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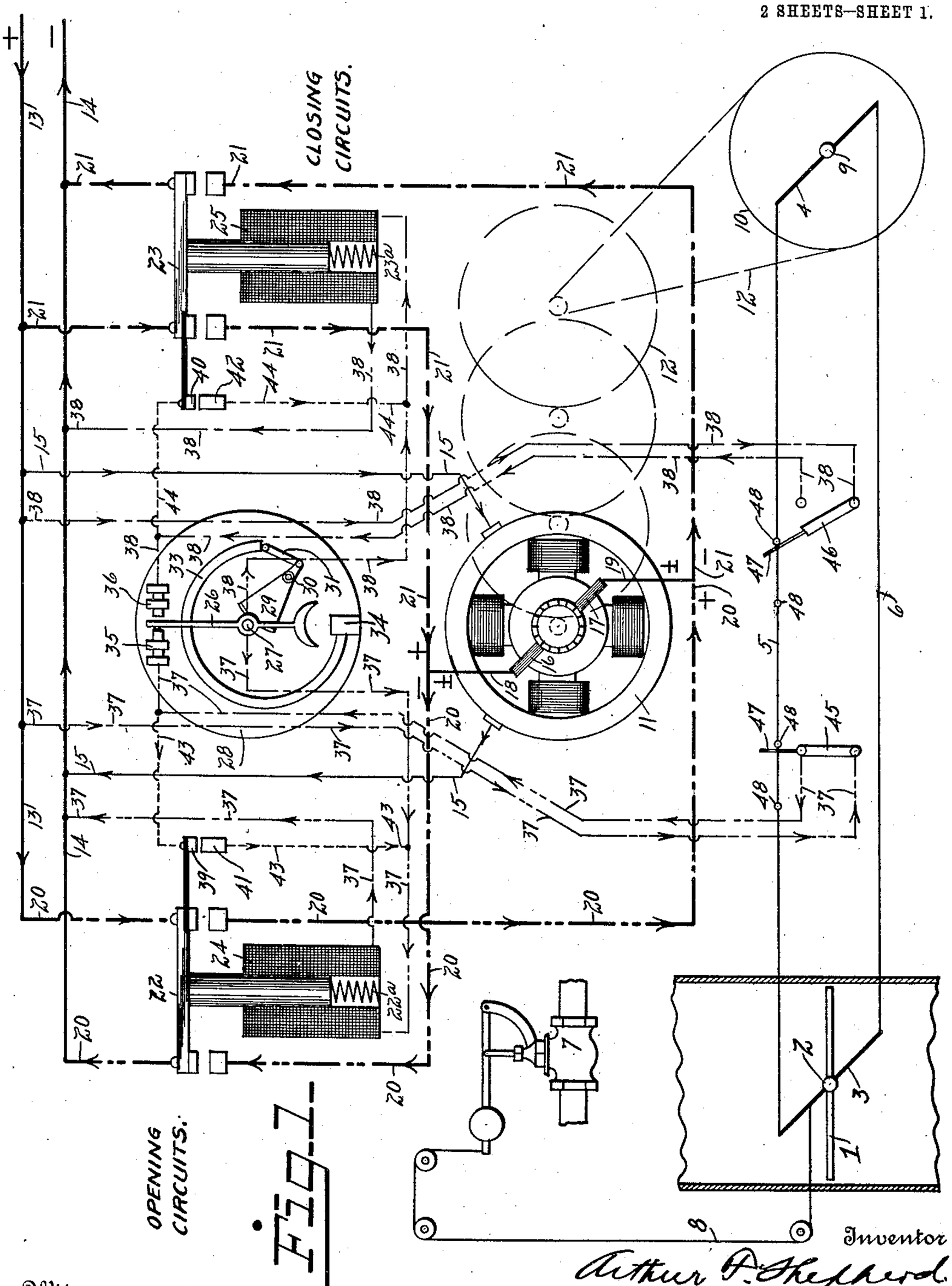
ELECTRICAL MEANS FOR AUTOMATICALLY CONTROLLING THE FLOW OF GASES OR LIQUIDS.

