(No Model.) 3 Sheets—Sheet 1.

H. C. SERGEANT.

DISCHARGE VALVE OPERATING MECHANISM FOR AIR COMPRESSORS.

No. 579,776. Patented Mar. 30, 1897.

Fig. 1.

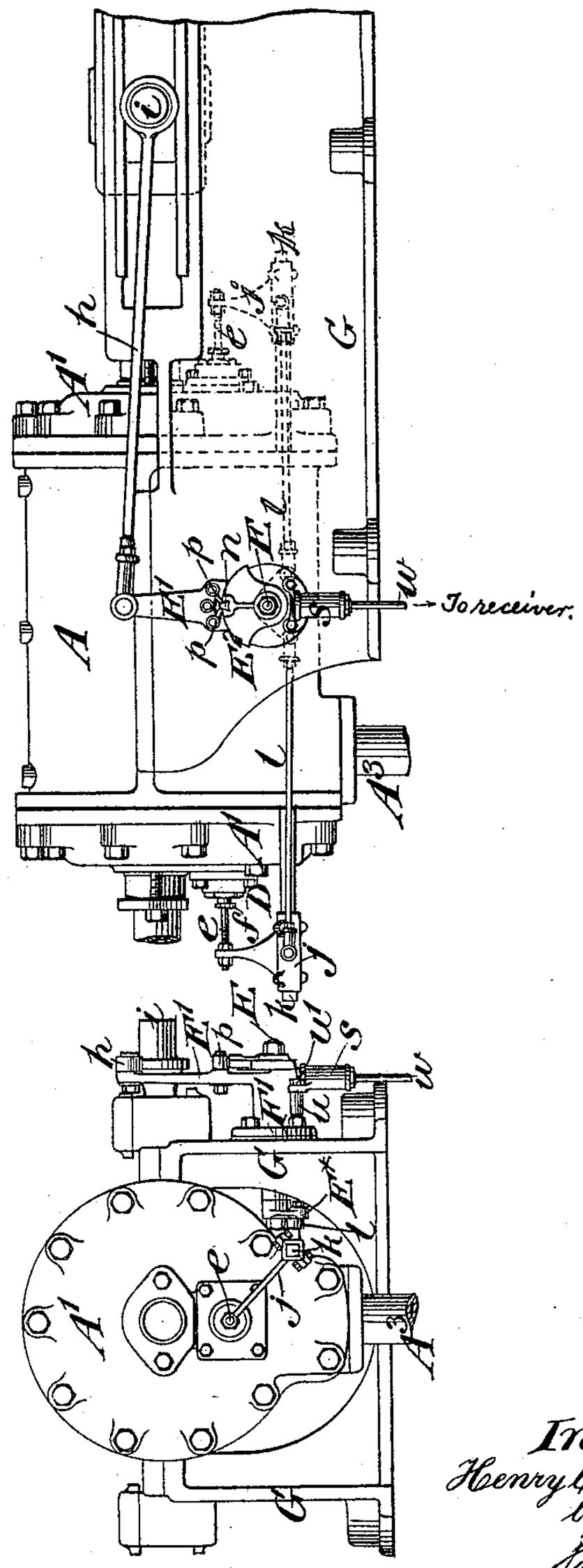

Fig. 2.

