No. 862,160. PATENTED AUG. 6, 1907.

E. HILL & H. P. MORGAN.

RELIEF MECHANISM FOR COMPRESSORS.

APPLICATION FILED JUNE 29, 1905.

4 SHEETS—SHEET 1.

Fig. 4.

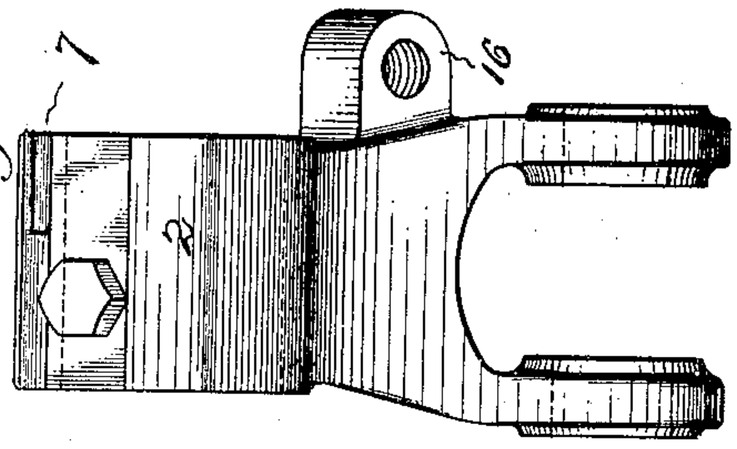


Fig. 2.

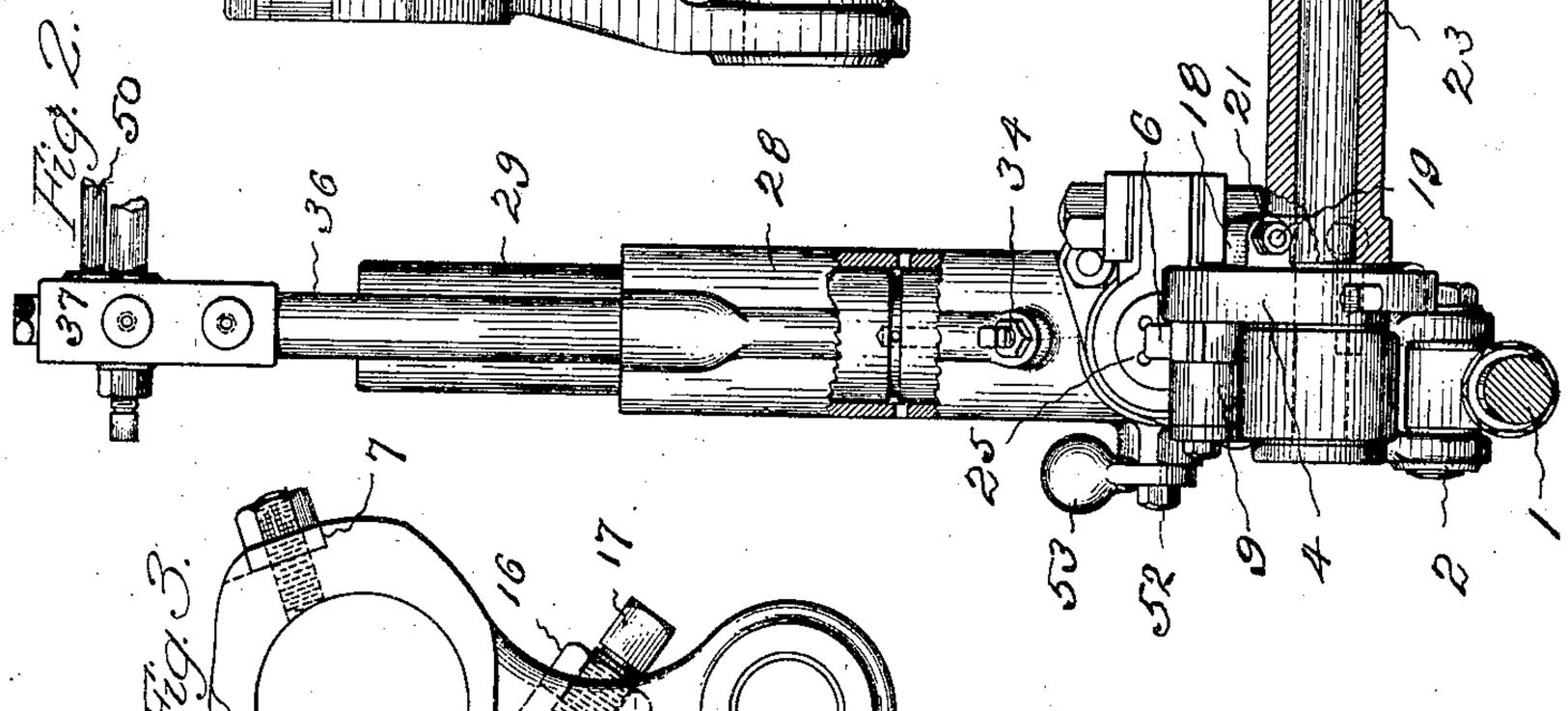
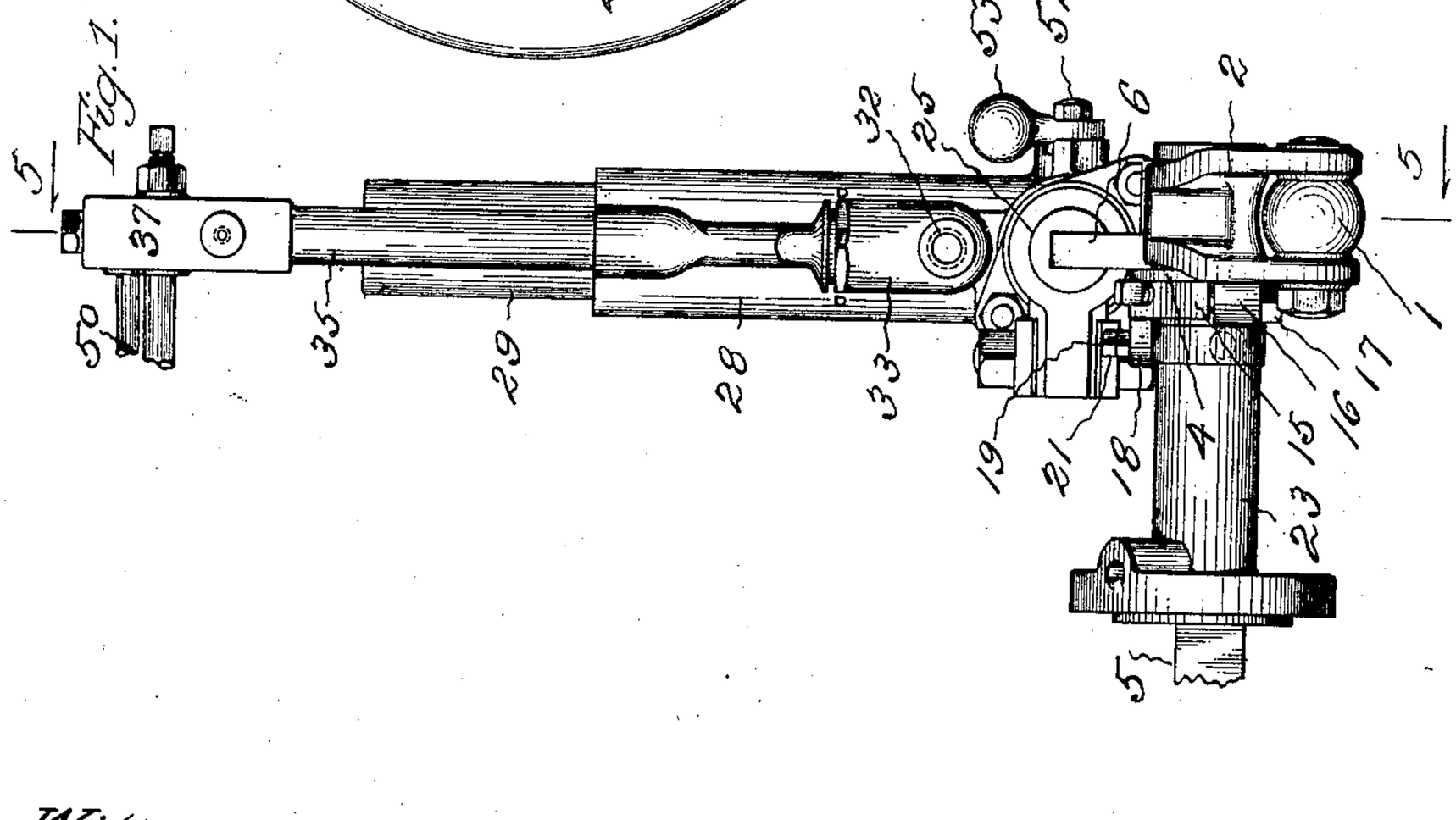


