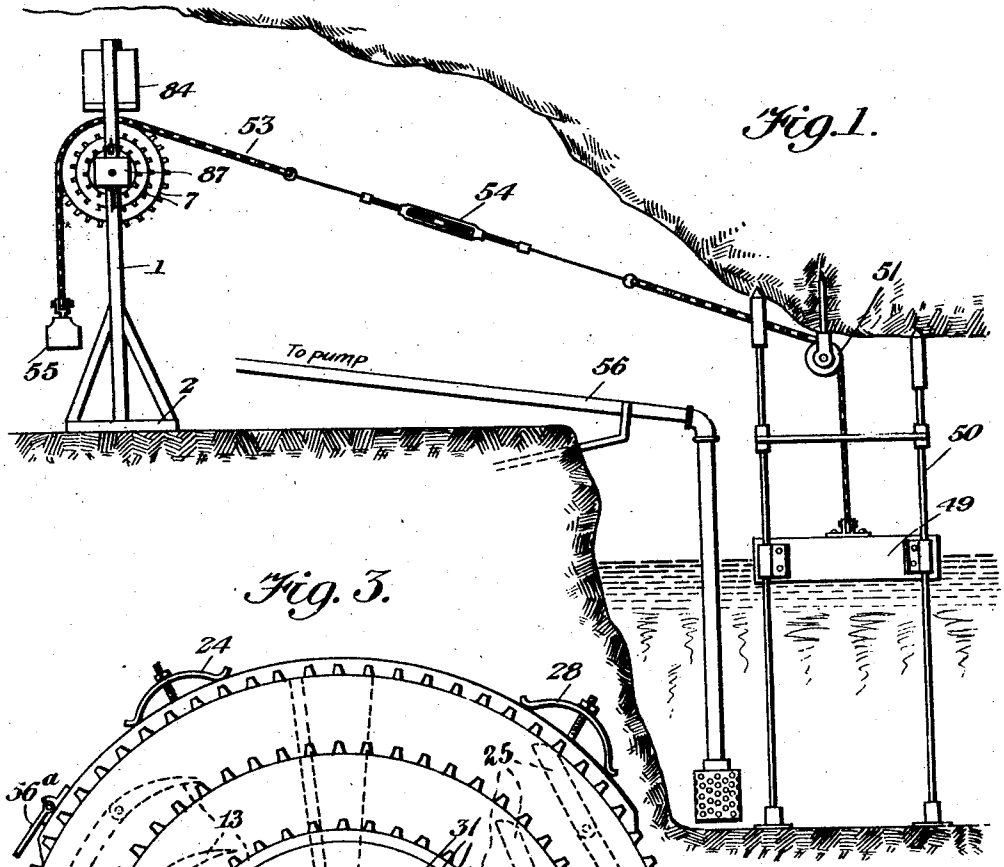
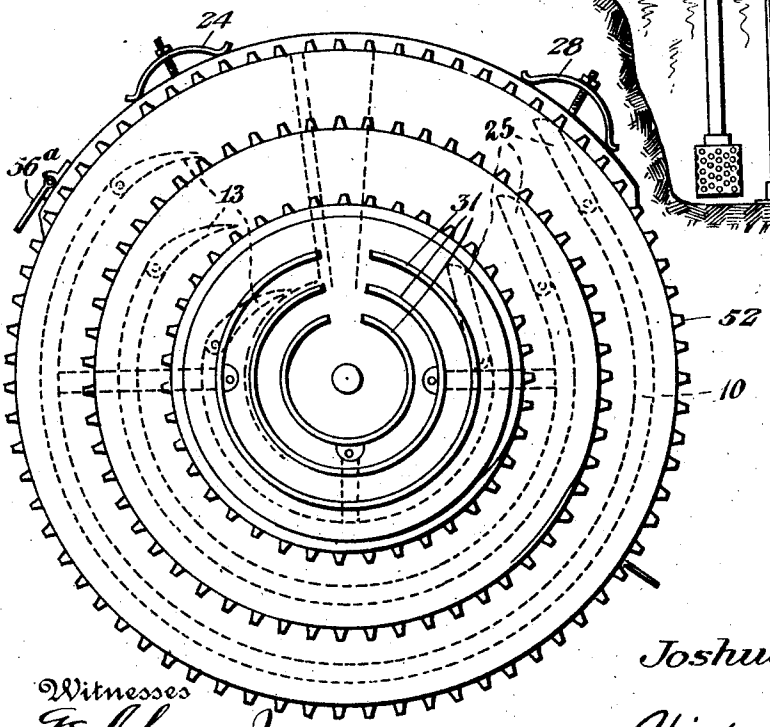


Fig. 3.