APPLICATION FILED MAR. 3, 1910.

995,036.

Patented June 13, 1911.

2 SHEETS—SHEET 1.



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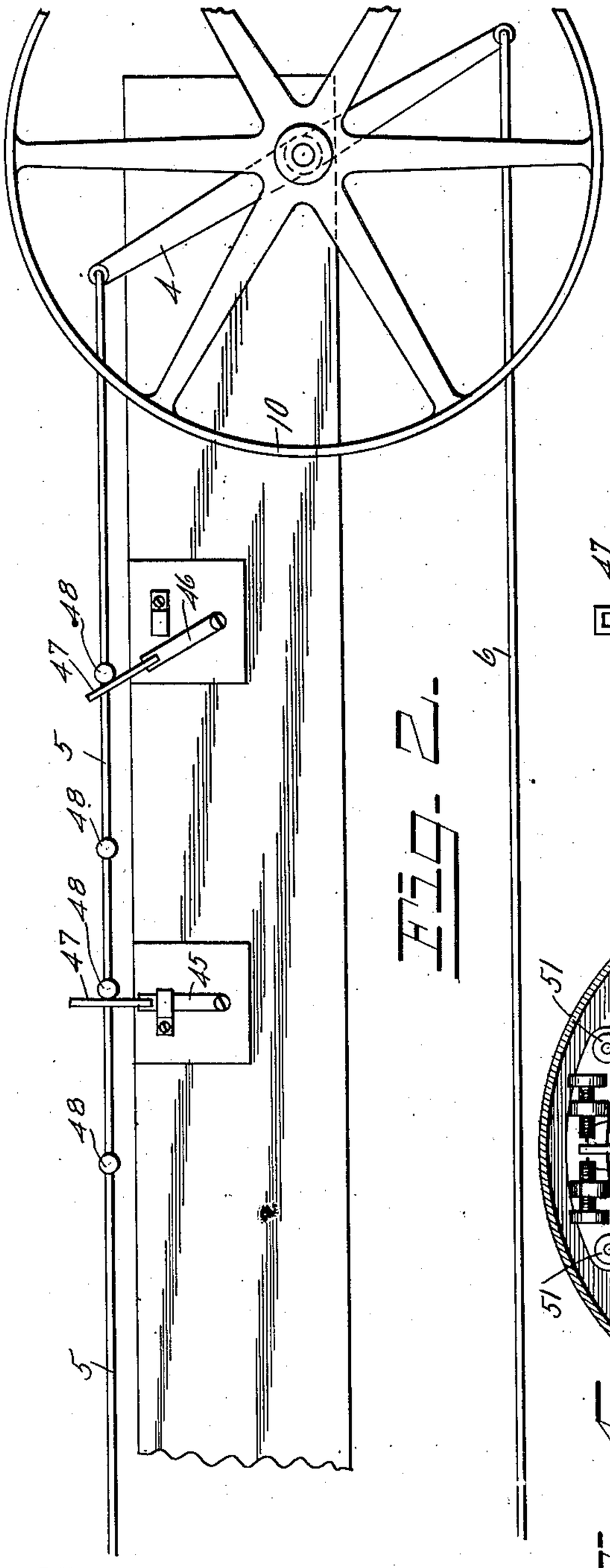

FIG. 2.