Fig. 3.

Fig. 1.



Witnesses.

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4 SHEETS—SHEET 2.

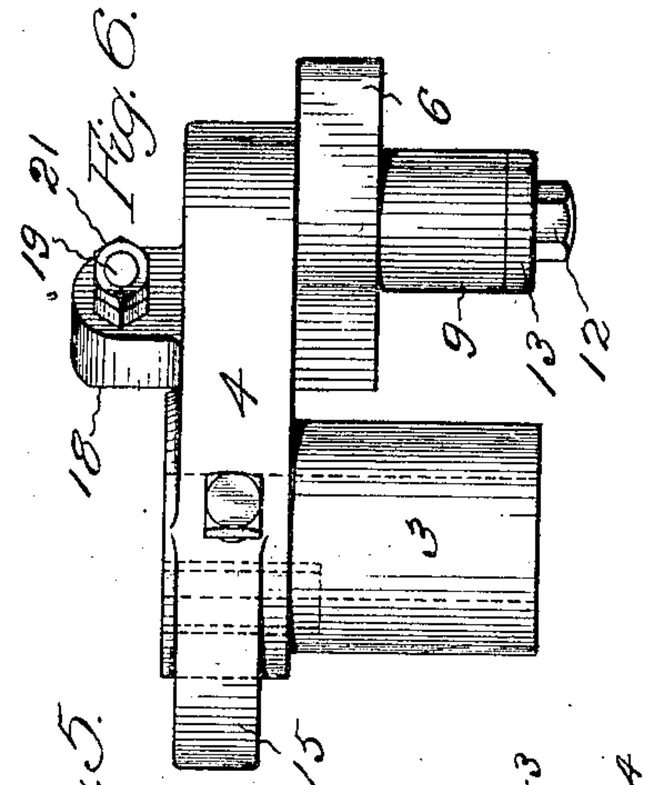


Fig. 6.

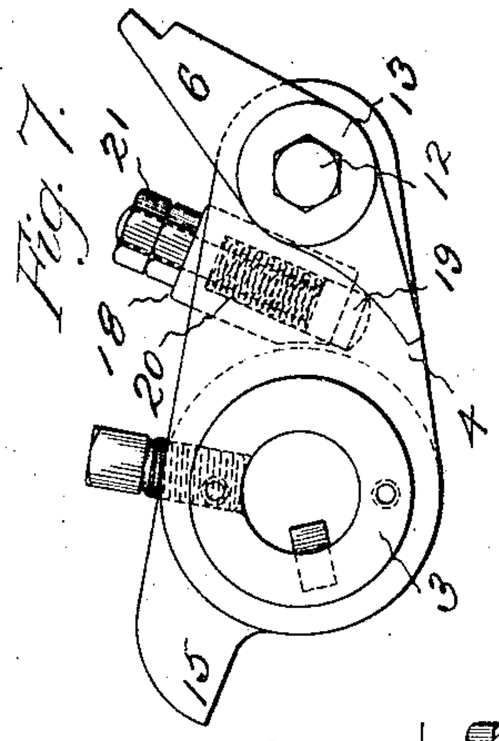
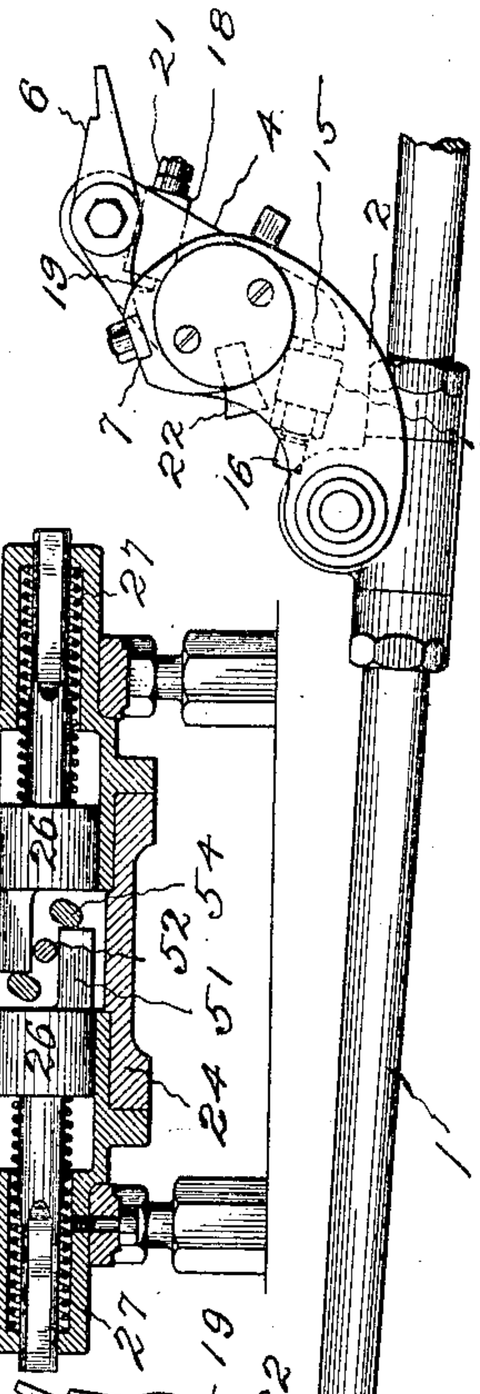