Witnesses

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4 SHEETS—SHEET 2.

Fig. 12.

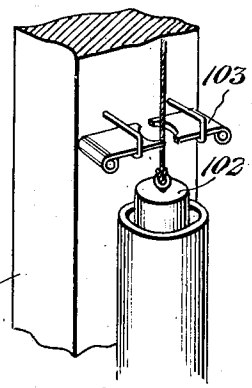


Fig. 11.

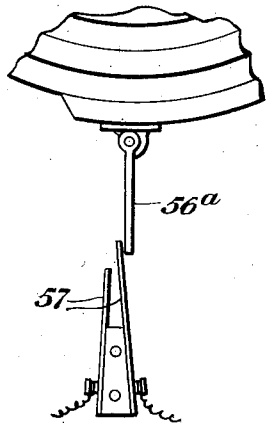
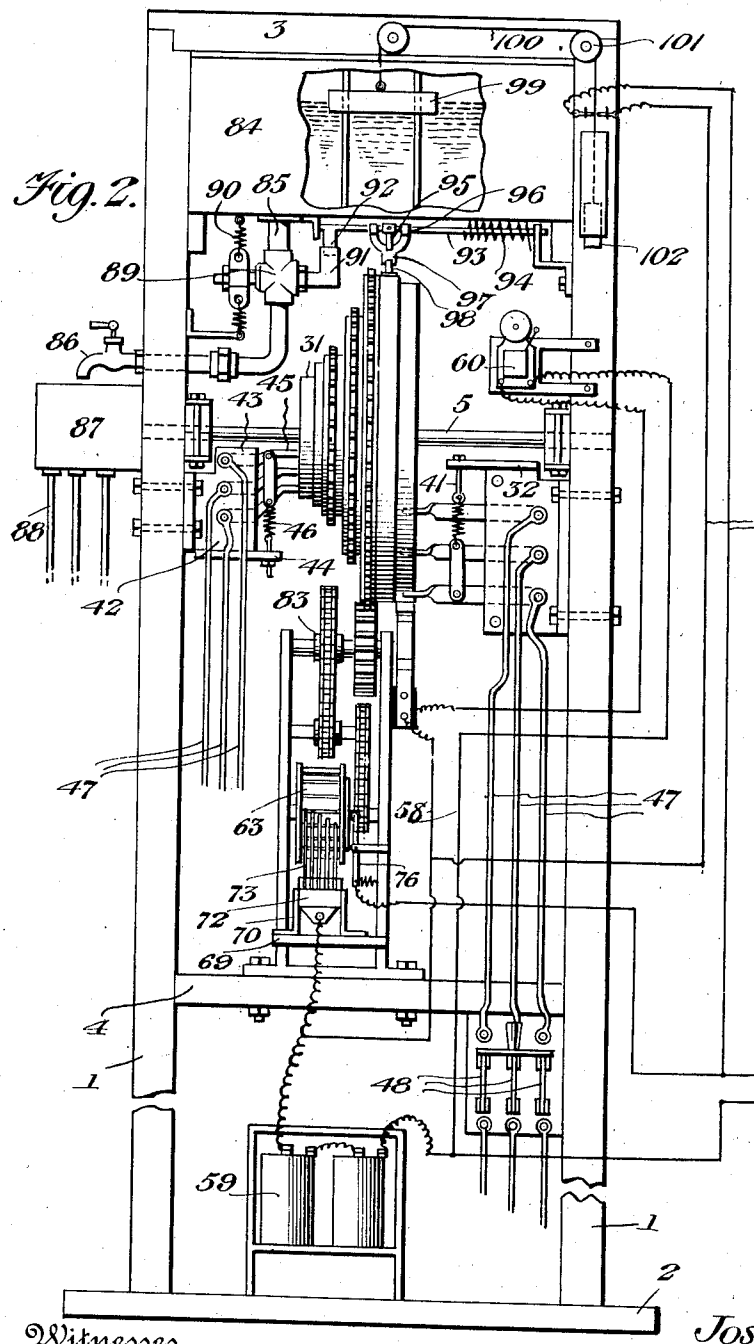


Fig. 2.



Witnesses

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4 SHEETS—SHEET 3.

Fig. 4.

