Nov. 20, 1928. 1,692,267

F. D. HOLDSWORTH

COMPRESSOR CONTROLLING MECHANISM

Filed Jan. 11, 1926

Fig. 1.

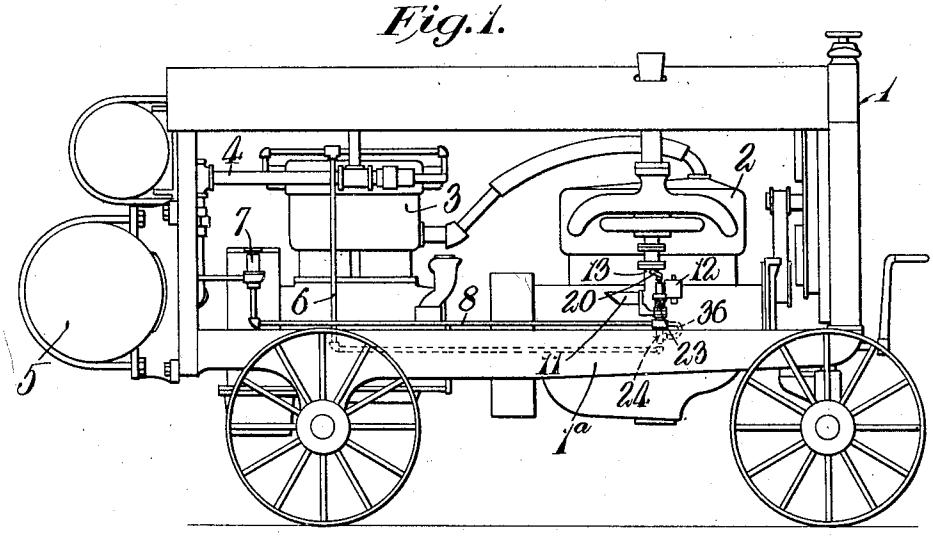


Fig. 2.

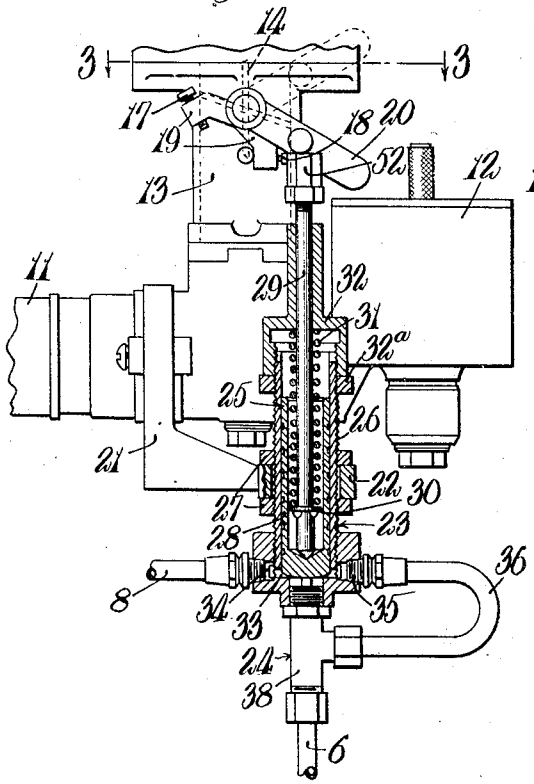


Fig. 3.

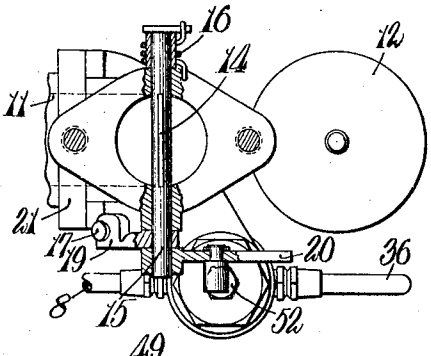
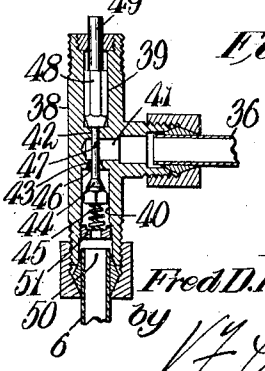


Fig. 4.



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UNITED STATES PATENT OFFICE.

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COMPRESSOR-CONTROLLING MECHANISM.

Application filed January 11, 1926. Serial No. 80,589.

