

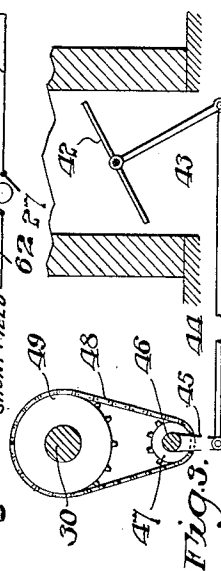
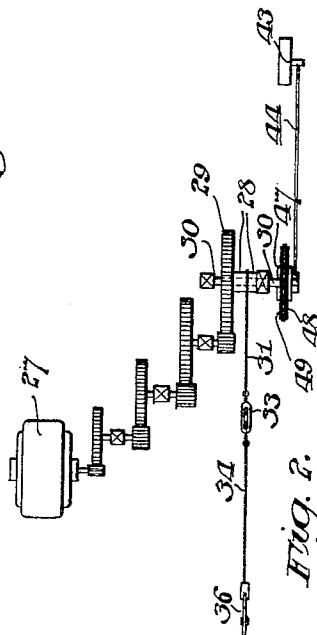
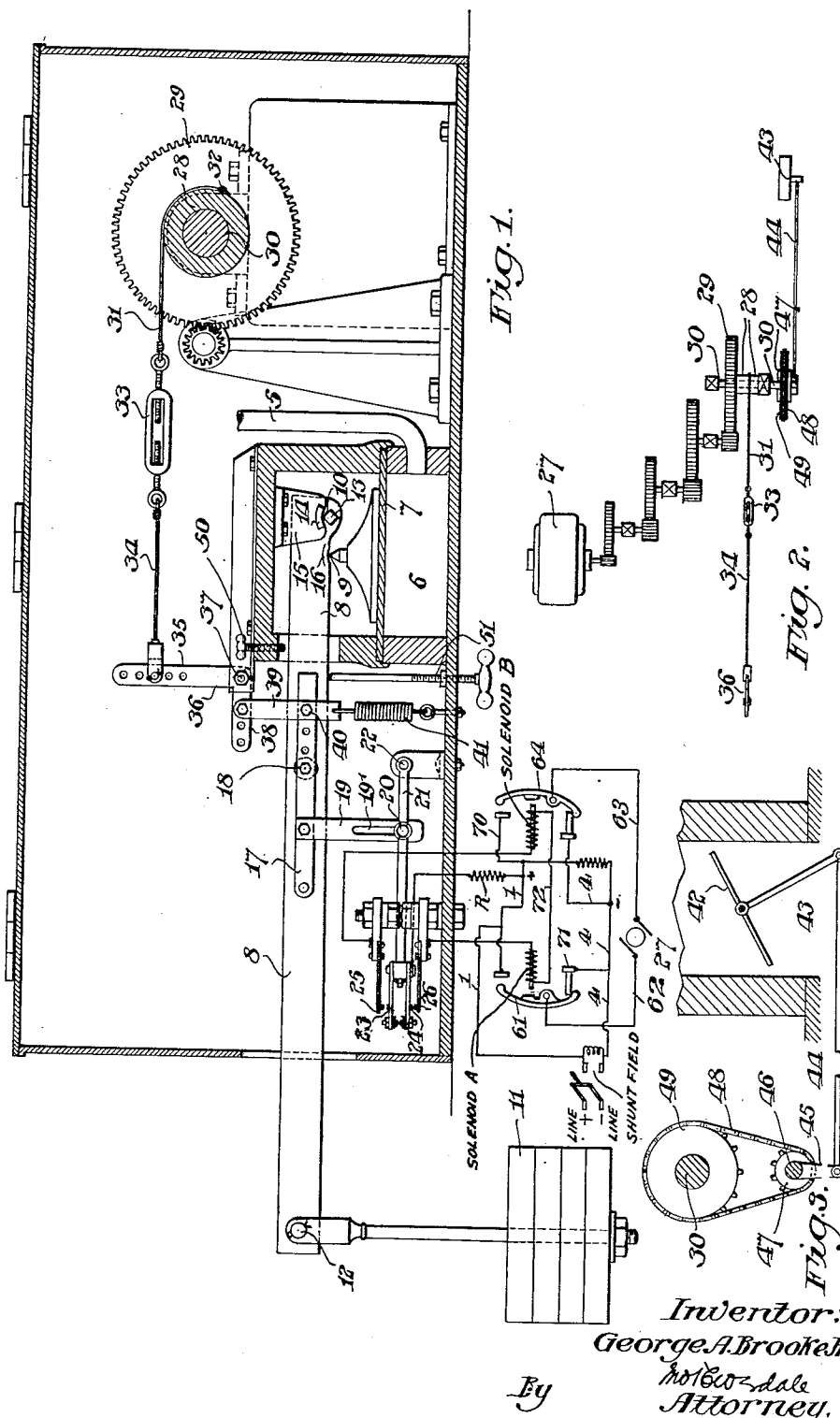
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## PRESSURE CONTROL