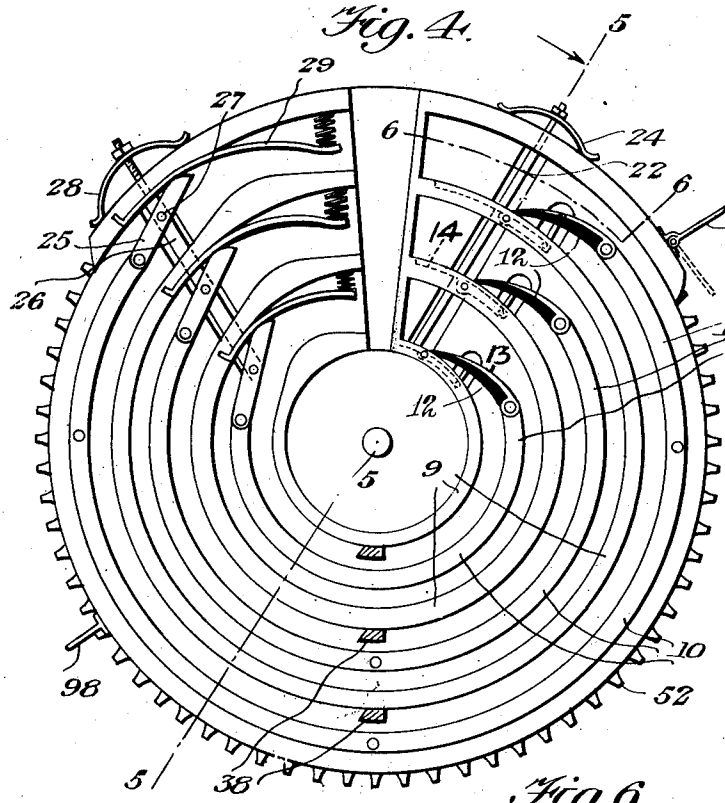


Fig. 5.

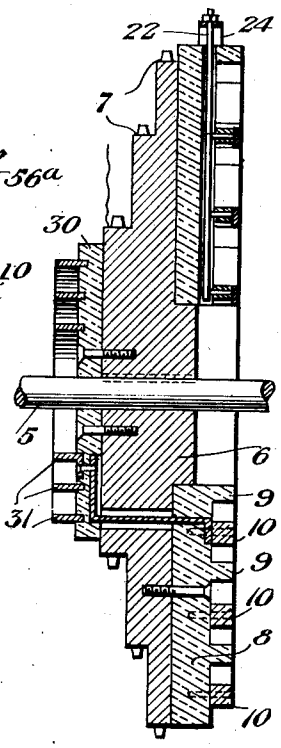


Fig. 6.

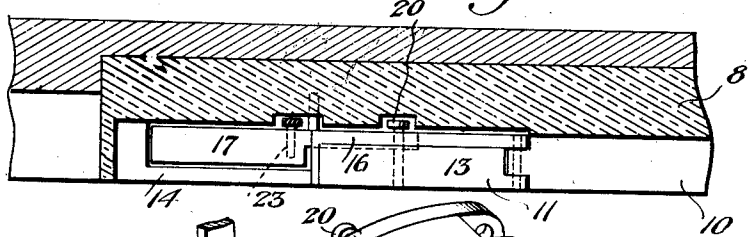
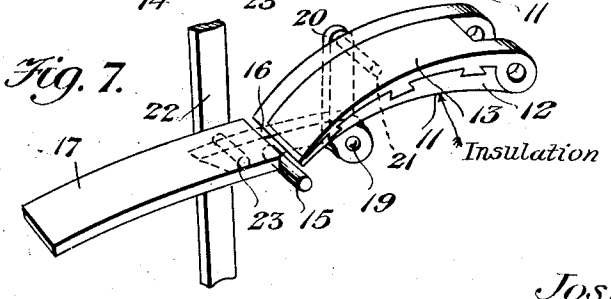


Fig. 7.



Witnesses

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1,347,408. Patented July 20, 1920.

4 SHEETS—SHEET 4.

Fig. 9.

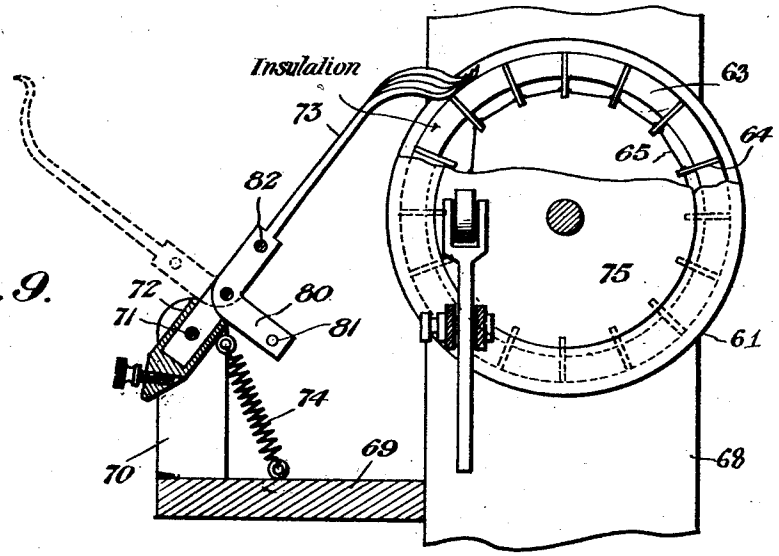


Fig. 8.