This invention relates to controlling mechanisms and more particularly to controlling mechanisms for internal combustion engines employed in the driving of air compressors or other pumping devices.

It is highly desirable in the driving of air compressors by internal combustion engines that during periods when no air is required the compressor be unloaded without stopping the engine, that during such periods of unloaded operation the engine be throttled in such a manner as to reduce its speed, and that when the compressor is to be reloaded the engine be brought up to its full speed before the load is again thrown upon the compressor.

Among the objects of the present invention is the provision of an improved controlling mechanism for a compressor driving engine operative to effect control of the latter in the manner described. Another object of the invention is to provide an improved internal combustion engine driven fluid pumping system having improved controlling means. Other objects and advantages of the invention will subsequently appear.

In the accompanying drawings in which for purposes of illustration one embodiment which the invention may assume in practice is shown:

Fig. 1 is a side elevation of a compressor mechanism in which the invention is embodied in its illustrative form.

Fig. 2 is a fragmentary view in side elevation of the intake connections for the internal combustion engine with the illustrative embodiment of a portion of the controlling mechanism shown in central vertical section.

Fig. 3 is a horizontal section on the line 3—3 of Fig. 2, with parts broken away.

Fig. 4 is a vertical section on an enlarged scale taken on the same plane as the sectioned portions of Fig. 2 showing details of controlling valve construction.

In the drawings 1 indicates generally a wheel mounted portable compressor outfit comprising a wheeled truck 1^a supporting an internal combustion engine 2 suitably connected in driving relation to an air compressor 3 which discharges the air compressed through a line 4 to a receiver 5. The compressor 3 is provided with appropriate unloading mechanism operated by pressure fluid delivered through a line 6. Unloading and reloading are effected in accoradnce with the variations in receiver pressure acting through a pilot valve 7. This pilot valve may be of any well known construction and is designed to function upon the reaching of a desired maximum pressure to admit fluid from the receiver or compressor discharge line to a connection 8 and upon a drop in the receiver pressure to a desired minimum, to vent the line 8 to atmosphere. The variations in pressure in the line 8 are communicated to the line 6 and to the compressor unloading mechanism in a manner which will shortly appear.

The intake manifold of the compressor driving engine 2 has connected thereto an air line 11 and a carburetor 12, the combustible mixture being conducted by a vertically extending pipe 13 to the intake manifold. A butterfly valve 14 is mounted upon a shaft 15 in the intake line 13 and is normally maintained in full open position by a coiled spring 16. The positions of maximum and minimum opening of the valve 14 may be adjustably controlled by screws 17 and 18 mounted on arms 19 secured in rigid relation to the valve carrying shaft, but other control means is provided as later described. An arm 20 similarly secured to the shaft controls the opening of the valve in a manner later described.

Upon a sleeve member 21 secured at the junction between the air supply connection 11 and the base of the carburetor 12 and traversed by the air supply opening is formed a bracket portion 22 supporting a vertical controlling mechanism generally designated 23. The latter comprises mechanism generally designated 24 for controlling the communications between the lines 6 and 8, and mechanism generally designated 25 for controlling the position of the valve 14. Mechanism 25 comprises a cylinder member 26 externally threaded and held by nuts 27 upon the exterior thereof in rigid relation to the bracket portion 22. Reciprocable within the cylinder is a piston 28 into whose interior a rod 29 extends, the rod abutting against the bottom end of the interior of the piston and carrying an abutment members 30 which is engaged by a spring 31 whose other end engages a guide member 32 for the rod 29. A lock nut 32^a serves to lock the member 32. Relative adjustment between the members 32 and 26 obviously varies the possible upward movement of piston 28 and so controls the degree of closure of valve 14 as will later be evident. The line 8 opens into the bottom of the cham-

ber 33 of the cylinder 26 and opposite the point of communication, 34, of the line 8 is a connection 35 to which a U-shaped pipe 36 is connected at one end. The other end of this pipe opens into a valve casing 38 which is secured at its upper end to the lower end of the cylinder 26. The valve casing 38 is provided at its opposite ends with a pair of alined chambers 39 and 40 and intermediate these chambers with a central chamber 41 with which the connection 36 communicates. The chamber 41 communicates through openings 42 and 43 respectively with the chambers 39 and 40. A check valve 44 normally held in closed position by a spring 45 cooperates with a seat 46 surrounding the opening 43 and is provided with a stem 47 which extends through the opening 42 into the chamber 39 when the valve is closed. A polygonal plunger 48 is loosely slidable in the chamber 39 and terminates in a reduced stem 49 projecting into engagement with the piston 28 when the latter is in bottom position. The line 6 communicates at 50 with the chamber 40. The compression of the spring 45 may be adjusted by an adjustable perforated threaded follower 51.

