M. MINTZ.

AIR COMPRESSOR.

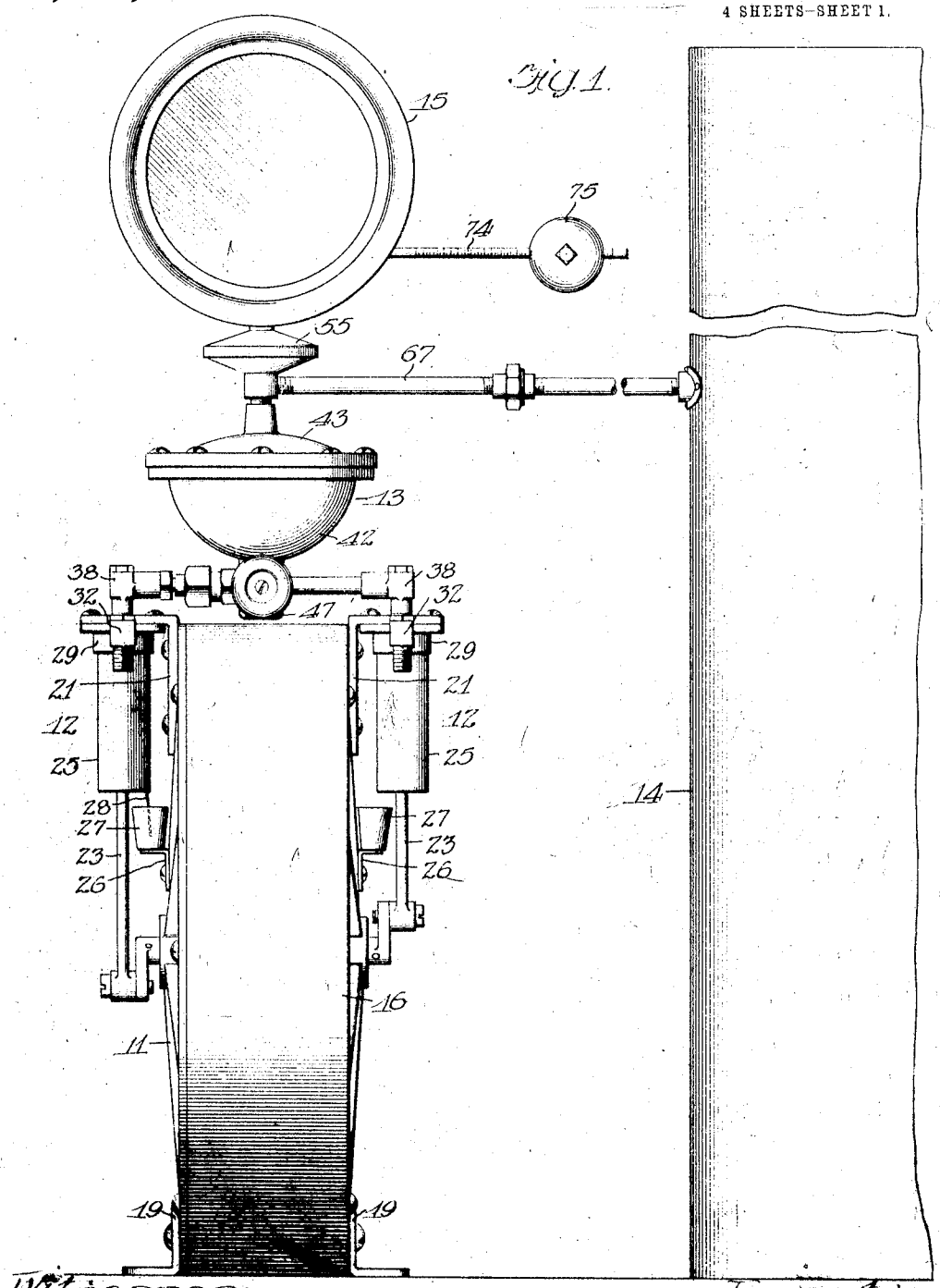
APPLICATION FILED DEC. 2, 1908.

1,035,804.

Patented Aug. 13, 1912.

4 SHEETS—SHEET 1.

Fig. 1.