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## UNITED STATES PATENT OFFICE.

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## PRESSURE CONTROL.

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My invention relates to improvements in pressure control. The object is to provide improved means for maintaining automatically the required pressure of an expansible medium.

The invention comprises means for utilizing changes in the pressure of the expansible medium for operating a control for a motor, which in turn operates a damper or other controlling device to restore the medium to normal or predetermined pressure, so that, as the pressure of the medium tends to rise or fall, the automatic control operates to restore said pressure to normal and at the same time the exact movement of the motor which is determined by the direction and amount of pressure change, is utilized to stop the motor.

Referring to the drawings, which illustrate merely by way of example suitable means for effecting my invention:—

Fig. 1 is a sectional elevation of such means with diagram of electric circuits.

Fig. 2 is a diagrammatic plan view.

Fig. 3 is a detail in part section and part elevation.

Similar numerals refer to similar parts throughout the several views.

Assuming for example that the expansible medium, the pressure of which is to be controlled, is the steam in a steam boiler or generator, and that a damper in the stack is utilized for regulating the fire which generates the steam, we conduct the steam through pipe 5 to an enclosed space 6 beneath the movable diaphragm 7, with the result that the diaphragm 7 rises and falls in accordance with the pressure in 6. A lever bar 8 is supported at the points 9 and 10 at or near one end, and is provided with the weight 11 connected at the other end, as at 12. The fulcrum 13 comprises a bar or trunnion formation having a knife edge 10 for engagement with a contact piece 14, of hardened metal, secured to the ends of the stationary lugs 15 which flank the end of bar 8. The other point of support is the knife edge formation 9, supported on the movable diaphragm 7, and engaging the contact piece 16 secured to the underside of bar 8.

The hand operated threaded rods 50 and 51 form adjustable abutments or stops for limiting the movement of the lever bar 8.

A bar 17 is pivotally secured to bar 8, as at 18. To this bar 17 is pivotally connected the link 19 provided toward its lower end

with slot 19' through which projects a stud 20 connected to the bar or lever 21 supported at one end, as at 22. The other end of bar or lever 21 carries two blades or plates provided with the contacts 23 and 24 which are adapted for alternate engagement with the contact points 25 and 26 respectively.

The contacts 25 and 26 may be called *a* minus and *b* minus, while contacts 23 and 24 represent plus, in their control of the motor circuits.

The function of the contacts 23, 25 and 24, 26 is to control circuits operating magnetic contactors to close the circuits operating the motor, as indicated diagrammatically in Fig. 1. This makes available dynamic braking of the motor when the arm 21 assumes the neutral position.

If the arm 21 moves up, the relay circuit is as follows: line plus, wire 1, resistance R, contacts 23, 25, solenoid coil B, wire 72 to wire 4 to line minus. This operates the pivoted spring or gravity controlled solenoid actuated switch 64.

When switch 64 is actuated, the armature circuit is as follows:

Line plus, wire 1 to wire 70 to switch 64 to wire 63 armature right to left to wire 62, switch 61 to contact 71 to wire 4 to line minus.