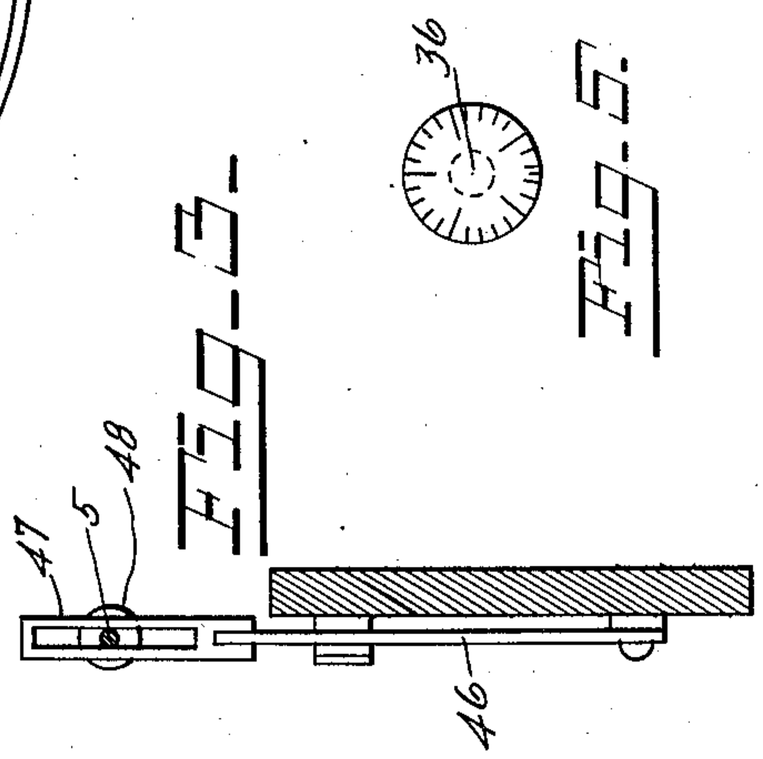

FIG. 3.

FIG. 5.

