No. 864,339. PATENTED AUG. 27, 1907.

G. SCHMIDT.

AIR PUMP AND AUTOMATIC PRESSURE REGULATOR THEREFOR.

APPLICATION FILED SEPT. 12, 1906.

2 SHEETS—SHEET 1.

Fig. 2.

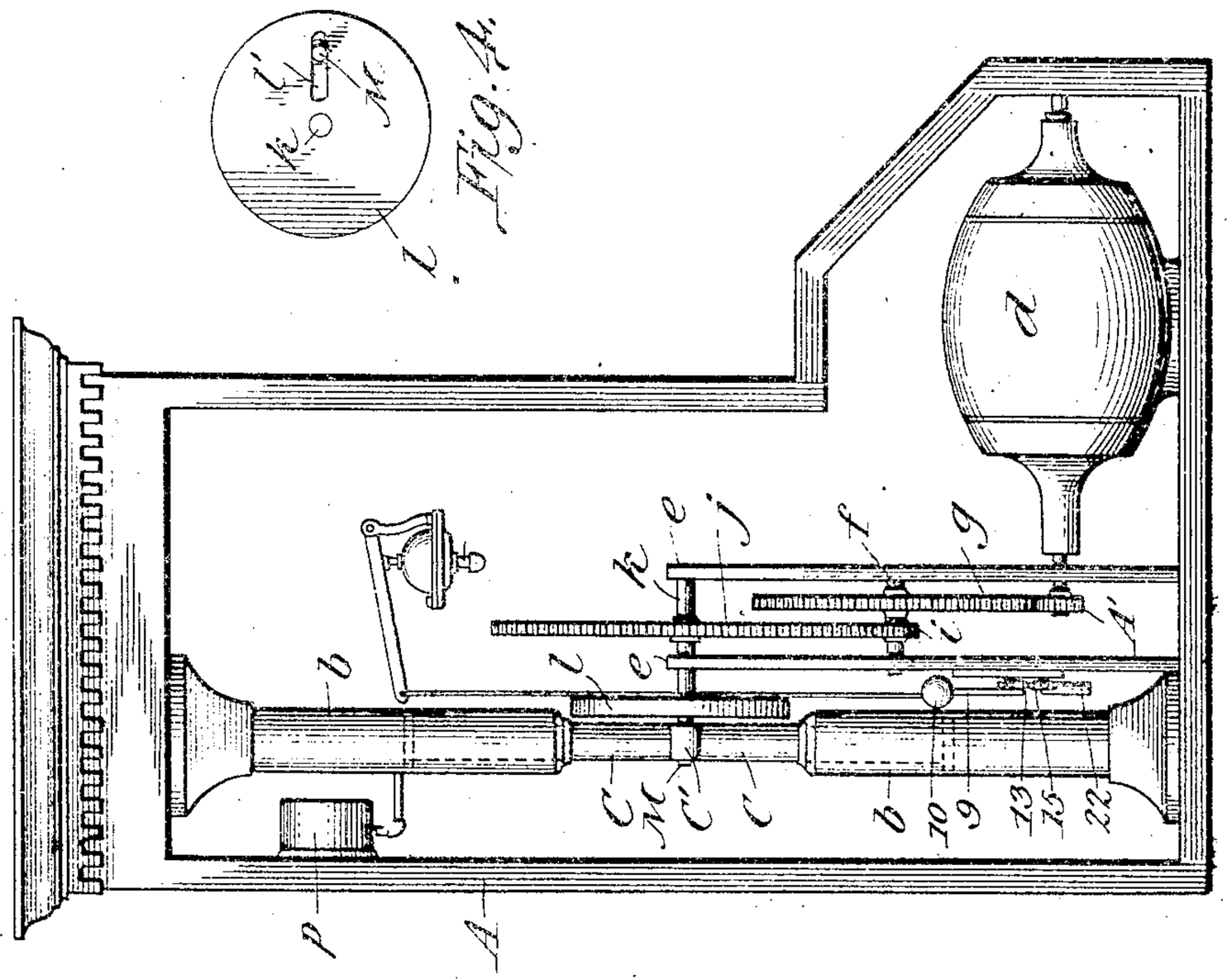
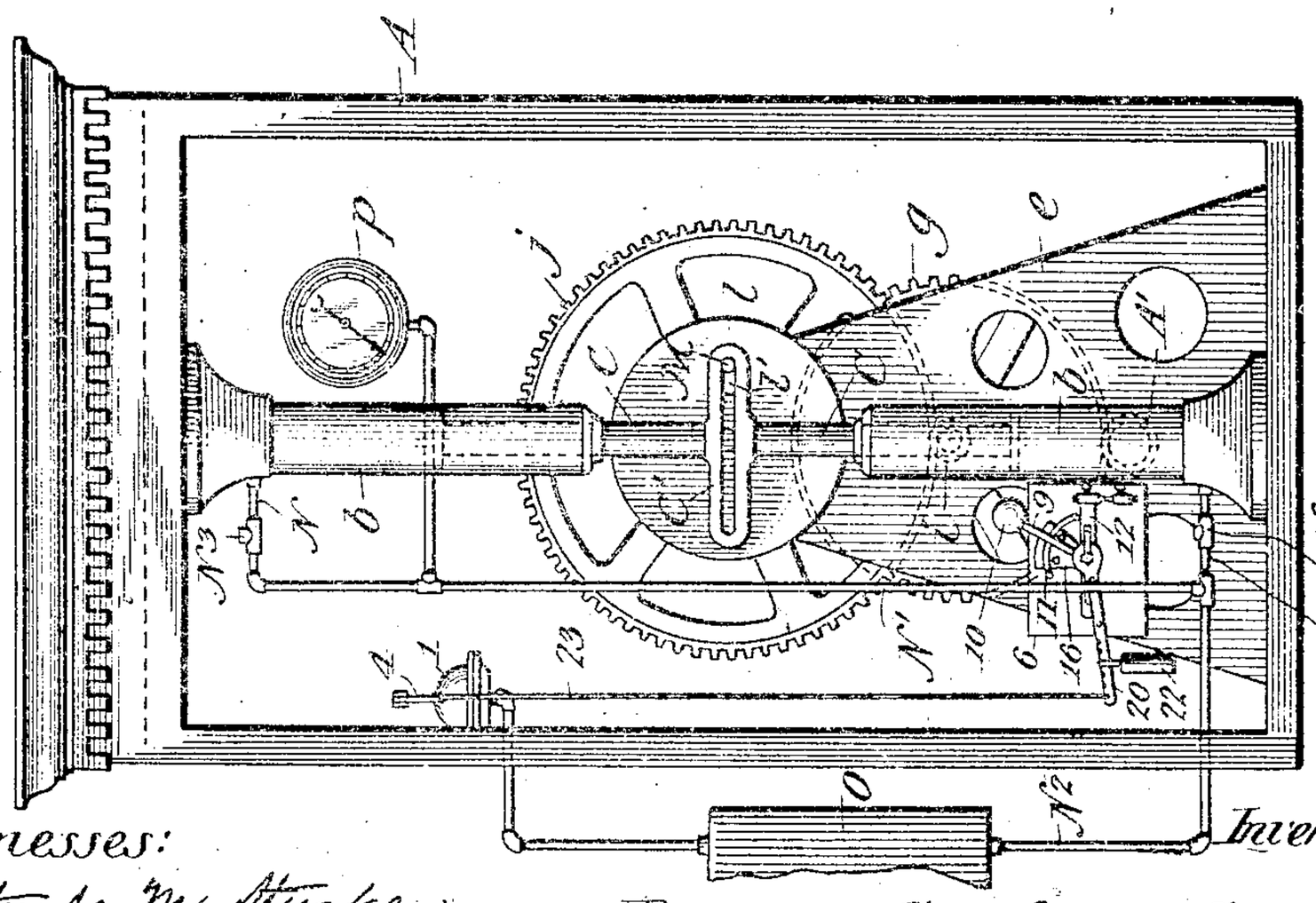


Fig. 1.