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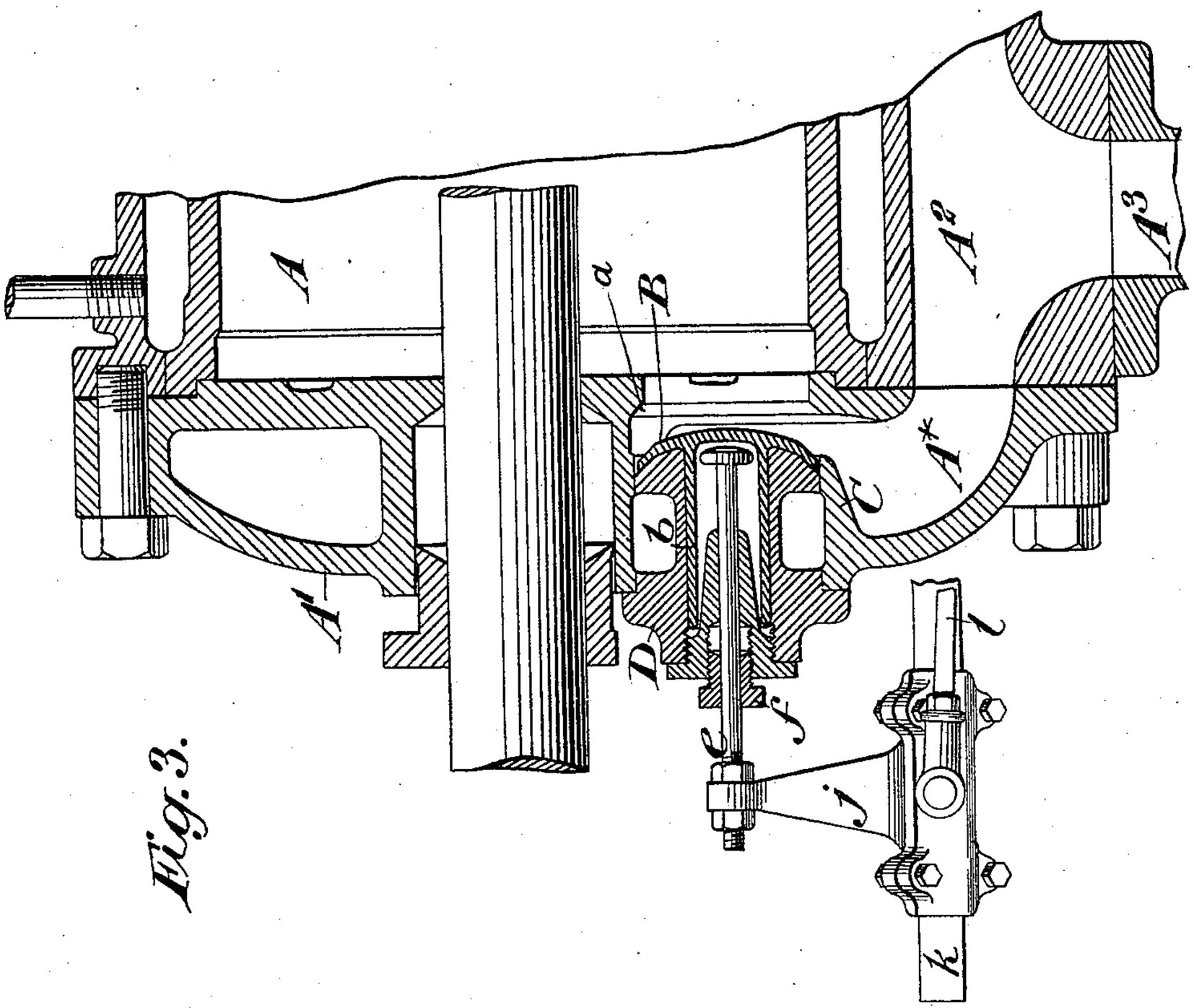

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 8.

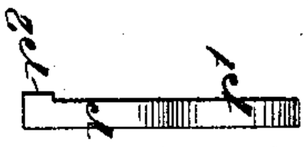


Fig. 7.

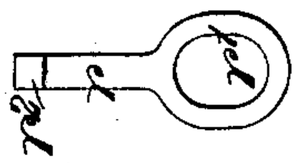


Fig. 4.