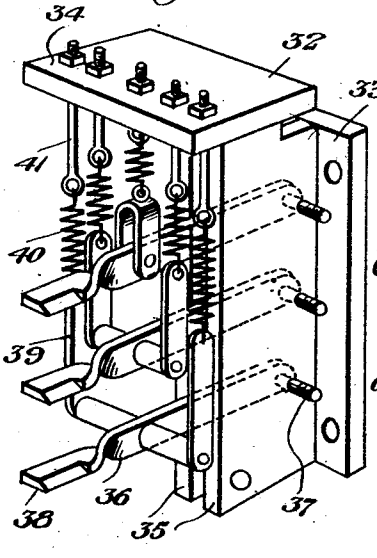
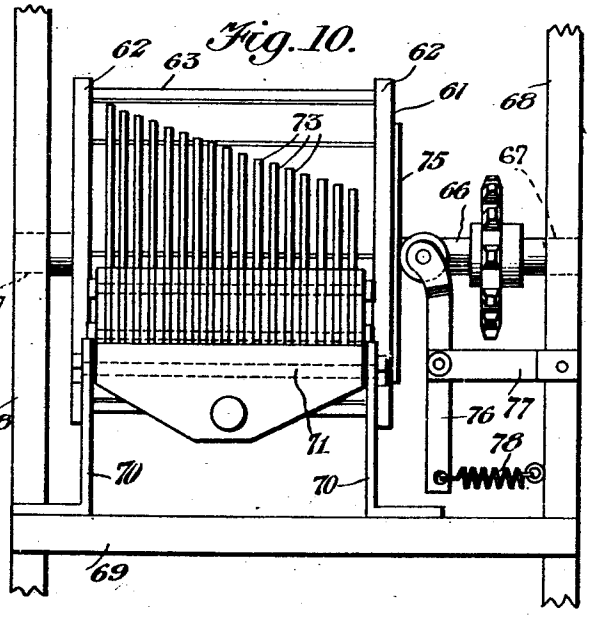


Fig. 10.



Witnesses

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WATER-PUMP-CONTROLLING DEVICE.

1,347,408. Specification of Letters Patent. Patented July 20, 1920.

Application filed January 7, 1919. Serial No. 270,069.

To all whom it may concern:

Be it known that I, JOSHUA ROSSINI, a citizen of the United States, residing at Olyphant, in the county of Lackawanna and State of Pennsylvania, have invented new and useful Improvements in Water-Pump-Controlling Devices, of which the following is a specification.

This invention relates to improvements in water pump controlling devices and has particular application to a controlling device for use in connection with the pumps employed to remove the drainage water from mines.

In carrying out the present invention it is my purpose to provide a controller for the water pumps used in mines whereby the pump will be automatically placed in operation when the water level in the sump rises to a predetermined point thereby enabling the pump to relieve the sump of the drainage water, and whereby the pump will be automatically cut out of service immediately that the mine is relieved of the drainage water.

It is also my purpose to provide a controlling device of the class described whereby a signal will be given just previous to the pump entering operation so that the attendant will be notified in order that he may examine the pump if he so desires, and whereby an intermittent signal will be given at the mine headquarters during the time that the pump is in operation so that the proper authorities may be advised of the fact that the pump is relieving the mine of the drainage water that has accumulated in the sump.

A further object of my invention is the provision of a controlling device which may be quickly and conveniently connected in the circuit of the driving motor of the pump so that such motor may be placed in service to operate the pump when the drainage water reaches the predetermined point or level in the sump and whereby the motor may be cut out of operation when the sump has been relieved of the drainage water by the pump, the controller including a circuit making and breaking device which is under the direct control of the drainage water in the sump and is controlled by such drainage water through the medium of a float and a flexible connection between the float and the circuit closer, such connection embodying speed changing elements whereby the speed at which the circuit closer operates may be varied according to circumstances or exigencies of the particular case.

A still further object of my invention is to improve and simplify the general construction of controlling devices of the class described, and to provide a device which may be installed and maintained at minimum expense and which will operate efficiently and effectively under all conditions.