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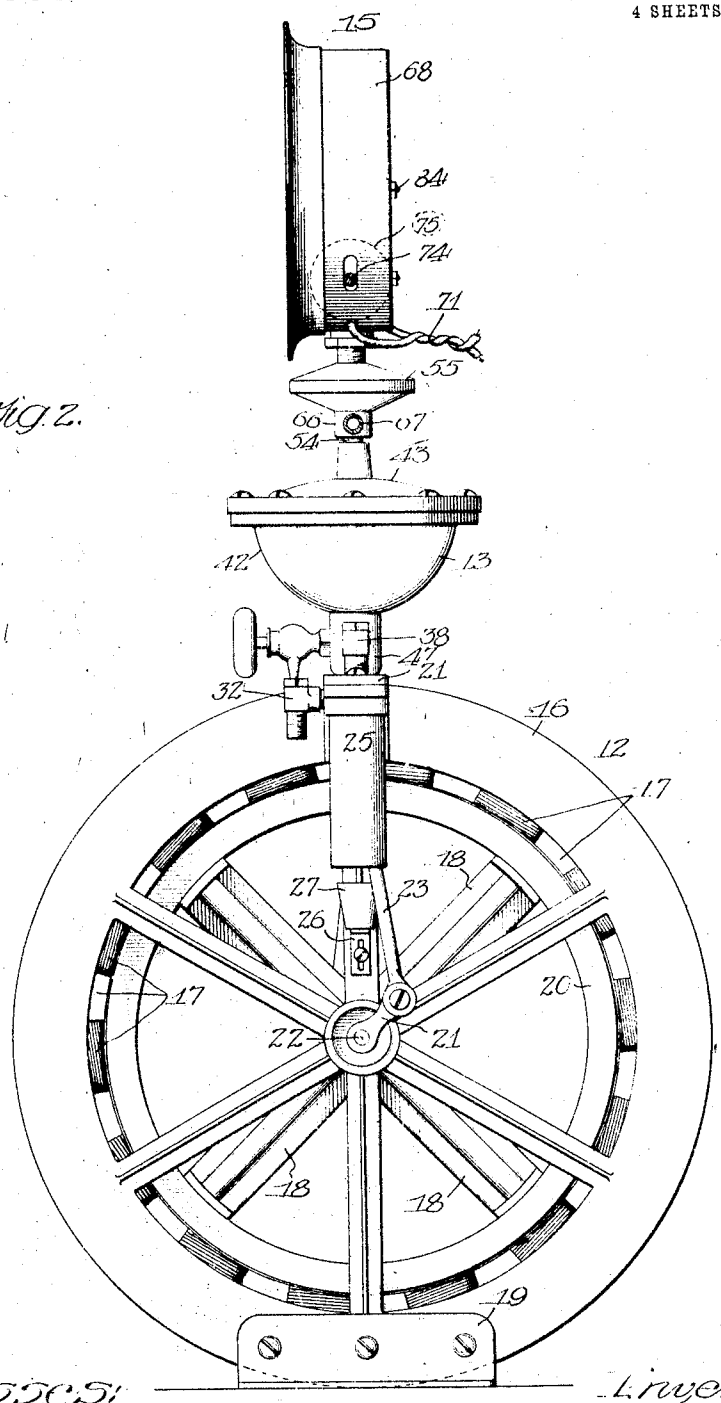
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

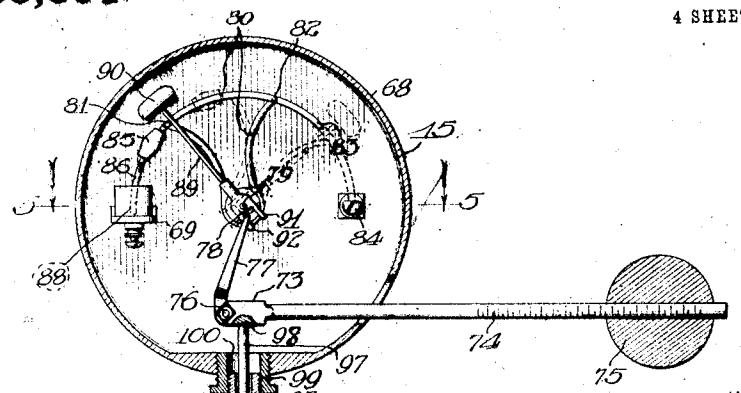

FIG. 4.