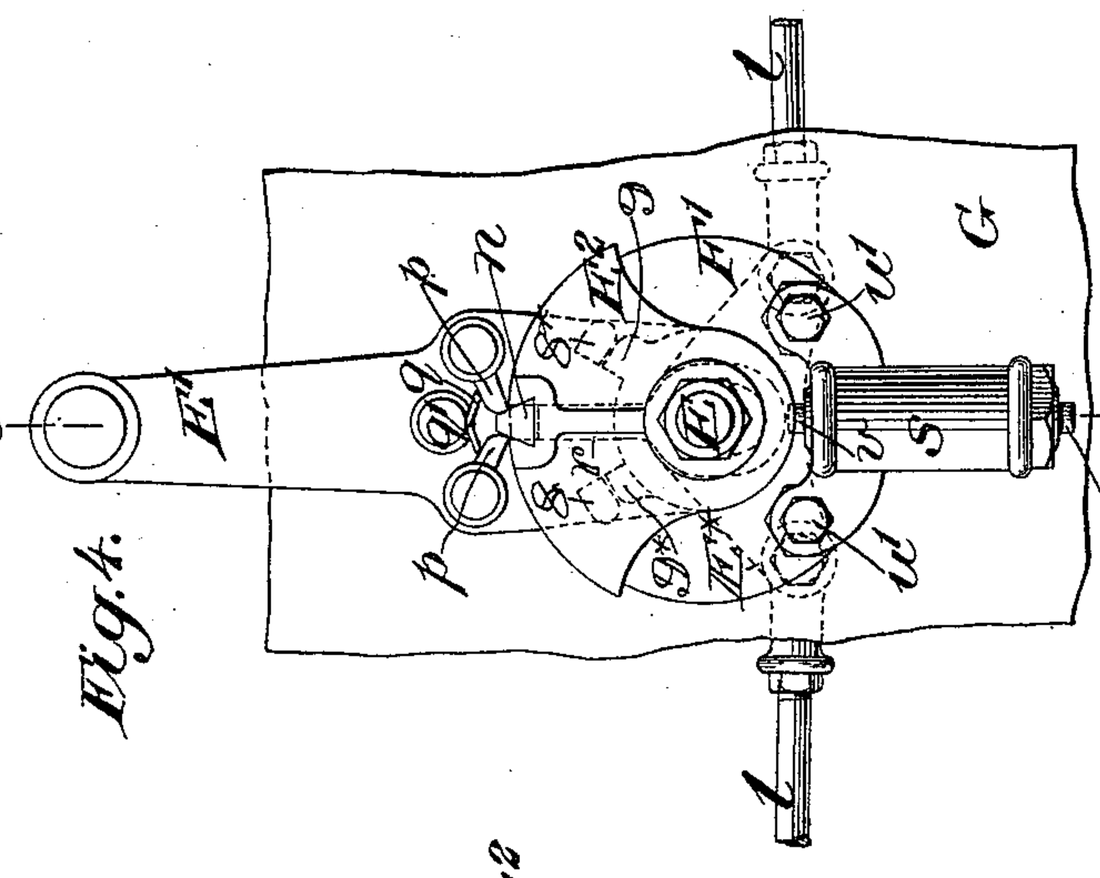


Fig. 6.

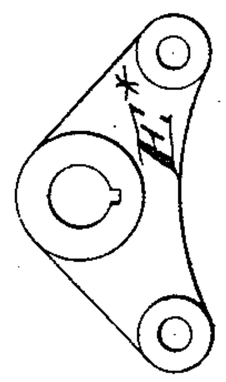
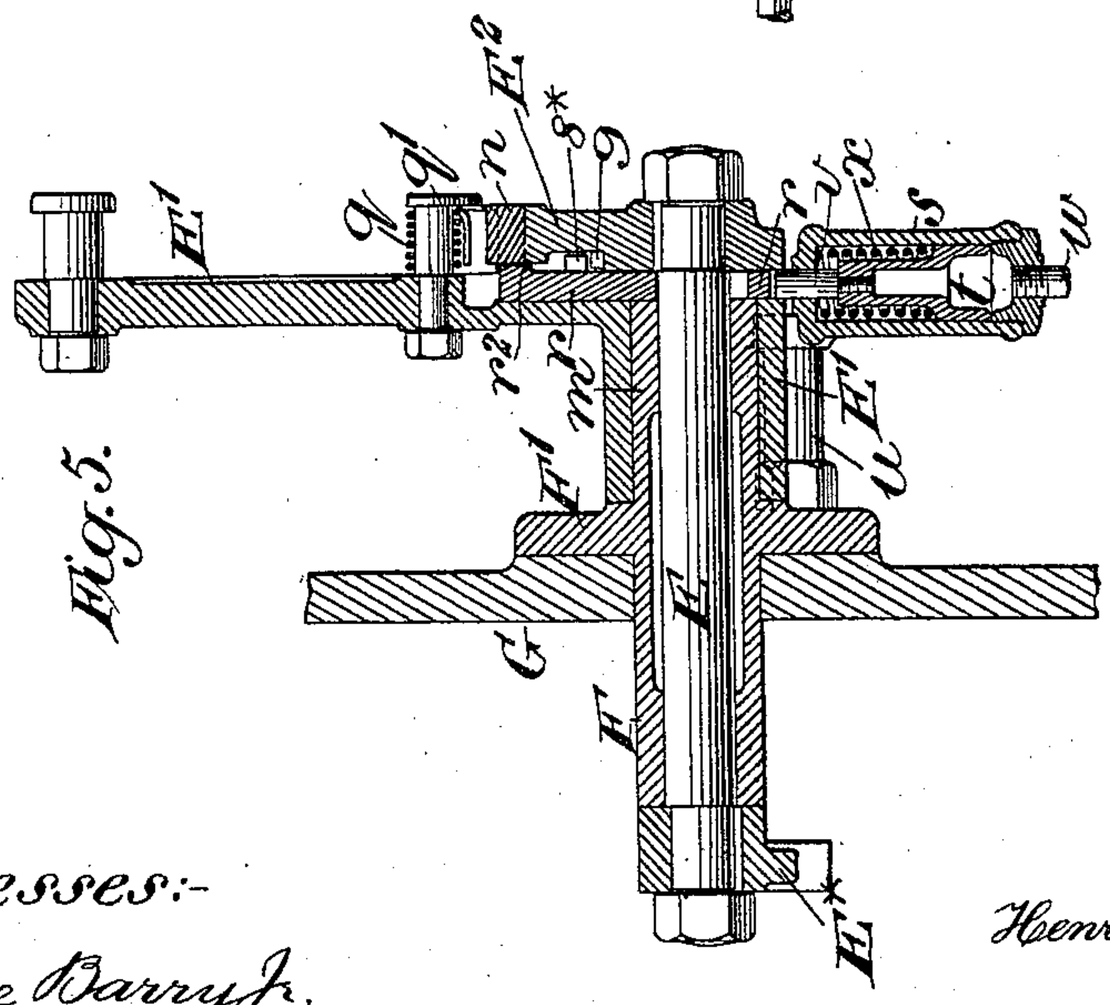