Fig. 7.



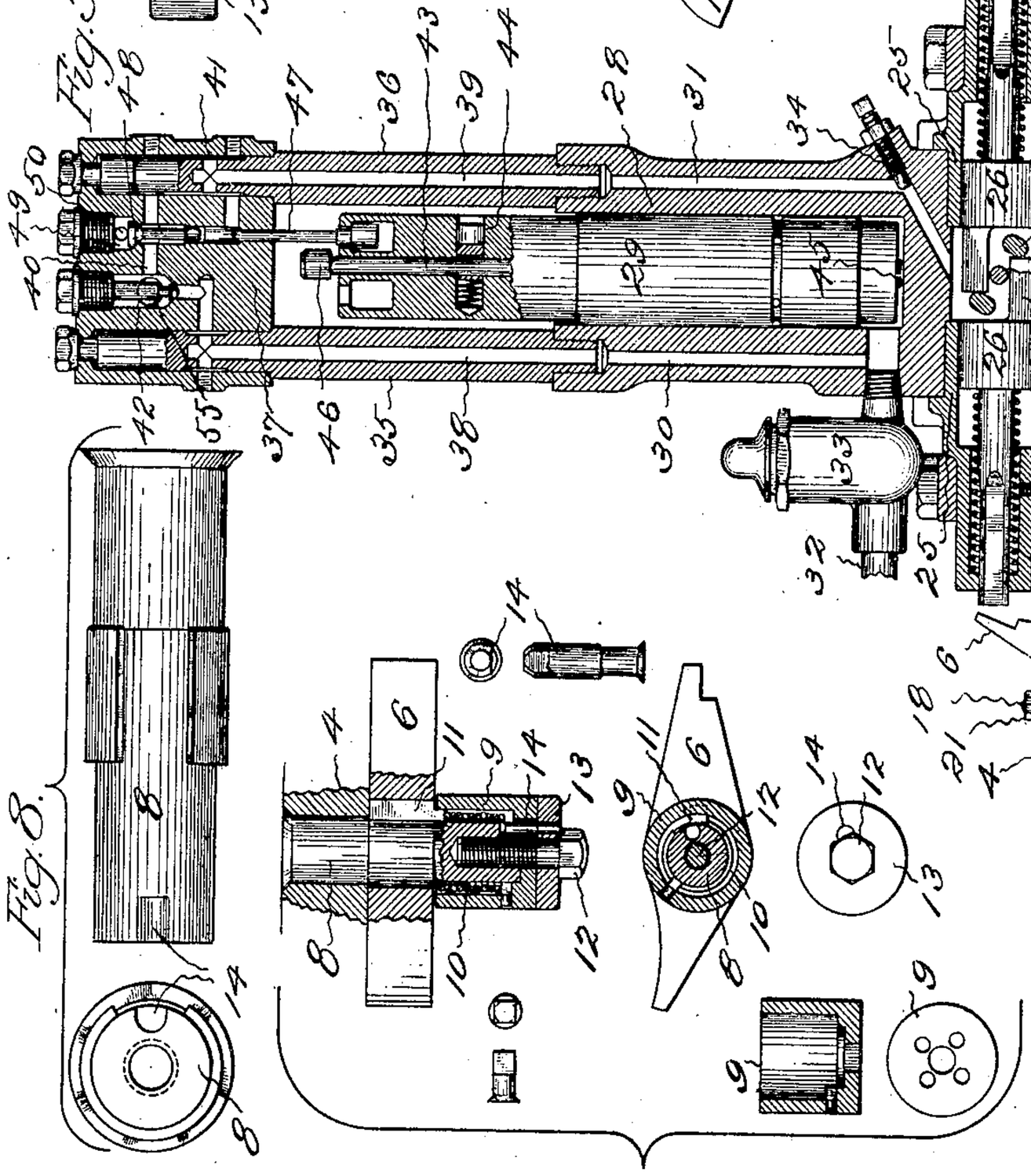


Fig. 5.

Fig. 9.

Fig. 8.

Witnesses.

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4 SHEETS—SHEET 3.

Fig. 10.