With the above recited objects in view and others of a similar nature, the invention resides in the construction, combination and arrangement of parts set forth in and falling within the scope of the appended claim.

In the accompanying drawings:—

Figure 1 is a diagrammatic view showing my improved controller installed in a mine, parts being shown in elevation.

Fig. 2 is a view in elevation of the controller.

Fig. 3 is a view in side elevation of a circuit making and breaking device.

Fig. 4 is a similar view of the opposite side of the device.

Fig. 5 is a cross sectional view on the line 5—5 of Fig. 4.

Fig. 6 is a sectional view on the line 6—6 of Fig. 4.

Fig. 7 is a collective view showing details of the circuit making and breaking device.

Fig. 8 is a perspective view of one set of the fingers and the mounting therefor of the circuit making and breaking device.

Fig. 9 is a view in elevation, parts being broken away, of an intermittent circuit making and breaking device that I use in one of my signal circuits.

Fig. 10 is a view taken at right angles to Fig. 9.

Fig. 11 is a detail of the circuit-closing means.

Fig. 12 is a fragmentary perspective view of another detail.

Referring now to the drawings in detail 1—1 designate vertical standards spaced apart in parallelism and uprising from a base 2, the standards being interconnected at the top by means of a cross piece 3 and at a point adjacent to the bottom by means of a cross piece 4. Arranged transversely of the frame formed by the standards and cross pieces adjacent to the upper end of such frame is a horizontal shaft 5 that has

its end suitably mounted in alining bearings carried by the respective standards 1—1. This shaft carries my improved circuit making and breaking device, and, in the present instance, this device comprises a disk 6 having the periphery thereof stepped circumferentially to provide annuli 7 of various diameters, the annuli gradually decreasing in diameter from the outermost to the innermost as clearly shown in Fig. 5 of the drawing. Secured to the outer side of the relatively large annulus is a circular plate 8 of insulating material. Formed integral with the outer surface of the plate 8 are ribs 9 arranged concentrically of one another and spaced apart, the ribs being also formed of insulating material. Arranged between the ribs 9 are electric current carrying strips 10 that alternate with the insulating ribs 9. The strips 10 are segments of circles and are disposed concentrically of one another and of the ribs 9, and as clearly illustrated in Fig. 4 of the drawings. Pivotally connected with one end of the electric current carrying strip 10 is a curved shoe 11 composed of a section 12 of insulating material and a section 13 of conducting material. The section 12 of insulating material is arranged upon the side of the shoe that faces the next innermost insulating rib and the outer end of the shoe is designed to normally engage the next innermost insulating rib. Each insulated rib 9 contiguous to the coengaging end of the shoe 11 is formed with a recess or chamber 14. Extending transversely of the chamber 14 in proximity to the adjacent end of the shoe 11 is a pivot pin 15 upon which is mounted an arm 16, with a contact finger 17 having its outer end pivotally connected, as at 19, with the inner end of a link 20. The outer end of the link 20 is connected through a medium of a pin 21 with the metal section 13 of the shoe 11, as clearly illustrated in Fig. 7 of the drawing. Extending radially through the plate 8 contiguous to the recesses 14 in such plate is a rod 22 provided with laterally projecting pins 23 that engage with the respective arms 16 contiguous to the connection between such arms and the contact plate 17. On the outer end of the rod 22 is a leaf spring 24 that has its ends against the periphery in the plate 8 and this leaf spring 24 acts upon the rod 22 to hold the plate 17 in normal position, that is the position forming, in effect, continuation in the curved outer side of the respective rib, as shown by the dotted lines in Fig. 4 of the drawings. When the plate 17 is thus held the inner ends of the respective shoes 11 engage the corresponding ribs 9 as illustrated in Fig. 4. Pivotally connected with the remaining end of the respective strips 10 are deflecting dogs 25 that normally extend outwardly against the inner sides of the respective insulated ribs 9, as shown in Fig. 4 of the drawing. These deflecting dogs 25 are held in normal position by suitable means. In the present instance this holding means embodies a rod 26 that is disposed within a bore formed in the plate 8 and is pivotally connected with the dogs 25 by means of pins 27. The outer end of the rod 26 is equipped with a leaf spring 28 that is bowed and has its end in engagement with the periphery of the plate 8 by a spring acting upon the rod to pull the latter outwardly of the plate thereby holding the dog 25 in engagement with the respective insulated ribs. In the present form of my invention spring actuated fingers 29 are secured to the inner side of the respective insulated ribs in the vicinity of the point of contact between such ribs and the deflector dogs. These fingers 29 act as shock absorbers or cushions to absorb the shock incident to the movement of the dogs 25 to normal position under the action of the springs 28.