Rod 29 has an adjustable abutment member 52 thereon engaging arm 20 and adjustable to control the full open positions of valve 14. Assume that the engine is operating the compressor and that the latter is loaded. The parts will then occupy the position shown in Fig. 2 and the valve 14 will be approximately wide open. It may be mentioned that this valve may also be controlled if desired by a speed governor, the control by the speed governor being independent of that by the air controlled mechanism described above. Let it now be assumed that the air pressure within the receiver builds up to such an extent that the pilot valve 7 opens, admitting pressure to the line 8. The effect of the admission of air to this line will be two-fold. In the first place the air will pass to the lower end of the piston 28, through the connection 36, past the valve 44, and into line 6, and unload the compressor. The pressure will also act upon the piston 28 to force the latter upwardly, moving the plunger 29 and thereby the arm 20 to close the throttle valve 14 to the extent necessary to effect the running of the engine 2 at reduced speed with the compressor unloaded. When the pressure in the line 6 approaches equality to that in line 8 the valve 44 will be closed by the spring 45 and remain closed except as it may be opened by air pressure should leakage cause reduction in pressure in the line 6 to a sufficient degree before reloading occurs. When the compressor discharge pressure reaches the predetermined desired minimum for which the pilot valve 7 is set, the latter will close off communication between the receiver and line 8 and will vent the latter to atmosphere. As a result the pressure in the line 8 and so in the cylinder 26 will begin to fall and with the falling of this air pressure the spring 31 will force the piston 28 and also the rod 29 downwardly, permitting the lever 20 to move downwardly, opening the throttle 14 and speeding up the driving engine 2. Only as the engine throttle opens fully again will the piston 28 engage the stem 49 and force open the valve 44 which has been acting as a check valve and preventing the flow of the air maintaining the compressor unloaded back through the passage 43, connection 36, and pipe 8 to the atmosphere. With the opening of the valve 44, however, the pressure which has been maintaining the compressor unloaded will be vented to atmosphere; and the compressor will then be reloaded and be driven loaded by the engine 2.

From the foregoing description it will be observed that the desired functioning of the compressor, driving engine, and the compressor unloading means mentioned above may be very simply and positively performed by the mechanism described and it will be noted that by reason of the connection 21 the parts require no special mode of mounting of auxiliary attachments upon the engine casing or frame 1, but may be arranged in close proximity to the parts controlled thereby.

While I have in this application specifically described one embodiment which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. The combination with a compressor and an internal combustion driving engine therefor, of controlling means for said compressor and for said engine comprising a cylinder adjustable in length, a piston therein, a plunger movable with said piston, a throttle for said engine having a controlling element engageable by said plunger, and means coaxially arranged with said piston and actuated thereby for controlling the condition of said compressor.

2. The combination with a compressor and an internal combustion driving engine therefor, said engine having a combustible mixture supply line extending vertically, of controlling means for said compressor and for said engine comprising a cylinder disposed parallel to said supply line, a piston therein, a plunger movable with said piston, a throttle for said engine in said supply line having a controlling element engageable by said plunger, and means coaxially arranged with said piston and actuated thereby for controlling the condition of said compressor.

3. The combination with a compressor and

an internal combustion driving engine therefor, said engine having a combustible mixture supply line having a substantially straight portion provided with a butterfly valve, of controlling means for said compressor and for said engine comprising a cylinder disposed parallel to said supply line, a piston therein, a plunger movable with said piston and operative to control the position of said butterfly valve, and means coaxially arranged with said piston and actuated thereby for controlling the condition of said compressor.

4. The combination with a compressor and a prime mover for driving the same, of pressure fluid operated unloading means for the compressor, a control for the prime mover including a cylinder and piston, the end of said cylinder and said piston cooperating to leave a space when the piston is at the end of its stroke, and means for controlling said unloading means including a pilot valve controlled passage communicating with said space, a check valve device axially alined with said cylinder, said check valve being positively opened by the last of the movement of said piston, said check valve device providing a passage leading from the valve side of said check valve to said unloading means, and a passage leading to the space at the end of said cylinder from the other side of said check valve, said passage being independent of the clearance surrounding the stem of the check valve.

In testimony whereof I affix my signature.

FRED D. HOLDSWORTH.