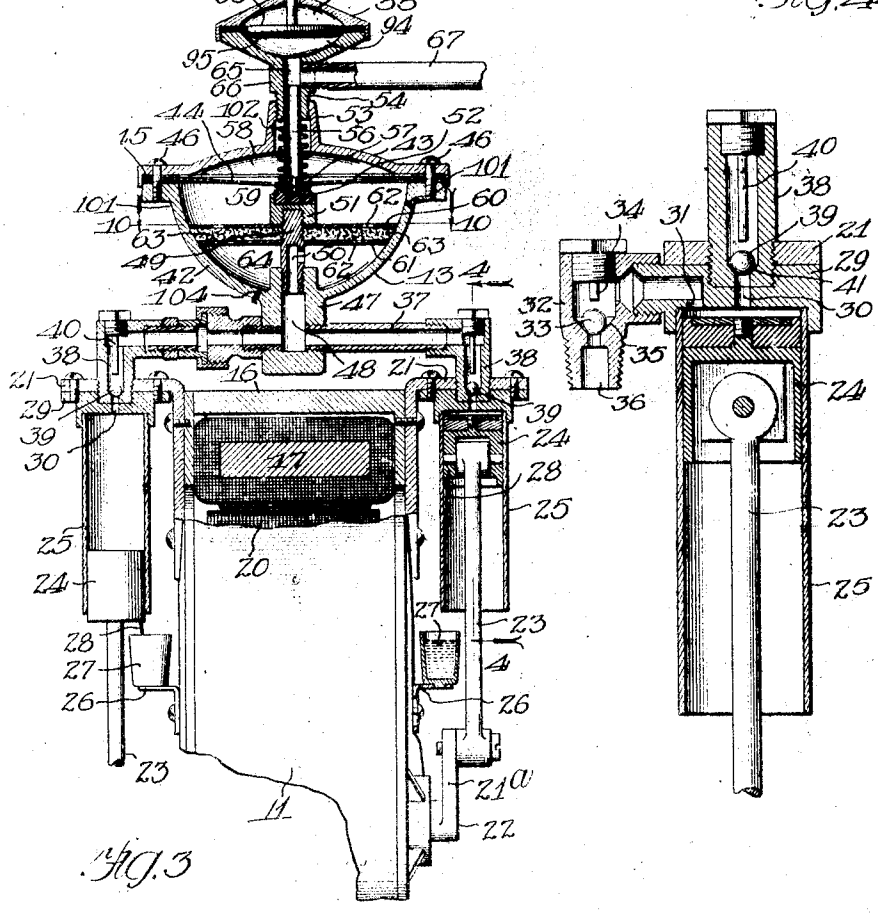

FIG. 3

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4 SHEETS—SHEET 4.

Fig. 5.

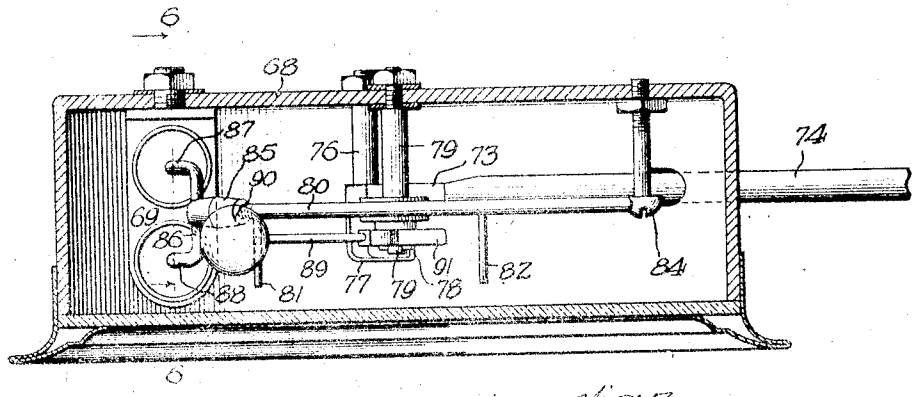


Fig. 7.

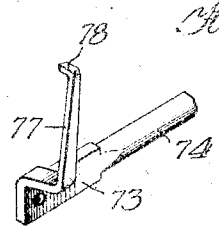


Fig. 6.

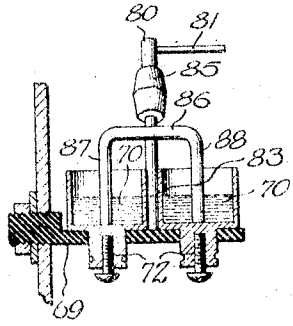
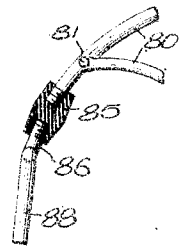


Fig. 8.



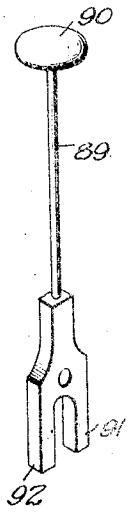
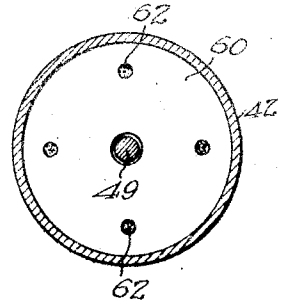


Fig. 9.