Suitably fastened to the outer surface of the relatively small annulus is a plate 30 of insulating material and suitably secured in the plate 30 are concentrically disposed circular contact strips 31, clearly illustrated in Figs 3 and 5 of the drawings. The plates or strips 31 are electrically connected with the respective current carrying strips 10 on the outer side of the plate 8 by means of suitable conductors, as illustrated in Figs. 3 and 5 of the drawings.

Suitably fastened to the inner side of the standard 1 opposite to the plate 8 is a contact carrying box or casing 32, which, in the present instance, embodies a back wall 33, a top wall 34 and vertical side plates 35 spaced apart in parallelism and having the rear edges connected with the back wall 33 and the top edges secured to the top wall 34, as clearly shown in Fig. 8 of the drawing. Arranged between the side plates 35 and spaced apart one above the other are horizontally disposed contact bars 36 having their inner ends mounted upon pivot studs 37 respectively and their outer extremities twisted at an angle of 90 degrees to form wipers 38 that are desired to engage the outer surfaces of the ribs 9 respectively in the rotation of the disk like element 6 in one direction and to engage the outer side of the electric current carrying strip 10 when the member 6 is revolved in the opposite direction. These contact bars 36 are equipped adjacent to their outer ends with upwardly projecting yokes 39 respectively that are connected through the medium of retractile springs 40 with rods 41 that pass through openings in the top wall 34 of the boxing or casing. This structure is clearly illustrated in Fig. 8 of the drawing and it will be seen that the springs 40 acting upon the yokes 39 urge the contact bar upwardly

at all times so that good electrical contact will be maintained, between the wipers 38 and the electric current carrying strips 10 when the disk like element 6 is traveling in a direction to maintain engagement between the wipers and such current carrying strip.

Fastened to the inner side of the standard 1 opposite from that carrying the casing 32 is the casing 42 which in the present instance, comprises vertical side plates 43 and a horizontal bottom plate 44 connected to the lower end of the side plates 43. Pivoted between the side plates 43 are contact arms 45 arranged one above another and having their outer ends in engagement with contact strips 31 respectively, as clearly shown in Fig. 2 of the drawing. These contact arms 45 are held in engagement with the respective strips 31 by means of a spring 46 so that a good electric contact will be established between the arms 45 and the strips 31.

The disk like element 6 and its associated parts together with the contact arms 36 arranged at one side of said element and the contact arms 45 arranged at the other side of the element constitutes the circuit making and breaking device of my improved controller. It is conceivable, however, that the particular structure, just described may be varied without departing from the spirit of my invention or exceeding the scope of the appended claim, and therefore it is to be understood that this particular type of circuit making and breaking device is shown merely for the purpose of illustration. The contact arms 36 and 45 are connected with the wires of a three-phase motor circuit 47 that includes a hand operated knife switch 48 and the motor operates the pump relieving the mine of drainage water.

In Fig. 1 of the drawings I have shown the operating mechanism of my improved circuit making and breaking device and in this instance the operating mechanism embodies a float 49 that is slidably mounted upon vertical guide rods 50 arranged in the water sump of the mine and having their lower extremities suitably anchored and their upper ends fastened to the roof of the mine. Also anchored in the roof of the mine is a bracket carrying a sheaf wheel 51. The peripheries of the annuli 7 are, in the present instance, formed with sprocket teeth 52 respectively and interchangeably associated with the toothed annuli is one end of a chain 53. The other end of the chain 53 is trained over the guy sheaf 51 and fastened to the upper surface of the float 49, as shown in Fig. 1 while the central portion of the chain is equipped with a turn buckle 54 whereby the length of the chain may be varied. The extremity of the chain that is passed over the annulus is equipped with a weight 55 that acts to counter balance the float 49, so that the chain will be at all times maintained taut in the upward and downward movement of the float, incident to the rise and fall of the drainage water in the sump.

56 designates the drainage pipe that has one end extended into the sump and the other end connected with the pump that is driven by the motor.