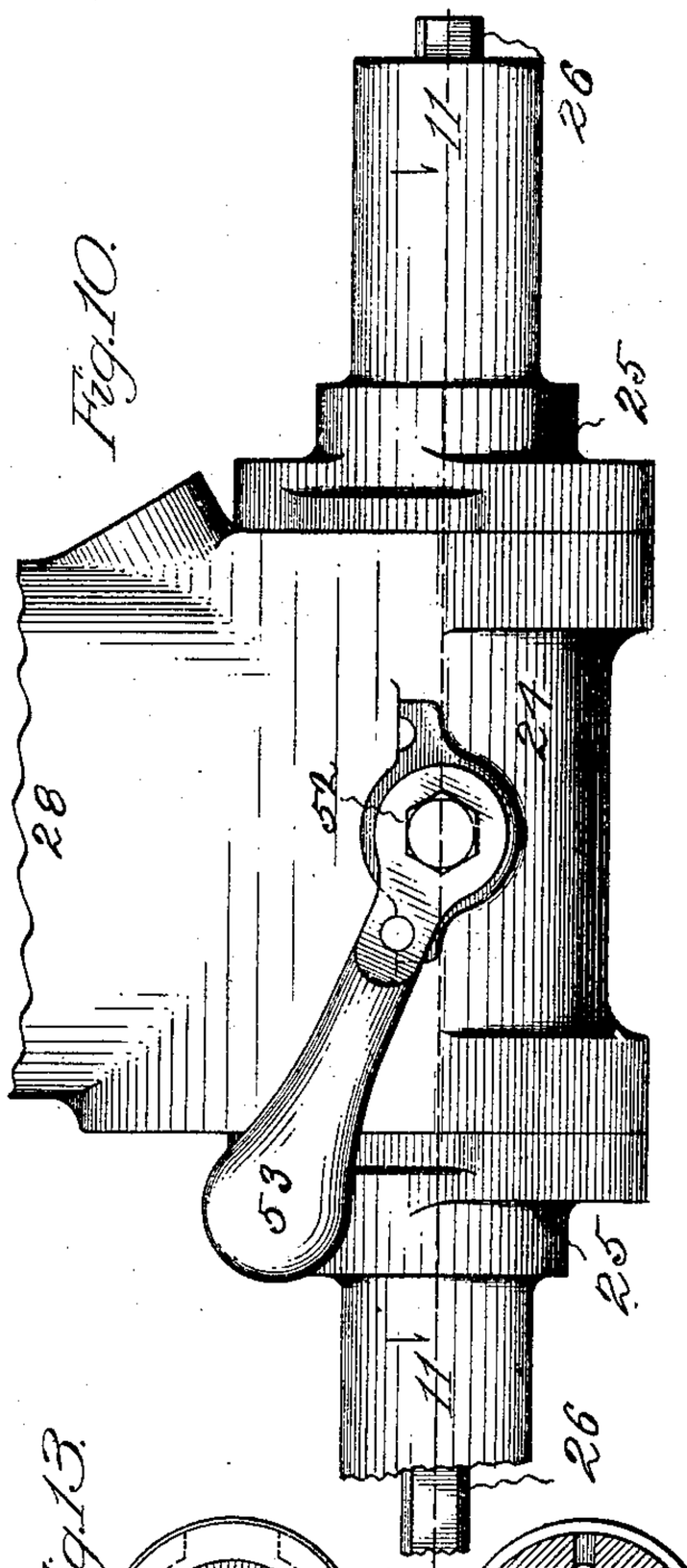


Fig. 11.

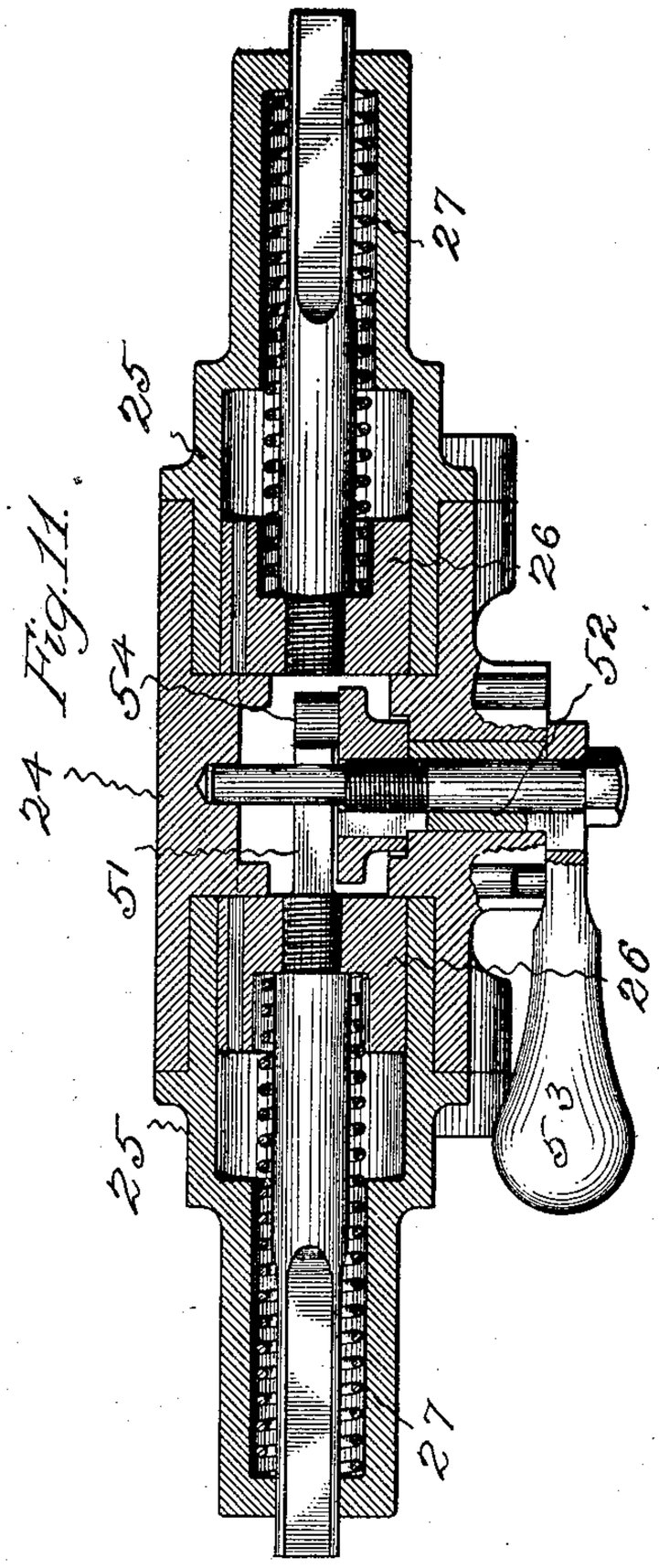


Fig. 13.

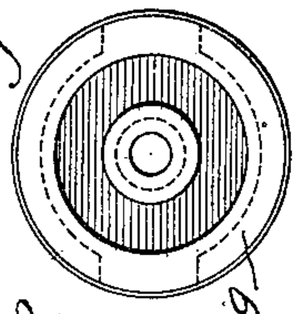


Fig. 14.