Since the field circuit is continually closed from line plus, to line minus, the motor will run when the armature is connected as above.

If arm 21 moves down, the solenoid A is actuated and the armature current is reversed.

The motor 27 is shown in Fig. 2 connected with a four reduction gear. The hub 28 of the last gear 29 which is mounted on shaft 30 is provided with a band or cable 31 secured to the hub as at 32. This cable 31 is connected, through the adjustable turnbuckle 33 and the cable 34, to one arm 35 of the bell crank lever 36, pivotally mounted as at 37. The other arm 38 of this bell-crank 36 is connected by the link 39 to the bar 17, as at 40, to the other side of the pivot support 18. The link 39 is also connected to the spring 41.

Any desired gear of the train of motor driven gears may be put in operative relationship with a control, such for example as a stack damper 42 as shown merely diagrammatically in Fig. 3. The damper 42 may be connected for example by means of lever 43, to connecting rod 44, crank arm 45, shaft 46,

sprocket 47, chain 48 and sprocket 49 mounted on shaft 30, or the shaft of any other of the gears, as required.

*In operation.*

By the proper adjustment of the turnbuckle 33, when the pressure in 6 is at the desired point and the motor is in the required position, with respect to the damper or other device which it is designed to operate, the tension of cables 31 and 34 acting through bell-crank 36 and link 39, against spring 41, serves to bring bar 21 in such position that the contact points 23 and 24 will be in neutral position, that is, out of engagement with contacts 25 and 26. Upon increase of steam pressure in space 6, the diaphragm 7 is lifted causing a lifting of the left hand end of bar 8, which actuation is communicated through link 17 to cause the movement of bar 21 so that 23 is brought into contact with 25 the circuits as indicated on page 3, thereby causing the motor to operate for example, to close the damper 42, and check the draft, at the same time the very slight movement of drum 28, due to the four gear reductions referred to, pulls the bell-crank 36 in the clockwise direction against the pull of spring 41. This causes the elevation of the right hand end of bar 17 and the depression of the left hand end, and consequently the depression of link 19 which permits the bar 21 to fall by gravity sufficiently to separate contacts 23 from contact 25. Whereupon the motor stops. Similarly upon occurrence of decrease of pressure in 6, the diaphragm 7 descends and through the connecting elements already described contacts 24 and 26 engage, causing the motor to be moved in the opposite direction, moving bell-crank in counter-clockwise direction and, correspondingly, through the mechanism described, bar 21 is lifted sufficiently to separate 24 and 26 and thus cause the motor to stop. In this way the operation may be repeated as often as required in either direction, depending

upon change of pressure in 6 either upwardly or downwardly, to correct the same.

The action of the bar 21 may be used to operate a motor reversibly by means of other and different circuits and electrical devices common to the art, the disclosure being merely by way of example.

The diaphragm 7 is preferably made of flexible and slightly elastic material and of such character that its resistance increases relatively to its distortion, due to change of pressure in 6. From this factor it follows that an increment change in pressure of fluid medium causes like incremental movement of a suitable actuator.

The movement of the motor is always exactly proportional to the movement of bar 8, therefore the movement of the motor is always exactly proportional to the pressure change.

It will be understood that the purpose of spring 41 is to maintain constant tension of the cable 31, and the slot 19' is provided in link 19 to permit idle movement of the link in one direction only. Connecting holes are provided in bar 17 and bell crank 36 for preliminary adjustment, but the final adjustment is secured by the turnbuckle 33.

What I claim is:—

In a pressure control, the combination of means forming a pressure chamber, a diaphragm associated therewith, a motor, a controlling device operated thereby, two motor circuits having stationary terminal contacts and a control for said circuits comprising a movable member provided with terminal contacts for cooperation with either of the stationary contacts, and means for communicating a magnified movement of the diaphragm to the movable contact member, operating to secure the actuation of the motor in direction corresponding to direction of pressure change and during an uninterrupted period corresponding to the amount of pressure change.

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