In practice, any movement of the float 49 in the sump is transmitted through the chain 53 to the disk like element of the circuit making and breaking device so that the latter will be operated to either make or break the motor circuit according to the position of the float in the sump. For instance, when the float rises the chain transmits motion from the float to the disk like element 6 with effect to revolve such element in the direction of the arrow in Fig. 4. In the continued movement of the disk like element the ribs 9 act against the wipers 38 until the shoes 11 pass over the wipers. As the shoes 11 engage the wipers such shoes are elevated and moved outwardly and in the outward movement of the shoes motion is transmitted through the links 20 the levers or arms 16 with the effect to swing the contact plates 17 into the recesses 14 thereby moving the contact plates 17 out of position to be engaged by the wipers 38 on the contact arms. However, as soon as the shoes pass over the wipers, the spring 24 reacts and restores the contact plate and the shoes to normal position. Upon return of the contact plate to normal position, such plate engages the corresponding wiper thereby establishing electrical connection between the wipers 38 and the contact arms 45 by way of the contact plates 17, the metal sections of the shoes 11, the current carrying strips 10, the conductors between the strips 10 and 31, and the strips 31. Thus the motor circuit is closed so that electrical energy may flow to the motor and operate the pump to drain the water from the sump through the pipe 56. Immediately the motor circuit is closed and the pump begins to operate the level of the water falls thereby permitting the float 49 to descend and in the downward movement of the float the chain 53 revolves the disk like element 6 in the reverse direction to that indicated by the arrow in Fig. 4. During this movement of the disk like element the wipers 38 ride over the metallic sections of the respective shoes 11 and continue to engage the conducting strips 10 during the greater portion of the revolution of the disk like element, thereby maintaining the motor circuit closed to enable the pump to relieve the sump of all of the drainage water. As the hands of the conducting strips 10 pass over the wipers 38 the dogs 25 engage such wipers both inwardly away from the fingers 29 and against the action of the spring 28, thereby permitting

the wipers 38 to be restored to normal position under the action of the springs, the fingers 29 coacting with the wipers 38 to return the latter to normal position immediately succeeding the release of the wipers by the dogs 25.

Owing to the fact that the chain 53 may be interchangeably associated with the tooth annuli of different diameters, it will be seen that the motor circuit will be closed when the float reaches any desired point in its upward movement, while the motor circuit may be broken when the float reaches the desired point in its downward movement.

In accordance with my invention I provide a signal apparatus which is under the control of a circuit making and breaking device and which is rendered active immediately preceding the passage of the shoes 11 over the wipers 38 so that the attendant may be notified of the fact that the circuit making and breaking device is about to close the motor circuit. In the present instance, the signaling apparatus embodies an operating arm 56ª pivoted upon the periphery of the plate 8 a short distance in advance of the plane of the shoes 11, the arm 56ª being capable of swinging movement in one direction being held against movement beyond the radial position with respect to the plate 8 in the reverse direction. Arranged in the path of the arm 56ª are the contact fingers 57 connected in electric circuit 58 including a battery 59 and a suitable form of signal device such for instance as the bell 60. In the rotation of the movable elements 6 the direction of the arrow in Fig. 4, the arm 56ª engages the fingers 57 to move such fingers to circuit closing position so that the signal 60 will be energized to advise the attendant of the condition of the rotatable element. On the other hand when the disk like element 6 is moving in the reverse direction under the action of the weight 49, incident to the rise of the float in the sump the arm 56ª, owing to its pivotal connection with the plate 8 idles by the fingers 57.

I also provide a signal located in the main office of the mine to notify the authorities when the pump is in operation and this signal under the control of an intermittent circuit closer that is driven from the disk like element 6 of the controller. In the present instance, the intermittent circuit closer, shown in Figs. 9 and 10 of the drawings embodies a drum 61 comprising end pieces 62, a cylinder 63 between the end pieces 62 and formed of insulating material. Arranged in the outer wall of the cylinder 63 and extending longitudinally thereof are contact strips 64 spaced apart equal distances around the cylinder and having the inner edges thereof electrically connected by means of a wire 65 arranged within the cylinder, as clearly shown in Fig. 9 of the drawing. The drum 61 is fast upon a horizontal shaft 66 journaled in bearings 67 carried by vertical side bars 68 upstanding from a base 69. Also uprising from the base 69 in advance of side bars 68 are posts 70 spaced apart in parallelism and extending across the space between the post 70 is a shaft 71 having the ends thereof secured to the post in some suitable manner. Mounted upon this shaft 71 is a suitable form of contact arm holders 72 in which are pivoted contact fingers 73. The contact fingers or arms 73 are of different lengths as illustrated in Fig. 10 and the ends thereof remote from the holder 72 engage the cylindrical wall of the drum so as to engage the contact strips 64 in the rotation of the drum. A retractile spring 74 has one end connected with the holder 72 and the other extremity fastened to the base 69, the spring acting to hold the fingers or arms 73 in frictional contact with the drum so that good electrical contact will be provided between the strip 64 and the fingers or arms 73. The wire 65 is connected with the plate 75 being secured to the outer side of one of the end pieces 62 and insulated from such end pieces. Bearing against the contact plate 75 is a roller of a contact arm 76 fulcrumed between its ends to a bracket arm 77 carried by the adjacent upright 68, a spring 78 being connected with the arm 76 to urge the roller end thereof in engagement with the plate 75. The roller contact arm 76 and the holder 72 is connected in series by a suitable signal, such, as for instance, a bell 79, and these elements are connected across the circuit 58 as shown in Fig. 2 of the drawing. By means of this construction it will be seen that when the drum 61 is rotated current will be caused to flow to the bell 79 intermittently as long as the drum revolves and as the bell is located in the main offices of the mine, the proper authority will be advised as to the operation of the pump. The arms 73 are so mounted in the holder 72 that they may be swung out of engagement with the drum independently of one another so that the periods at which the bell 79 is sounded may be changed. In the present instance the ends of each arm 73 within the holder 72 is equipped with an angularly arranged lug 80 formed with an opening 81 that is adapted to register with an opening in the holder 72 when the particular arm is swung to a position indicated by the dotted lines in Fig. 9. The pin 82 may be passed through the alining opening to hold the contact arm in the desired position. In the present instance, the shaft 66 of the intermittent circuit closer is driven from one of the tooth annuli 7 through the medium of a reduction gearing 83 of suitable construction as shown in Fig. 2.