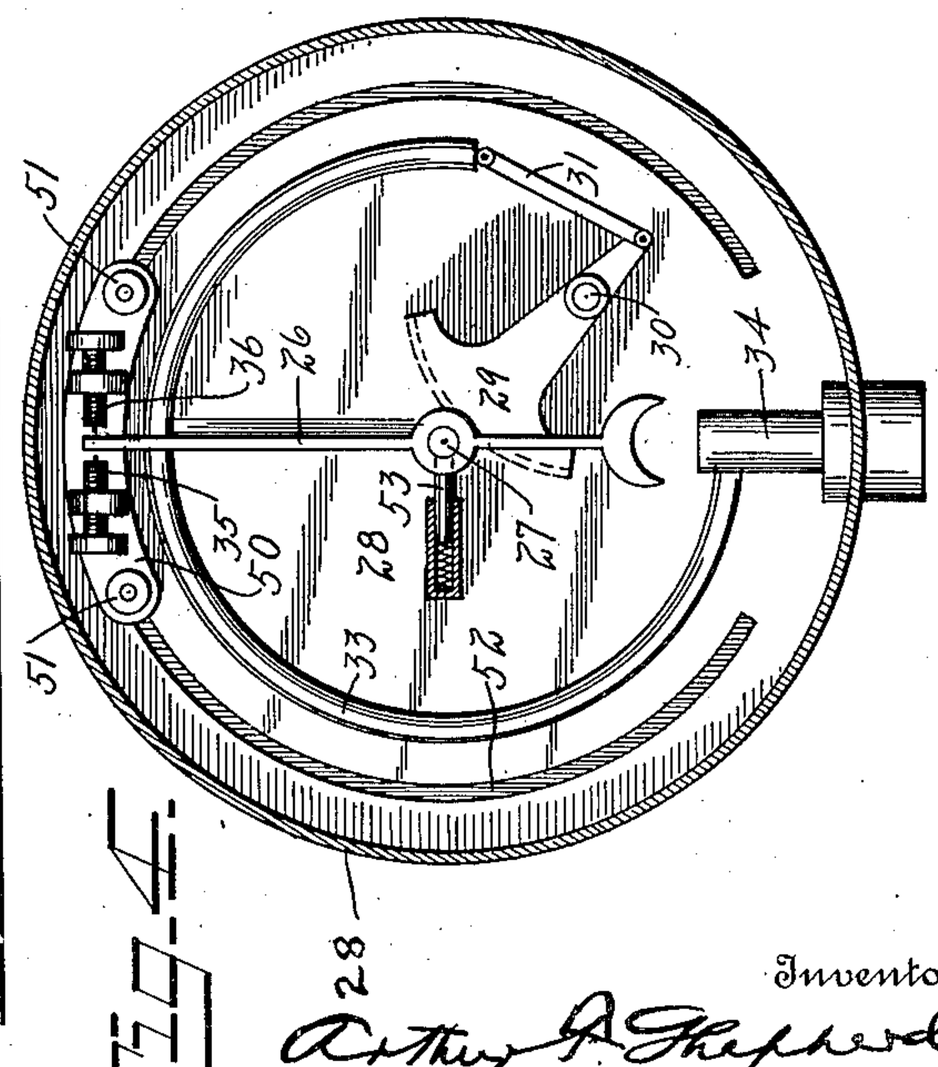

FIG. 4.

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ELECTRICAL MEANS FOR AUTOMATICALLY CONTROLLING THE FLOW OF GASES OR LIQUIDS.

995,036. Specification of Letters Patent. Patented June 13, 1911.

Application filed March 3, 1910. Serial No. 547,002.

To all whom it may concern:

Be it known that I, ARTHUR F. SHEPHERD, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Electrical Means for Automatically Controlling the Flow of Gases or Liquids; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to certain new and useful improvements in electric motor controlling means of the type adapted to control the flow of gases or liquids.

The object of the invention is to provide a device of this type in which the switches, which are of a delicate nature, are relieved of the strain due to breaking the heavy motor circuit, thereby allowing the device to regulate the flow of the gas or liquid through a large or a great number of valves or dampers, and thus enabling the entire device to be controlled by a minimum amount of variation in the temperature or pressures of the gases or liquids.

For a more detailed description of the invention, reference is had to the accompanying drawings of which—

Figure 1 is a diagrammatic view of the complete device, the same being shown attached to the damper and the stoker engine throttle valve of a steam generating plant. Fig. 2 is a view of switches and their actuating means which are used to relieve other delicate switches in the same circuit of the strain of breaking the circuit. Fig. 3 is a side view of one of the circuit breakers shown in Fig. 2. Fig. 4 is a front elevation enlarged, of the duplex switch. Fig. 5 is an end view of one of the contact screws of the duplex switch showing the calibrations thereon.

Throughout the specification and drawings similar reference characters indicate corresponding parts.

In the drawings 1 designates a damper or gas-controlling valve located in the flue of a furnace upon a pivot 2 provided with a lever 3. The lever 3 is connected to a similar lever 4 by cables 5 and 6 of any suitable length. The said lever 3 is also connected to the throttle valve 7 of a stoker engine, through a cable 8. The arrangement is such that the valve and damper open and close concurrently. The lever 4 is mounted on a pivot 9 provided with a pulley 10 connected to a motor 11 through any suitable form of reducing gear 12, which may consist of gears or belts or both as is shown in the drawings. The ratio of this reducing gear is such that the extreme high speed, common to electric motors, is reduced to about five revolutions per minute of the pivot 9.

It will be seen from the above description that if the armature of the motor is rotated in one direction, the damper will be opened, and if rotated in the other direction the damper will be closed.

As shown in the drawings the fields of the motor 11 are connected with the main supply wires 13 and 14 through a circuit 15, and that said fields are at all times energized. In order that the motor may be reversed, the armature is supplied from two different circuits, the currents in said circuits traveling in opposite directions through the armature. These circuits are as follows. The brushes 16 and 17 of the motor may be provided with vertical wires 18 and 19 connected with the supply wires 13 and 14 through circuits 20 and 21. It will be seen from the drawings that the brush 16 is connected with the negative wire 14 of the main circuit through the circuit 20, and with the positive wire 13 through the circuit 21, and that the brush 17 is connected with the positive wire 13 through the circuit 20, and with the negative wire 14 through the circuit 21. Therefore, if the circuit 21 is open and the circuit 20 is closed, the motor will rotate in one direction, and if the circuit 20 is open and the circuit 21 is closed, the motor will rotate in the opposite direction. The circuits 20 and 21 are provided with circuit breakers 22 and 23 respectively, which are controlled by solenoids 24 and 25 or any other form of magnet. The said circuit breakers 22 and 23 are normally held open by springs 22^a and 23^b. As illustrated, these circuit breakers 22 and 23 are adapted to break both legs of their

respective circuits, but it will be understood that they may be constructed to break only one leg of the circuit.