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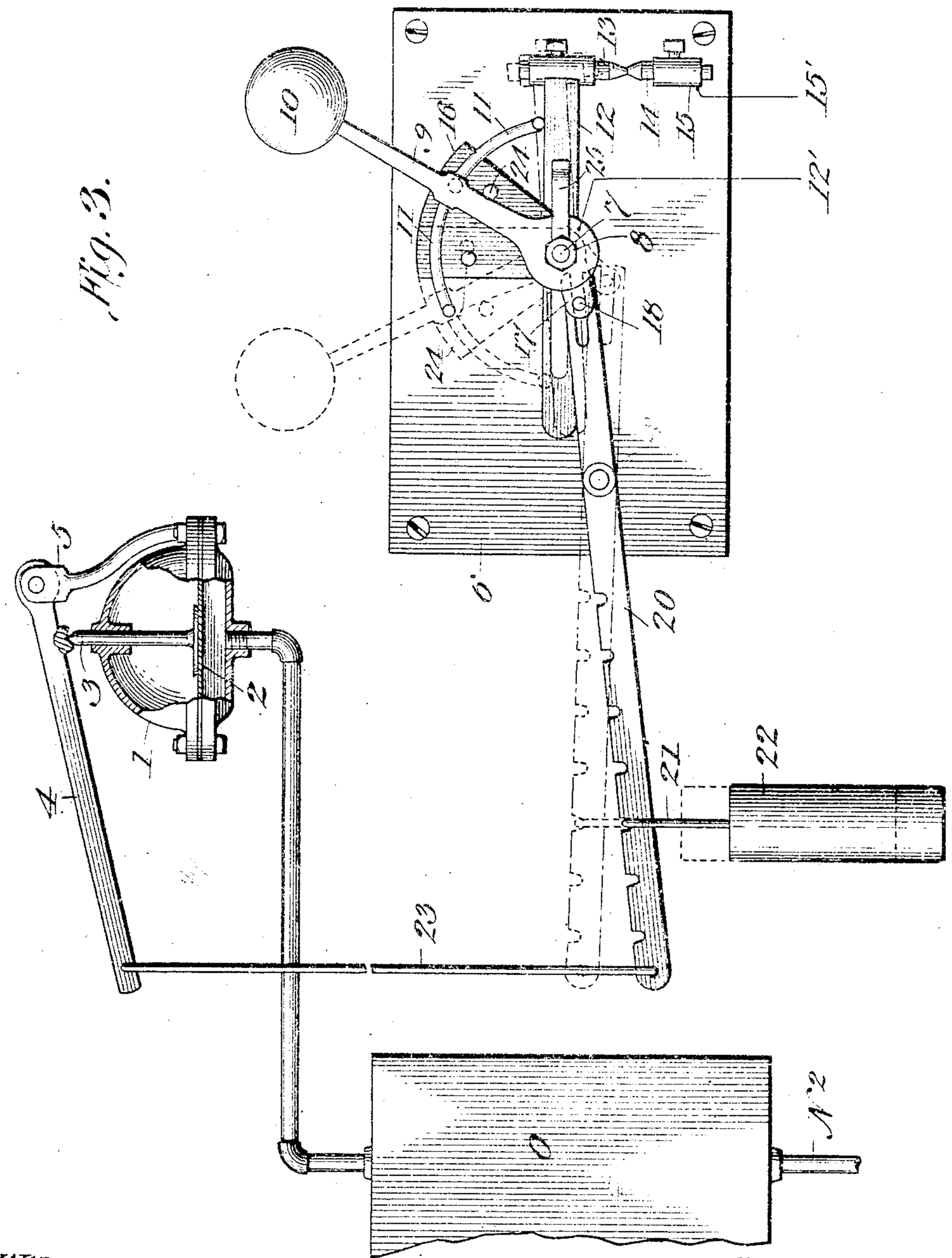
2 SHEETS—SHEET 2

Fig. 3.



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UNITED STATES PATENT OFFICE.

GOTTFRIED SCHMIDT, OF HAZLETON, PENNSYLVANIA, ASSIGNOR OF ONE-THIRD TO HARRY W. JACOBS, OF HAZLETON, PENNSYLVANIA.