In the present embodiment of my invention I have also made provision for lubri-

cating the motor and the pump. The lubricating mechanism embodies a tank 84 mounted between the standards 1—1 at the upper ends of the latter and adapted to contain the lubricant. From the tank 84 leads the pipe 85 that is connected with a valve 86 arranged above the secondary tank 87 from which lead the oil supply pipes 88 to the various parts to be lubricated. Within the pipe 85 is a controlling valve 89 which is normally held in closed position by means of suitably arranged springs 90 connected with one end of a stem in the valve 89. The other end of the stem of the valve 89 is formed with an upstanding lug 91 disposed in the path of movement of a lug 92 secured to a rock shaft 93 held in suitable bearings of the make and break device of my controller. The rock shaft is held in normal position by means of a spring 94 which surrounds the shaft 93 and has one end fastened to the shaft and the other end secured to one of the bearings of the shaft. Fixed to the shaft 93 is an arm 95 and loosely mounted upon the shaft at opposite sides of the arm 95 are the legs of a yoke 96 equipped with a depending arm 97 disposed in the path of movement of the finger 98 secured to the periphery of the plate 8. As the element 6 revolves in one direction the finger 98 engages the arm 97 with effect to engage the yoke 96 with the arm 95 and so rotate the shaft 93 against the action of the spring 94 thereby moving the lug 92 into engagement with the lug 91 to open the valve 89 to permit a quantity of the lubricant to flow through the pipe 85 into the tank 87. Immediately the finger 98 disengages the arm the shaft 93 is thrown to normal position under the action of the spring 94 and the valve 89 is closed by means of the spring 90. When the element 6 revolves in the opposite direction, however, the finger 98 engages the arm 97, the latter swings freely on the shaft without influencing the valve 89. This free movement of the yoke 96 carrying the arm 97 is due to the arrangement of the yoke with respect to the arm.

Also arranged within the tank 84 is a vertically movable float 99 that is under the control of the lubricant within the tank. This float 99 is connected by means of a cable or other flexible element 100 trained over suitable guy sheaves 101 with the bridging block 102 adapted to engage the fingers 103 that are connected in circuit with the battery 59 and the bell 79 by means of conductors 104. As the float 99 descends incident to the fall of the level of the lubricant the bridging block 102 rises toward the contact strips 103 and as the float approaches the bottom of the tank 84 the block 102 engages the strips 103 thereby causing current to flow continuously to the bell 79 so that the proper authorities will be notified of the condition of the lubricating apparatus.

I claim:—

In a circuit controller for electrically driven pumps for pumping water from the sump in mines, a circuit closer embodying a disk like element mounted for rotary movement, electric current conducting strips on one side of said element concentrically disposed with relation to one another, contact strips on the other side of said element concentrically arranged and electrically connected with the first named strips respectively, contact fingers normally in engagement with the first named strips, contact fingers coöperating with the respective last named strips and normally out of engagement therewith, means for holding the last named fingers out of engagement with the conducting strips during the movement of said element in one direction, means for actuating said fingers into engagement with the respective strips in the reverse movement of said element, and means controlling the movement of said element.

In testimony whereof I affix my signature.

JOSHUA ROSSINI.