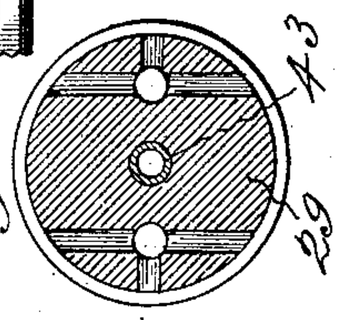
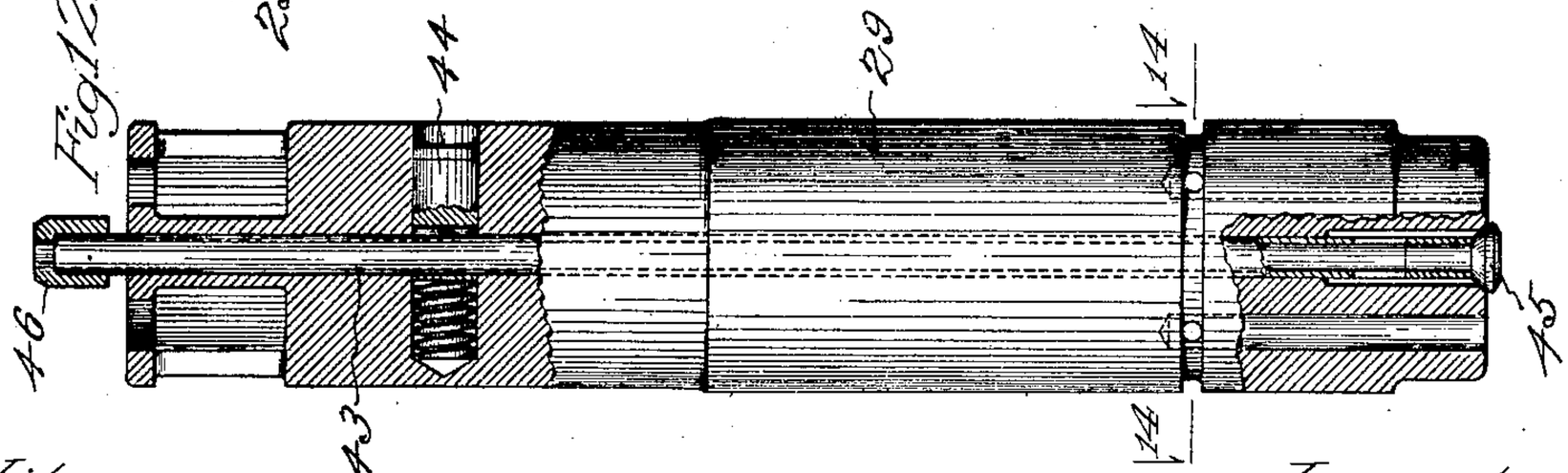


Fig. 12.



Witnesses.

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No. 862,160. PATENTED AUG. 6, 1907.

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RELIEF MECHANISM FOR COMPRESSORS.

APPLICATION FILED JUNE 29, 1905.

4 SHEETS—SHEET 4.

Fig. 15.

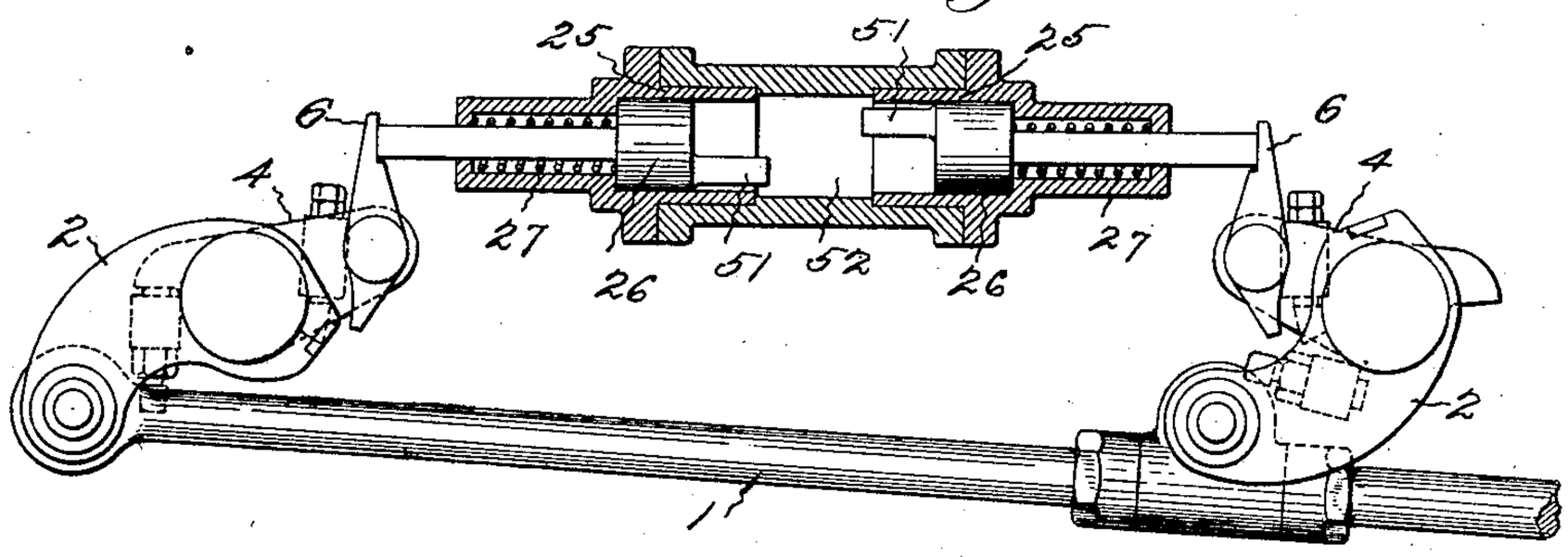
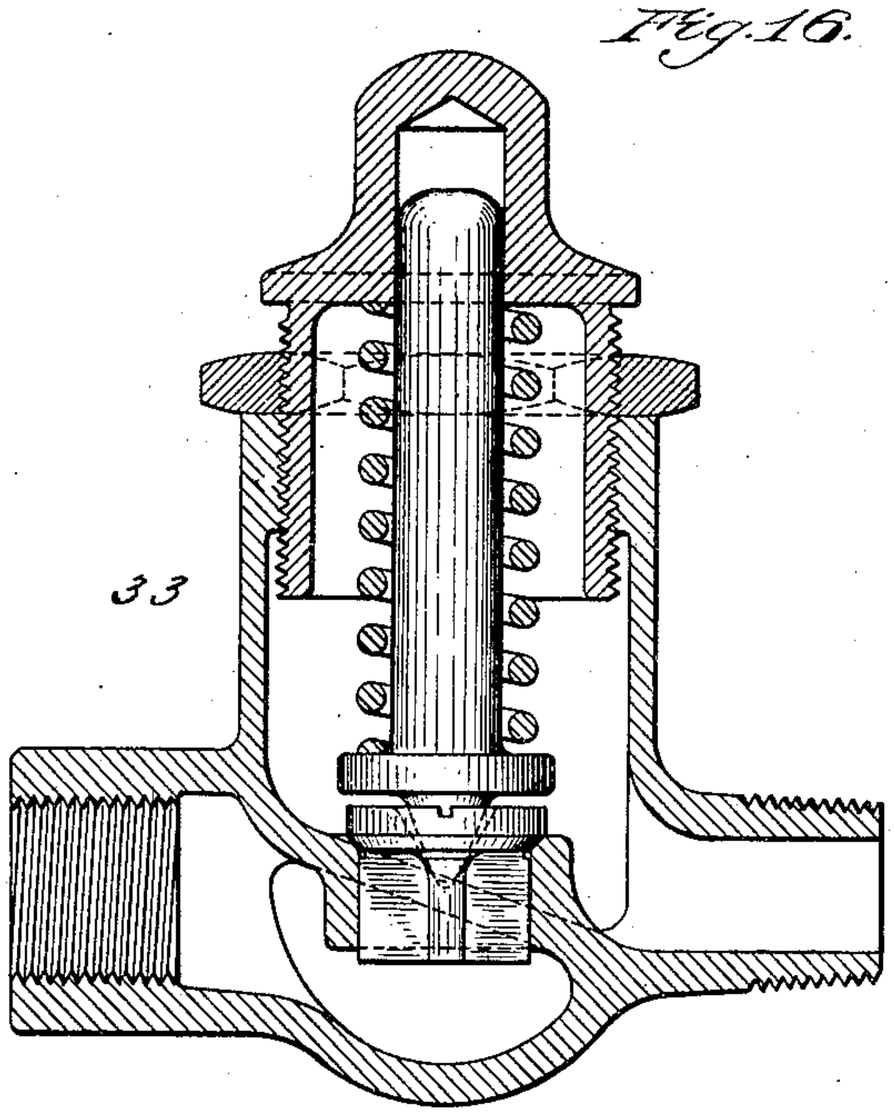