AIR-PUMP AND AUTOMATIC PRESSURE-REGULATOR THEREFOR.

No. 864,339. Specification of Letters Patent. Patented Aug. 27, 1907.

Application filed September 12, 1906. Serial No. 334,258.

To all whom it may concern:

Be it known that I, GOTTFRIED SCHMIDT, a citizen of the United States, residing at Hazleton, in the county of Luzerne and State of Pennsylvania, have invented new and useful Improvements in Air-Pumps and Automatic Pressure-Regulators Therefor, of which the following is a specification.

This invention relates to an air pump and an automatic pressure regulator therefor.

The object of my invention is to produce an air pump of the compound variety, operated by a suitable electric motor.

A further object is to provide a device that will automatically operate to stop or start the motor when the pressure in the air storage tank rises above or falls below a certain predetermined point.

In my improved device this regulator consists, briefly, of a diaphragm inclosed in a casing and adapted to be flexed by the pressure of the air in the supply tank, and a novel arrangement of levers operated by the flexing of the diaphragm whereby the circuit which runs the electric motor is automatically closed or broken as the pressure in the supply tank rises above or falls below a predetermined point.

For the sake of convenience, I have described this as used in compressing air. However, it may be employed in connection with various other agents and I therefore do not limit the scope of my invention to the compression of air alone, but to all agents of a gaseous liquid nature.

For a more complete description of my device, reference is had to the accompanying drawing, in which—

Figure 1 represents a front elevation of the complete device; Fig. 2 is a side view; Fig. 3 is a front elevation of my regulating attachment; and Fig. 4 is a plan view showing the adjustable wrist-pin.

The whole device is arranged in a suitable casing A, as illustrated in the drawing. To the bottom and top of the casing are arranged in tandem air pump cylinders *b*. Suitable pistons are arranged in these cylinders and are operated by piston rods C, which are connected with a slotted cross head C′.

The motive power for this device is furnished by the electric motor *d* fixed to the lower floor of the casing. Secured to the shaft of the motor is a pinion A′. Standards or shaft rests project upwardly from the bottom of the casing, and in these shaft rests are journaled the ends of the shaft *f*, to which is secured, in any suitable manner, the gear wheel *g* which meshes with the pinion *d*′ on the motor. Also secured on the shaft *f* is a gear wheel *i*, meshing with the gear wheel *j*, which in turn is securely mounted on the shaft *k*. This shaft *k* is journaled in the upper parts of the shaft rests *e*, and has fixed to its inner end a driving crank *l* in the shape of a disk. This driving crank carries a wrist-pin M which is adapted to work in the slotted cross-head C′. For the purpose of adjusting the stroke of the pump, I have provided a slot *l*′ in the driving crank *l*, as clearly shown in Fig. 4 of the drawing, in which the wrist-pin M may be adjusted to obtain the length of stroke desired. As the operation of the mechanism for running the pump will be easily understood from the foregoing description, further description of operation does not appear to be necessary.

While the gear mechanism just set forth is especially suitable for connecting the motor with the pump, it will be seen, however, that other mechanism could be substituted for that just described.

Leading from each of the pump cylinders are pipes N for conducting the compressed air from the cylinders to the pipe N′, which, in turn, is connected to a pipe N² leading to an air storage tank O. Arranged on each of the pipes N are check valves N³ to prevent the backward flow of compressed air. At *p* is shown a pressure gage having a pipe connection with the pipe N′.

My improved pressure regulator is best shown in Fig. 3 of the drawings. The various parts of the regulating device may be arranged about the casing, as desired. This regulator is connected with the air storage tank O by means of the pipes N⁴ and N². On the upper end of the pipe N⁴ is a two-part casing 1, the parts of such casing being fixed together in some air-tight manner, preferably by bolts. Between the sections of the casing 1 is secured a flexible and elastic diaphragm 2 adapted to be elevated by the pressure in the supply tank transmitted by the pipe connections. Secured to the upper side of the diaphragm is a plunger or pin 3 which is slidably adjusted in an aperture in the upper section of the casing. The upper end of this plunger or pin 3 is pointed and bears against a pendent boss on the underside of the lever 4 fulcrumed at one end to an arm support 5, mounted on the casing 1. When the pressure elevates the diaphragm and with it the pin or plunger 3, it will be seen that the free end of the lever 4 is elevated. The connections shown with the free end of this lever 4 will be explained later.