The solenoids 24 and 25 are controlled by a duplex switch operated by steam pressure or temperature as follows. The duplex switch shown in the drawings is constructed similar to a steam gage and consists of an arm 26 mounted upon a pivot 27 journaled in the casing 28. The pivot 27 is actuated to move the arm 26 by a segment gear 29, pivoted at 30 and connected by a link 31 to the end of a curved tube 33. The other end of the curved tube 33 is rigidly mounted at 34 where it connects with the boiler (not shown) in a well known manner. When the pressure in the tube 33 increases, the free end thereof moves outwardly or expands, and the upper end of the arm 26 will move to the right. If the pressure in the tube 33 decreases, the free end of the tube will move inwardly and the upper end of the arm 26 will move to the left. On the left side of the upper end of the arm 26 is mounted an adjustable contact 35, and on the right side of said arm is mounted a similar adjustable contact 36. The contact point 35, the pivot 27 of the arm 26, and the solenoid 24 are connected in series by a circuit 37. The contact point 36, the pivot 37, and the solenoid 25 are connected in series by a circuit 38. The circuits 37 and 38 receive current from the main supply wires 13 and 14 as shown in the drawings.

It will be seen from the above description that if the pressure in the tube 33 decreases and the upper end of the arm 26 moves to the left, the solenoid 24 will be energized and the circuit breaker 22 will be closed, therefore the armature of the motor will be rotated and the damper 1 and throttle valve 7 will be opened. When the pressure in the tube increases and the arm 26 moves to the right, the solenoid 25 will be energized by the circuit 38 and the circuit breaker 23 will be closed, therefore, the armature of the motor will rotate in an opposite direction and the damper 1 and throttle valve 7 will be closed.

It is essential that the contact between the arm 26 and the points 35 and 36 shall be as delicate as possible. These points are therefore relieved of the strain of the heavy current by bypasses constructed as follows. Flexibly mounted on each of the circuit breakers 22 and 23, and insulated therefrom, are contact points 39 and 40 which are adapted to engage contact points 41 and 42 when the solenoids 24 and 25 are energized. The contacts 39 and 41 are in a shunt circuit 43 which cuts into the circuit 37 around the contact 35 and the arm 26. The contacts 40 and 42 are in a shunt circuit 44 which cuts into the electric circuit 38 around the contact 36 and the arm 26. It is desirable that the circuits 43 and 44 be of as low resistance as possible, in order to prevent a large amount of current passing through the contacts 35 and 36. It will be seen that, after the circuit 37 or 38 is closed, and the arm 26 moved away from one of the contacts 35 or 36, the circuit 37 or 38 will not be broken, as the current will then pass through the shunt circuit 43 or 44. Therefore no arc will form at the contacts 35 or 36 and thus fusing is prevented. After either of the circuits 37 or 38 are closed, they remain closed until the motor 11 completely shifts the damper, at which time said circuits are opened by the following mechanism. Within the circuit 37 is a switch 45, and within the circuit 38 is a switch 46. These switches 45 and 46 are provided with slotted arms 47 through which the cable 5 passes. Attached to said cable 5 are trip pieces 48 which engage the slotted arms 47 to open and close the switches 45 and 46. The movement of the cable 5 is somewhat greater than the throw of the switches and at the end of the opening movement of the damper the switch 45 will be opened and the switch 46 will be closed. When the circuit 37 is broken by the switch 45, the solenoid 24 releases the circuit breaker 22; this breaks the circuit 20 through the armature, and the motor stops. The momentum of the motor is, however, sufficient to close the switch 46 after the switch 45 is opened. It will be noted that the circuits 37 and 38 are not broken at the contact points 39, 40, 41 and 42, thereby preventing fusing at said points. The closing of the switch 46 places the circuit 38 in a condition to energize the solenoid 25 which closes the circuit 38 by the contact points 36 and 42. When the circuit 38 is thus closed at the points 36 and 42, the circuit 21 will be closed at the circuit breaker 23 and the motor will rotate in a direction to close the damper 1. At the end of this movement, the switch 46 will be opened and the switch 45 will be closed, which places the circuits 20 and 37 in a condition to rotate the motor in an opposite direction at which time the circuit 37 is closed at the contacts 35 and 41. It will be seen that the switches 45 and 46 compel the armature to rotate alternately. This insures the complete opening or closing of the damper at each operation.