Fig. 16.



Witnesses.

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UNITED STATES PATENT OFFICE.

EBENEZER HILL AND HENRY P. MORGAN, OF NORWALK, CONNECTICUT, ASSIGNORS TO NORWALK IRON WORKS COMPANY, OF SOUTH NORWALK, CONNECTICUT.

RELIEF MECHANISM FOR COMPRESSORS.

No. 862,160. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed June 29, 1905. Serial No. 267,631.

To all whom it may concern:

Be it known that we, EBENEZER HILL and HENRY P. MORGAN, citizens of the United States, residing at Norwalk, in the county of Fairfield and State of Connecticut, have invented a new and useful Relief Mechanism for Compressors, of which the following is a specification.

This invention relates to a mechanism which operates to temporarily relieve an air or gas compressor of work when the pressure in the system supplied by the compressor reaches a predetermined degree.

The object of the invention is to provide a comparatively simple mechanism which may be operated manually or mechanically or which will operate automatically when the pressure in the system beyond the compressor exceeds the maximum, to open and hold open one or more of the intake valves of the compressor thus rendering the reciprocations of the compressor piston ineffective and relieving the engine or motor until the pressure in the system drops to the desired degree.

The mechanism shown in the drawings as illustrating the invention has two arms adapted to be connected with the intake valve eccentric rod, which arms are connected by latches with arms adapted to be connected with the intake valve stem. When the air pressure rises above normal a safety valve is opened and the air which escapes through it lifts a weighted plunger which opens a valve and allows the air pressure to be exerted upon horizontal plungers in such manner as to force their ends into the paths of the latches and disconnect the arms so the intake valves will remain open and not be closed by the reciprocation of the eccentric rod.

Figure 1 of the accompanying drawings shows an elevation looking at one side of a relief mechanism which embodies the invention. Fig. 2 shows an elevation looking at the other side of this relief mechanism with portions broken away. Fig. 3 shows a front elevation of one of the eccentric-rod arms. Fig. 4 shows a side elevation of this eccentric-rod arm. Fig. 5 shows a central vertical section of the relief mechanism. Fig. 6 shows a plan of one of the valve-stem arms and latch. Fig. 7 shows a front elevation of this valve-stem arm and latch. Fig. 8 shows a plan and end view of one of the latch supporting studs. Fig. 9 shows the manner of holding a latch on its stud and details of the fastening parts. Fig. 10 shows a front elevation of the lower portion of the plunger case. Fig. 11 shows a horizontal section through the plunger case on the plane indicated by the line 11—11 looking in the direction pointed by the arrows on Fig. 10. Fig. 12 shows a side elevation of the weighted plunger with portions cut away to expose its interior. Fig. 13 is a top view of this plunger. Fig. 14 is a sectional view on the plane 14—14 looking in the direction indicated by the arrows on Fig. 12. Fig. 15 shows a view of the position of the parts of the compressor relief mechanism when the valves are detached or disconnected from the operating means by reason of the connecting latches being thrown out by the plungers which are forced outwardly by the air when it is higher than the predetermined pressure. Fig. 16 shows a sectional view of the valve which is used to control the action of the unloading mechanism.

The intake-valve eccentric-rod 1 is of ordinary construction and is connected with the eccentric of the engine in the usual manner. The reciprocation of this rod is utilized to open and close the intake valves at the proper time. Hinged at the end and also some distance from the end of the eccentric rod is a curved forked arm 2 (Figs. 3, 4). Each of these eccentric arms is loosely mounted on a hub 3 which extends outwardly from the valve stem arm 4 (Figs. 6, 7). Each valve arm is fastened to the stem 5 of an intake valve of common construction, so that the oscillations of the valve arms will open and close the intake valves.

Mounted on each valve arm is a latch 6 (Fig. 9), the lower end of which is adapted to engage a notch 7 in the end of the eccentric arm in such manner that the swinging of the eccentric arm through the latch will turn the valve arm so as to open the intake valve to which the arm is attached.