The reference numeral 6 represents a slab or plate to which is secured the switch mechanism of the regulator. This plate may be made of any suitable non-conducting material, such as porcelain, and may be secured to any suitable support, as the lower face of the casing. Projecting outwardly from near the center of this plate is a pivot 7 carrying a nut 8. Fulcrumed on this pivot 7 is a lever 9 which operates as an actuator for the device, opening and closing the electric circuit. To the upper end of this lever is attached a weight 10, the purposes of which will be explained later. This weighted lever 9 has extended from its two opposite sides curved arms 11, which are adapted to alternately contact with the circuit-controlling lever 12 when the lever 9 is os-

cillated. The circuit-controlling lever 12 is also fulcrumed on the pivot 7, and has mounted on one end thereof a contact 13 which is adapted to engage a cooperating contact 14 secured to the plate 6. The contact 13 is adjustably mounted in a sleeve on the end of the lever 12, while the contact 14 is secured in a like manner in a sleeve 15 secured to the plate 6. Connected with the lever 12 and the sleeve 15 are wires 12′ and 15′, forming part of an electric circuit, not shown, which operates the motor. When the contacts 13 and 14 are engaged, the circuit will be closed and the motor will be operated. On the pivot 7 is also loosely mounted a segment-shaped plate 16, carrying on its lower end a tail piece 17. On the end of this tail piece is located a pin 18. At S some distance from the pivot 7 is fulcrumed a lever 20 having a long and a short arm, and in the outer end of the short arm is located a slot 19, in which the pin 18 is adapted to loosely play. At graduated intervals on the long arm of the lever 20, are notches into any one of which may be set the hook 21 of the weight 22. By this arrangement the weight 22 may be adjusted on the lever 20 so as to secure the operation of the lever 4 at different pressures, the outer ends of the levers 4 and 20 being connected by the rod 23. Near the two straight edges of the front face of the segment 16 are projections 24 which may consist of screws tapped into the plate 16. These projections 24 are adapted to alternately engage the opposite sides of the weighted lever 9 and shift the same.

In the drawings I have shown the two contacts 13 and 14 as being in engagement, and hence the circuit is closed and the pump is operating. When the pressure in the tank O reaches a certain pressure as determined by the location of the weight 22 on the lever 20, further operation of the pump will cause the diaphragm 2 to rise, carrying with it the pin 3. This will force upward the outer ends of the levers 4 and 20 to the position shown by dotted lines in the drawing. The short arm of the lever 20 will necessarily be lowered by the upward movement of the long arm, and in this downward movement of the short arm the tail piece 17, through the pin and slot connection, is forced around to the right, which will cause the weighted lever 9 to move to the left from the position shown in the drawings until it has passed the vertical line, when further movement in that direction is accentuated by gravity acting on the weight 10. This movement of the lever 9 to the left will cause the left-hand curved arm 11 to contact with the end of the lever 12 and raise the contact 13 from engagement with the contact 14, and thus the circuit is broken and the pump is stopped. By means of this weighted lever and the device operating the same, it will be seen that whenever the pressure rises above the predetermined point, so as to force the weighted lever 9 beyond the vertical line, there is a quick and positive throw of the switch carrying the contact 13 rapidly away from the contact point 14. When the pressure is reduced the diaphragm 2 falls, and the levers 4 and 20 will assume the positions shown in Fig. 3. In assuming this position the lever 20 will force the weighted lever 9 back across the vertical line, when, by reason of its own weight, it will fall to the right. The right-hand lever 11 impinging on the circuit-controlling lever will bring the contact 13 into engagement with the contact 14, and thus close the circuit operating the motor. The two curved arms 11 are made somewhat resilient so as to avoid undue shock when they strike the circuit controlling lever 12.