Fig. 5.



Witnesses:-
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H. B. Howard

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UNITED STATES PATENT OFFICE.

HENRY C. SERGEANT, OF WESTFIELD, NEW JERSEY, ASSIGNOR TO THE INGERSOLL-SERGEANT DRILL COMPANY, OF NEW YORK, N. Y.

DISCHARGE-VALVE-OPERATING MECHANISM FOR AIR-COMPRESSORS.

SPECIFICATION forming part of Letters Patent No. 579,776, dated March 30, 1897.

Application filed April 7, 1896. Serial No. 586,623. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. SERGEANT, of Westfield, in the county of Union and State of New Jersey, have invented a new and useful Improvement in the Discharge-Valve-Operating Mechanism for Air-Compressors, of which the following is a specification.

This invention relates to air-compressors the discharge-valves of which are closed by the positive operation of mechanism in connection with the piston of the compressor or with the motor which drives it.

The object of the improvement is to provide for the cessation of the operation of the said valves and to leave them open, and thus render the compressor inoperative when the pressure in the receiver or other place to which the compressed air is delivered by the compressor reaches a determined maximum and so long as this maximum is maintained.

The nature of the improvement will be described with reference to the accompanying drawings, and its novelty will be pointed out in claims.

Figure 1 represents a side elevation, and Fig. 2 an end elevation, of a compressor embodying my invention. Fig. 3 represents a central vertical section of a portion of one of the cylinder-heads and of the discharge-valve and its box in that head on a larger scale than Figs. 1 and 2. Fig. 4 is a side view on a scale corresponding with Fig. 3 of the principal parts of the valve-operating mechanism. Fig. 5 represents a transverse section in the line 5 5 of Fig. 4. Fig. 6 is a side view of what is hereinafter termed the "swing-plate" of the valve-operating mechanism. Figs. 7 and 8 represent, respectively, a face view and a side view of what is hereinafter termed the "pawl-lifter."

A designates a compressor-cylinder having in its heads A′, as shown in Fig. 3, discharge-chests A*, which are always in free communication through a discharge-passage A^2 with the discharge-pipe A^3, through which the compressed air is discharged to a receiver. (Not shown.) The discharge-valves B, only one of which is shown, through which the compressed air is delivered into the discharge-chests within the cylinder-heads are of the puppet type and close into conical seats *a* (see Fig. 3) in the inner walls of the respective cylinder-heads. These valves are represented as having hollow cylindrical stems *b*, the stem of each being fitted and guided in a valve-box C D in its respective cylinder-head. The said valves are intended to open automatically when by the movement of the compressor-piston the pressure of the air in the cylinder in front of the said piston is greater than that in the discharge-chest A* and in the receiver, but they are to be closed by a positive movement produced by the piston of the compressor or by the motor which drives the latter. The said valves themselves form no part of the present invention, but are the subject-matter of my application for United States Patent, Serial No. 586,622, filed April 7, 1896, and they are merely here selected as serving as well as any other for the illustration of the present invention.