Each latch turns on an arbor 8 which projects from the valve arm. In a barrel 9 fastened to this arbor is a spiral spring 10 which has one end connected with the barrel and the other end connected with a key 11 that is fixed to the latch. The tension of this spring may be regulated by loosening the screw 12 and drawing away the cap 13 until the stud 14 is withdrawn from a socket in the end of the arbor. When this stud is withdrawn the barrel can be turned to increase the tension of the spring and when the proper tension is obtained the cap is moved back and the stud thrust into the socket in the end of the arbor so as to connect the barrel and cap with the arbor, the screw being then set up to hold the parts together (Fig. 9). The tension of this spring is such as to cause the lower end of the latch to engage the notch in the eccentric arm so that when that arm is swung in one direction through the latch it will swing the valve arm and turn the valve stem.

Extending outwardly from each valve arm on the opposite side of the axis from the latch is a finger 15 (Figs. 6, 7) and turning in a lug 16 that extends inwardly from each eccentric arm is a set screw 17 (Figs. 3, 4). The set screws carried by the eccentric arms are turned up against the fingers projecting from the valve arms so that when the eccentric rod is reciprocated the movement in one direction of the eccentric arms will be communicated to the valve arms through these screws and

fingers, while the movement of the eccentric arms in the opposite direction will be communicated to the valve arms through the latches (Fig. 5).

Extending from one side of each valve arm is a lug 18 bearing a plunger 19 which is thrust downwardly by a spring 20 and which is provided with clamping nuts 21 to determine the amount of its downward movement (Figs. 6, 7). These spring plungers are adapted to engage lugs 22 (Fig. 5) that project outwardly from the hubs 23 (Figs. 1, 2) that support the ends of the valve stems, for limiting the downward movement of the valve arms.

Held by a casing 24 are two horizontal cylinders 25 movable in which are two plungers 26. The outer ends of these plungers are in line with the upper ends of the latches. Springs 27 tend to thrust these plungers toward each other and draw the ends in. When these plungers are forced outwardly against the pressure of the springs their outer ends move into the paths of the upper ends of the latches which then engage the ends of the plungers and are rocked so that their lower ends are disengaged from the notches in the eccentric arms and then the oscillations of the eccentric arms will not oscillate the valve arms and consequently will not turn the valves (Fig. 5).

In a vertical cylinder in the upright portion 28 of the casing is a weighted plunger 29 and in the side walls of this upright portion of the casing are air passages 30 and 31. A pipe 32 which leads from a receiver or reservoir or any other part of the system which is supplied with air under pressure by the compressor to which this relief mechanism is applied, communicates through a safety valve 33 of common construction with the lower end of the air passage 30, also with the lower end of the vertical cylinder containing the weighted plunger. The lower end of the passage 31 communicates with the chamber between the two horizontally movable plungers. A screw valve 34 is arranged in this passage so that its size may be accurately governed.

Posts 35 and 36 extend upwardly from the upright portion of the casing and at their upper ends support a head 37. The lower end of the passage 38 through the post 35 communicates with the passage 30 from the safety valve and the lower end of the passage 39 through the post 36 communicates with the passage 31 that leads to the chamber between the horizontal plungers. The upper end of the passage 38 communicates by means of the passage 40 and the space 41 around the upper end of the post 36 with the passage 39 in that post. A downwardly closing valve 42 is arranged in this passage 40 (Fig. 5).

An opening 55 is shown from the passage 40 through the side of the head above the valve 42 for the connection of a pipe which may lead to a governing device, but this feature forms no part of the present invention.

Carried by the weighted plunger 29 is a tube 43. The movement of this tube up and down in this plunger is restricted by a friction block 44 that is arranged to bear against the side of the tube. The lower end of this tube is provided with a valve 45 and the upper end is provided with a cap 46. When the plunger is down the valve 45 rests upon the casing and closes the opening into the lower end of the plunger tube and when the plunger is lifted the cap 46 engages with the underside of the head 37 and closes the opening into the upper end of the tube, but as the plunger moves up the valve 45 opens the opening at the lower end (Fig. 12).

A rod 47 extends loosely into an opening in the upper end of the weighted plunger and also extends loosely into an opening in the head. Above this rod is the stem of a valve 48 that controls the passage from a chamber 49 in the head to the passage 40. This chamber is adapted to be connected by a pipe 50 (Figs. 2, 5), with a receiver, reservoir, or other part of the system which is supplied with air by the compressor to which this relief mechanism is applied.

When the pressure in the system above the compressor rises sufficiently high to open the safety valve 33 air under the high pressure flows upwardly through the passage 30 in the casing, the passage 38 in the tube 35, the passage 40 in the head, and down through the passage 39 in the tube 36, and passage 31 in the casing into the chamber between the plungers. The air under the high pressure at the same time under the control of the safety valve 33 also enters beneath the weighted plunger and forces it up. As this plunger rises the rod 47 engages the stem of the valve 48 and lifts it so that air under high pressure may also enter through the pipe 50 and flow down through the passages 36 and 31 to the chamber between the plungers. This air pressure in the chamber between the plungers forces the plungers outwardly against their springs so that their outer ends are engaged by the upper ends of the latches and cause the latches to be disengaged from the notches and thus disconnect the eccentric arms from the valve arms, so that the valves will stay open as the eccentric rod reciprocates as long as these plungers are forced outwardly by the excessive pressure. When the pressure enters through the pipe 50 air under that pressure besides passing down into the space between the plungers is exerted on the valve 42 in such manner that that valve is held closed and then the pressure through the safety valve is only exerted underneath the weighted plunger.

As soon as the pressure in the system drops sufficiently for the safety valve to close the weighted plunger will descend. As it descends and the cap on the central tube moves away from the underside of the head the air beneath the plunger will flow through the tube and thus will not interfere with the rapid descent of the plunger. When the plunger reaches its lower limit the valve at the lower end of the central rod is pushed up so that the opening through the tube is again closed and the plunger ready to be lifted the next time the safety valve opens. The descent of the plunger also draws down the rod 47 and allows the valve 48 to close and thus cut off the pressure from the chamber 49. When this pressure is cut off the horizontal plungers are relieved of air pressure and their springs force them toward each other and draw their ends in so that the latches can again engage the notches and connect the eccentric arms with the valve arms and the valves resume their normal action.