It will be seen from the above description, that the motor armature circuits 20 and 21 are independent from the circuits 37 and 38 which pass through the switch 26, which must necessarily be of a delicate nature. All of these circuits may be connected into the main circuit 13—14 in parallel, but it will be seen that, as the two sets of circuits are independent, the current which passes through the armature, does not at any time pass through the duplex switch 26. Therefore, the motor 11 may be of large size to

actuate a multiplicity of dampers 1, while at the same time the switch 26 may be of an extremely delicate nature. The gas or liquid to be controlled may, therefore, be of a large volume, but the variations in temperature will be extremely small.

In Fig. 4 is shown a more detailed construction of the duplex switch. The contact breakers 35 and 36 are mounted in an insulated member 50 attached to the casing 28 by means of screws 51 which penetrate an annular slot 52 in the casing. It will therefore be seen that the contact points 35 and 36 may be shifted to set the switch to any desired steam pressure. The contact points 35 and 36 may be calibrated as shown in Fig. 5, thereby allowing said points to be delicately adjusted.

To prevent vibration of the arm 26 there is provided a friction device which consists of a spring-engaged plunger 53 which presses against the pivot 27.

In the drawings I have shown the arm 26 adapted to be shifted by a curved tube 33 actuated by pressure, but it will be understood that the said arm may be shifted by any means acted upon by temperature, such for example as a thermostat without departing from the essentials of my invention.

The operation of the device is briefly described as follows. As shown in Fig. 1, the damper 1 is closed as is also the throttle valve 7. The draft is therefore subdued and no fuel is being fed to the furnace. The result is, the pressure of the steam is falling and the arm 26 of the duplex switch moves to the left. When said arm engages the contact 35 the circuit 37 will be closed and the solenoid 24 will be energized. This closes the shunt circuit 43 at the contact points 39 and 41 which relieves the contact point 35 of the excessive current. It also closes the circuit 20 at the circuit breaker 22, which energizes the armature of the motor, at which time the damper 1 and valve 7 will be opened through the reducing gear 12 and the cables 5 and 6. At the end of this opening movement, the switch 45 will be opened and the switch 46 will be closed. When the damper 1 and the valve 7 are opened, the products of combustion have a free outlet through the flue, and the coal is being fed to the furnace by the stoker. As a consequence, the pressure of the steam will rise and the arm 26 will move to the right. When said arm contacts with the point 36, the circuits 38 and 21 will be energized in the same manner as were the circuits 37 and 20, and the motor will rotate in an opposite direction, or in a direction to close the damper and valve.

The circuits on the left of the duplex switch, which open the damper and valve, are exact duplicates of the circuits on the right with the exception that each series of circuits is adapted to rotate the motor in a different direction.

Having described my invention, I claim:

In a device of the type specified, the combination of a motor, an electric circuit energizing the fields of said motor, independent armature circuits adapted to rotate the armature in opposite directions, a reciprocating member actuated by said motor, a circuit breaker in each armature circuit, an independent circuit breaker circuit for each circuit breaker, a duplex switch in both of said circuit breaker circuits, right and left shunt circuits connected into said circuit breaker circuits around said duplex switch, right and left contact members in said shunt circuits controlled by the right and left circuit breakers, a second switch in each circuit breaker circuit actuated by said reciprocating member, said switches being operatively connected, whereby said duplex switch is relieved of the strain due to breaking the motor circuit, substantially as specified.

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

ARTHUR F. SHEPHERD.

Witnesses:

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