For the purpose of closing the valve by the positive operation of mechanism in connection with the piston or motor of the compressor there is represented applied behind each valve a tappet *e*, working through a stuffing-box in the back of the valve-box C D, the said tappet being carried by a slide *j*, which works on a fixed guide *k*, secured to the cylinder-head. The slides *j* of the valve-tappets *e* at each end of the cylinder serve to make the connection with the positively-operating closing mechanism, which in the example represented includes an engaging device which is capable of being tripped to disengage the valves and leave them open when and while the pressure of the air delivered by the compressor reaches and remains at the maximum desired.

I will now proceed to describe the tappet-operating mechanism and the means of tripping the engaging device, which constitute essential features of this invention.

E, Figs. 1, 2, 4, and 5, is a horizontal rock-shaft fitted to a long bearing F, which is bolted through its flange F′ to one side of the bed-frame G of the compressor about midway of the length of the cylinder A, the said shaft and bearing being arranged transversely of the cylinder. To the inner end of this rock-shaft E is keyed or firmly secured a two-armed swing-plate E*, of which a front view is given

in Fig. 6. The valve-tappet slides *j* are connected permanently by a rod *l* with the two arms, respectively, of this swing-plate.

E′ is a rocker-arm fitted to rock on a stationary journal *m*, Fig. 5, formed on the exterior of the rocker-shaft bearing F. This rocker-arm is permanently connected by a rod *h* with the cross-head *i* of the air-compressor piston, so that its rocking motion continues while the compressor is in motion. To the outer end of the rock-shaft E there is keyed or firmly secured a sector-plate E^2, into which is dovetailed or firmly secured a tooth *n*, preferably of hardened steel, and to the rocker-arm E′ there are pivoted two pawls *p*, Figs. 1 and 5, constituting a tripable engaging device for engaging with the tooth *n* of the sector-plate on opposite sides thereof, and so connecting the rocker-arm E′ with the rock-shaft E that the movement received by the said rocker-arm from the compressor cross-head will be imparted to the rock-shaft and its swing-plate E*, and the movement of the cross-head will thus be made to produce the closing movement of the discharge-valves at the termination of every stroke of the compressor-piston so long as the engagement of the pawls and the tooth *n* continue. The engagement of the pawls is maintained by a spring *q*, attached to the rocker-arm E′ by a stud *q′*, the said spring holding the pawls against the arc-formed edge of the sector-plate, from which the tooth *n* projects, and insuring their engagement with the tooth until they are required to be tripped therefrom.

The tripping device for tripping the pawls *p p* out of engagement with the tooth *n* consists in part of a pawl-lifter *r*, of which Fig. 7 is a front view and Fig. 8 a side view, and in part of a small upright air-cylinder *s* and plunger *t*. (Shown in Figs. 4 and 5.) The said lifter is a sliding bolt which is fitted to a guiding-groove in the rocker-arm E, between the said arm and the sector-plate, the said bolt being made with a yoke *r′* at its lower end, which surrounds the rock-shaft E, and having at its upper end a bit r^2, which projects outward a little way under the pawls *p*, as shown in Fig. 5. The cylinder *s* is fixedly secured below the rock-shaft E to the flange F′ of the rock-shaft bearing F by studs *u* and screw-bolts *u′*. The plunger *t*, which is fitted air-tight to the said cylinder, has projecting from it through the upper end of the cylinder a square rod *v*, which is directly opposite the pawl-lifter *r*. The lower end of the cylinder *s* has connected with it an air-pipe for supplying air to it from the air-receiver or other place to which the air is delivered by the compressor whenever the pressure of the so-delivered air reaches the determined maximum, the said air being admitted to the said pipe *w* under the control of any valve suitably loaded to shut off the said air from said pipe and from the cylinder *s* so long as the pressure of the said air is less than the said maximum, but to admit the said air through the said pipe to the cylinder when the maximum is reached and so long as it is maintained. The piston *t* has applied to it within the cylinder a spring *x*, which presses downward upon it and which when there is no air admitted to the cylinder depresses the piston to a position in which it is inoperative upon the pawl-lifter, so that until the maximum pressure of the delivered air is reached the tripping device is inoperative upon the pawls *p* and the operation of the valves continues; but when the air is admitted to the cylinder *s* its pressure overcomes the force of the spring *x* and presses upward the piston *t*, which presses up the lifter *r* and so disengages the pawls *p* and allows the movement of the rocker-arm derived from the compressor cross-head to continue without producing the movement of the rock-shaft by which the closing of the valves is effected, and so the valves remain open.