Extending through the casing between a pair of lugs 51 that project from the horizontal plungers is a spindle 52 that on the outside of the casing has a handle 53. This spindle has lugs 54 that project opposite the ends of the lugs that extend from the plungers so that when the spindle is rotated the plungers will be forced apart by these lugs (Figs. 5, 11).

With this device applied to an air or gas compressor if the pressure in the system supplied by the compressor becomes excessive that pressure opens the safety valve and causes the plungers to move into such position that the latches are disengaged so that the intake valves of the compressor will remain open as long as the pressure is excessive. Immediately the pressure falls to normal the plungers are drawn in so the pawls may connect the parts in such manner that the reciprocation of the eccentric rod will open and close the valves as usual. Of course when the intake valves are open the piston of the compressor simply reciprocates back and forth without doing work and thus while the pressure is high the engine or other motor used for driving the piston is relieved.

The invention claimed is:

1. A relief mechanism for an air compressor having an oscillatory arm adapted to be connected with and swung back and forth by an eccentric rod, an arm adapted to be fixed to and to open and close a compressor valve, means carried by the valve arm and normally engaging the eccentric rod arm so as to lock the arms together and cause them to move as one piece for both opening and closing the valve, and means actuated by excessive air pressure for temporarily engaging and unfastening the means which locks the arms together and by such engagement locking the released holding means so as to hold the valve arm immovable, substantially as specified.

2. A relief mechanism for an air compressor having an oscillatory arm adapted to be connected with and swung back and forth by an eccentric rod, an arm adapted to be fixed to and to open and close a compressor valve, a latch carried by the valve arm, a spring arranged to normally cause the latch to engage the eccentric rod arm and lock the arms together so they will move as one piece for opening and closing the valve, and means actuated by excess air pressure for temporarily engaging and unfastening the latch and also by such engagement holding the latch and the valve immovable, substantially as specified.

3. A relief mechanism for an air compressor having an oscillatory arm adapted to be connected with and swung back and forth by an eccentric rod, an arm adapted to be fixed to and to open and close a compressor valve, means carried by the valve arm and normally engaging the eccentric rod arm and locking the arms together so they will move as one piece for both opening and closing the valve, and a plunger adapted to be forced into the path of movement of and cause the release of the locking means and to engage said locking means and hold it and the valve immovable, substantially as specified.

4. A relief mechanism for an air compressor having an arm adapted to be connected with and moved by an eccentric rod, an arm adapted to be connected with and move a valve stem, a latch carried by the valve stem arm and normally engaging the eccentric rod arm and holding the arms together so they will move as one piece, a plunger, means for forcing the plunger into the path of movement of and cause the release of the latch, and a spring for drawing the plunger out of the path of movement of the latch, substantially as specified.

5. A relief mechanism for an air compressor having an arm adapted to be connected with and moved by an eccentric rod, an arm adapted to be connected with and move a valve stem, a latch carried by the valve stem arm and normally engaging the eccentric rod arm and holding the arms together so they will move as one piece, a plunger adapted to be forced into the path of movement of and to cause the release of the latch, and a relief valve adapted to be connected with the system to be supplied with air by the compressor to which this mechanism is applied and communicating with a chamber back of the plunger, substantially as specified.

6. A relief mechanism for an air compressor having an arm adapted to be connected with and moved by an eccentric rod, an arm adapted to be connected with and move a valve stem, a latch carried by the valve stem arm and normally engaging the eccentric rod arm and holding the arms together so they will move as one piece, a plunger adapted to be forced into the path of movement of and cause the release of the latch, a relief valve controlling a passage from the system to be supplied by the compressor to which this mechanism is applied and communicating with a chamber back of the plunger, a valve normally closing a passage communicating with the system supplied by the compressor and with the chamber back of the plunger, and means which opens this latter valve when the safety valve is opened, substantially as specified.

7. A relief mechanism for an air compressor having an arm adapted to be connected with and moved by an eccentric rod, an arm adapted to be connected with and move a valve stem, a latch carried by the valve stem arm and normally engaging the eccentric rod arm and holding the arms together so they will move as one piece, a plunger movable into the path of movement of and adapted to be engaged by the latch for releasing the latch, a relief valve controlling a passage from the system to be supplied by the compressor to which this mechanism is applied, a valve normally closing a passage communicating with the system supplied by the compressor and with a chamber back of the plunger, a weighted plunger adapted to be lifted by the air pressure when the relief valve is opened, and means moved by the weighted plunger for opening the valve controlling the passage to the latch plunger chamber, substantially as specified.

8. A relief mechanism for an air compressor having an arm adapted to be connected with and moved by an eccentric rod, an arm adapted to be connected with and move a valve stem, a latch carried by the valve stem arm and normally engaging the eccentric rod arm and holding the arms together so they will move as one piece, a plunger movable into the path of movement of and adapted to be engaged by the latch for releasing the latch, a relief valve controlling a passage from the system to be supplied by the compressor to which this mechanism is applied, a valve normally closing a passage communicating with the system supplied by the compressor and with a chamber back of the plunger, a weighted plunger movable in a chamber that communicates with the passage controlled by the relief valve, means moved by the weighted plunger for opening the valve controlling the passage to the latch plunger chamber, and a valve tube movably held by the weighted plunger and adapted to seat at its lower end against the bottom of the weighted plunger chamber when said plunger is down and at its upper end against a fixed part when said plunger is up, substantially as specified.

9. A relief mechanism for an air compressor having an arm adapted to be mounted on and fastened to a valve stem, an arm loosely mounted on the valve stem arm and adapted to be connected with an eccentric rod, a latch carried by the valve stem arm and adapted to engage a notch in the eccentric rod arm, a stud carried by the eccentric rod arm and adapted to engage the valve stem arm, a stop fixed in the path of the valve stem arm to limit its motion in one direction, and a part movable into the path of movement of the latch for temporarily disengaging it and holding the valve stem arm immovable, substantially as specified.

10. The combination with an air compressor inlet valve stem and eccentric rod, of a crank arm attached to the eccentric rod, a crank arm attached to the valve stem, a latch mounted on the valve stem arm and engaging a notch in the eccentric rod arm and normally locking the arms together so they move as one piece for opening and closing the valve, a plunger movable into the path of movement of and adapted to engage and by such engagement release the latch from the eccentric rod arm and hold the latch and the valve stem arm immovable, and mechanism for moving the plunger, substantially as specified.

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Witnesses:
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