On the outer end of the pivot 7 is mounted a spring 25 which is held in place by the nut 8 threaded onto said pivot. The spring 25 bears against the circuit controlling lever 12 so as to hold the contact 13 firmly against the contact 14. This spring serves to hold the lever 12 in both of its shifted positions so that it will not be oscillated by the jarring of the machinery while in motion.

While I have described my apparatus as a device for compressing air, it will be understood that it may be used also for compressing other agents.

I do not restrict my invention to the exact details herein described, as various alterations in the details could be made without departing from the scope of the invention.

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

1. In a device of the class described, the combination of a shiftable motor-controlling member, an oscillatory weighted lever to positively actuate the same at each end, only, of the stroke of the lever, a pivoted segment having studs to engage and move said lever, said segment also provided with a tailpiece carrying a pin, and a fluid pressure controlled lever having a slotted engagement with said pin.

2. In a device of the class described, the combination of a shiftable motor-controlling member, an oscillatory lever having a weight movable to opposite sides of a vertical line extending through the center of motion of the lever, the latter being provided with curved arms adapted to engage the circuit controlling member and move it to different positions, an oscillatory member having projections between which the lever is located, and mechanism for operating the oscillatory member to cause the projections to alternately engage and operate said lever.

3. In a device of the class described, the combination of a shiftable motor-controlling device, an oscillatory lever having a weight, the lever having a movement to carry its weight to opposite sides of a vertical line intersecting its center of movement, said lever being adapted at the end of each of its oscillations only to move the motor-controlling member into its operative and inoperative positions respectively, an oscillatory member having projections between which the lever is located, and a pressure operable lever having a slot in engagement with a pin on said oscillatory member and adapted on its stroke to move the oscillatory member back and forth to cause the projections thereon to oscillate said lever.

4. In a device of the class described, the combination of a pivotally mounted circuit controller, a weighted lever supported for oscillation by the pivot of the circuit controller, a segment also supported for oscillation by said pivot, the weighted lever serving to engage the circuit controller on each side of its pivot and move it into its operative and inoperative positions, respectively, and the segment serving to operate the lever, and pressure-operated means for actuating the segment.

5. In a device of the class described, the combination of a pivotally mounted circuit controller, a weighted lever supported for oscillation on the pivot of the circuit controller, a segment also supported for oscillation on said pivot, the weighted lever serving to engage the circuit controller on each side of its pivot and move it into its operative and inoperative positions, respectively, and the segment serving to operate the lever, pressure operated means for actuating the segment, and a spring acting against the circuit controller to hold the same positively in its shifted positions.

6. In a device of the class described, the combination of a circuit controller, a weighted lever for moving the circuit controller into its operative and inoperative positions, respectively, an oscillatory member for actuating

the lever, and a pressure actuated lever for engaging and shifting said member and provided with an adjustable weight.

7. In a device of the class described, the combination of a pivotally mounted circuit controller, a lever supported for oscillation by the pivot of the circuit controller and adapted to act against said circuit controller at opposite sides of its center of motion to move the same into operative and inoperative positions, respectively, a segment supported for oscillation by said pivot and provided with projections between which the lever is located, pressure operated means for actuating the segment to cause the projections to alternately operate the weighted lever, a spring fitted against the circuit controller to hold the same in its shifted positions, said pivot extending through the spring.

8. In a device of the class described, the combination with an electrically operated means for compressing air, a pressure regulating means consisting of a fixed pivot, a circuit-controlling lever mounted to oscillate thereon for opening and closing the circuit operating said motor, a weighted lever carrying side arms for oscillating said circuit controller mounted on said fixed pivot, a segment plate also mounted on said fixed pivot and having projections adapted to contact with the opposite sides of said weighted lever to shift the same, a tail piece having a projection on said segment plate, a lever pivoted near one of its ends and having a loose connection with the projection on said tail piece, a weight adjustably mounted on said last-named lever and means operated by the varying pressure created by the compression means for oscillating said last-named lever whereby the mechanism is actuated to open and close the circuit operating the motor.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GOTTFRIED SCHMIDT.

Witnesses:
HENRY ZEIGLER,
JOSIAH WOODRING.