In order to bring and keep the sector-plate E^2 and swing-plate E* to their central position, in which they hold back each valve-tappet far enough to leave its valve wide open, as illustrated by the valve and tappet in Fig. 3, after the tripping of the pawls *p*, there are provided on the face of the rocker-arm, as shown in Fig. 5, on opposite sides of the median radial line of said arm, two projections 8* 9*, which act, respectively, on two projections 8 9 (shown in dotted outline on the same figure) on the back of the sector-plate, the two projections 8 and 8* being at a corresponding distance from the axis of the shaft E, and the two projections 9 9* being at a corresponding, but greater, distance from said axis, that 8 may not interfere with 9 nor 8* with 9*. The said projections are so spaced that when the sector-plate is in its central position, while the rocker-arm continues in motion, the projections 8* 9* on the latter will oscillate freely between those 8 9 on the sector-plate without any action on the latter; but whenever the sector-plate is left to one side or other of its central position the projection 8* or 9*, as the case may be, comes into operation on the projection 8 or 9 and so brings the said plate back to the central position, where it then remains until the pawls *p* again come into operation. The projections 8* and 9 are also shown in Fig. 5.

When the pressure of the delivered air falls to or within the determined maximum and the air is shut off from the pipe *w*, the piston *t* is depressed by the spring *x* and the lifter *r* is allowed to slide back in the rocker-arm within range of the arc of the sector-plate, and the pawls *p* are allowed to come again into engagement with the tooth *n*, and connect the valves with the rocker, and the valves resume their operation.

I have herein referred to the mechanism for operating the valve-tappets and closing the valves as in connection with or connected with the compressor-piston, and have represented said mechanism as connected with the cross-head of the compressor-piston, but it is

evident that the connection for driving said mechanism may be connected with any part of the compressor the movements of which are coincident with the movements of the piston.

What I claim as my invention is—

1. In an air-compressor, the combination with a discharge-valve which opens by the pressure of air in the compressor-cylinder and positively-operating mechanism for closing said valve including a tripable engaging device, of a tripping device under the control of the air delivered by the compressor for tripping said engaging device to prevent the operation of said closing mechanism and leave the said valve open whenever the pressure of the said delivered air reaches a determined maximum and so long as said pressure remains at or above said maximum, substantially as set forth.

2. In an air-compressor, the combination with the discharge-valves, of tappets for closing said valves, a rock-shaft having arms connected with said tappets, a driving rocker-arm loose around said rock-shaft and connected with the compressor-piston, a tripable engaging device for engaging said rocker-arm with the rock-shaft and a tripping device under the control of the air delivered by the compressor for tripping said engaging device when the pressure of the delivered air reaches a determined maximum, substantially as herein described.

3. In a discharge-valve-closing mechanism for air-compressors, the combination of a rock-shaft having affixed thereon arms connected with the discharge-valves and having also affixed thereon a plate from the edge of which projects a tooth, a rocker-arm loose around said rock-shaft and connected with the piston of the air-compressor, pawls on said rocker-arm for engaging with said tooth, and a lifter under the control of the air delivered by the compressor fitted to slide within said plate for disengaging said pawls from said tooth, substantially as herein described.

4. The combination of the valve-closing rock-shaft E having affixed thereon the two-armed swing-plate connected with the valves and the toothed sector-plate E^2, the bearing F for said rock-shaft having a journal *m* on its exterior, the driving rocker-arm E^2 fitted loosely to said journal and connected with the piston of the compressor, the spring-actuated pawls *p* on said rocker-arm for engaging with said toothed sector-plate, the lifter *r* on the said rocker-arm for disengaging said pawls, the air-cylinder *s* containing the piston *t* for operating said lifter, all substantially as herein described.

5. The combination with the valve-operating rock-shaft, of the toothed sector-plate affixed to said shaft, the driving rocker-arm loose around said rock-shaft and carrying pawls for engaging with said toothed plate, and the lifter on said rocker-arm for disengaging said pawls from said plate, the said sector-plate and rocker-arm being furnished respectively with projections 8, 8*, 9, 9* for bringing the rock-shaft to a central position when the said pawls are disengaged, substantially as herein described.

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Witnesses:

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LIDA M. EGBERT.