Fig. 10.



Witnesses:

Ira D. Perry

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Inventor:

Mike Mintz by

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UNITED STATES PATENT OFFICE.

MIKE MINTZ, OF ROCK ISLAND, ILLINOIS.

AIR-COMPRESSOR.

1,035,804. Specification of Letters Patent. Patented Aug. 13, 1912.

Application filed December 2, 1908. Serial No. 465,629.

To all whom it may concern:

Be it known that I, MIKE MINTZ, a citizen of the United States of America, and resident of Rock Island, Rock Island county, Illinois, have invented a certain new and useful Improvement in Air-Compressors, of which the following is a specification.

My invention relates to improvements in air compressors, and has for its object the production of a device utilizing an electric motor in which the pumps can be geared directly on the rotor shaft.

A further object is the utilization of improved valve means, whereby the motor may be caused to start immediately against any pressure.

A further object is the utilization in a device of the class described of a vertical rotor directly geared to a pumping mechanism that can be immediately started regardless of the starting torque of the motor.

A further object is the utilization of certain new and useful improvements in valves, switches and oilers, which will be clearly set forth in the accompanying specification and illustrated by the drawings, in which:—

Figure 1 represents an end elevation of my device in operative position. Fig. 2 represents a side elevation of my device. Fig. 3 represents a sectional view through the center of Fig. 1. Fig. 4 represents a sectional view on the line 4—4 of Fig. 3, looking in the direction indicated by the arrows. Fig. 5 represents a sectional view on the line 5—5 of Fig. 3, looking in the direction indicated by the arrows. Fig. 6 represents a sectional view on the line 6—6 of Fig. 5, looking in the direction indicated by the arrows. Figs. 7, 8 and 9 represent perspective views of details of Fig. 5. Fig. 10 represents a sectional view on the line 10—10 of Fig. 3, looking in the direction indicated by the arrows.

Like numerals of reference indicate like parts in the several figures of the drawings.

Referring now to the drawings, and especially to Fig. 1, 11 represents a motor; 12 a pair of pumps connected therewith; 13 a diaphragm valve controlling the admission of air to the tank 14; and 15 represents a switch by means of which the current to actuate the motor is automatically cut in and out at predetermined times. The motor proper shown is of a single phase type for alternating currents and comprises a case 16, a field 17 and a rotor 18. A support 19 secured to the case or frame 16, so the motor may stand in a vertical position. The armature ring 20 of the rotor has been turned down, leaving a full clearance between the armature and the field. On the opposite sides of the frame are screwed brackets 21, on which are mounted the pumps 12. A crank arm 21ª is mounted on the rotor shaft 22, and the lower end of the piston rod 23 is mounted thereon. The piston head 24 moves within the cylinder 25. Seated on a bracket 26, mounted on the frame, is an oil receptacle 27 just below the open end of the cylinder 25. A small strip of metal 28 is mounted on the lower side of the piston head 24 and adapted to pass within the oil receptacle on the down stroke. This strip is so positioned that it bears against the side of the cylinder when within the cylinder, thus depositing a small quantity of oil on the inside of the cylinder at each stroke. The cylinder head 29 is provided with two passages, one 30 communicating with the air compressor, and the other 31 communicating with a valve 32, opening to the atmosphere. This valve comprises a ball 33, a stop 34, a seat 35 and a passage 36 to the atmosphere or any other desired source of supply. The passage 30 of each pump communicates with a pipe 37. An ordinary valve 38, comprising a casing, a ball 39, a stop 40, and a seat 41, controls the passage of air from the pump to the tube 37 on the path to the compressed air tank. The diaphragm valve 13 is shown above the motor and comprises a lower shell or casing 42, an upper shell or cover 43, and a diaphragm 44. Washers 45 are inserted between the shells and the diaphragm, and screw bolts 46 secure the parts together. The lower shell terminates in a hollow stem 47. A valve post 49 screws within the passage 48 within the stem 47, and is provided with a passage 50 opening into the interior of the diaphragm chamber. A valve-seat support 51 is screwed on the top of the post 49 on which is mounted a valve-seat 52. The top of the upper shell or cover 43 also terminates in a hollow stem 53, within which is screwed a lower stem 54 of a diaphragm casing 55. A tube 56 fits within these stems, the upper end passing into the stem 54, and the lower end being constricted at 57 and passing through the diaphragm 44, and seating on the valve-seat 52. It will thus be evident that when the diaphragm is

down, as shown in Fig. 3, communication between the upper and middle chambers 58—59 is cut off. Located within the diaphragm case, below the diaphragm, are a pair of circular disks 60—61, provided with openings 62. These disks are of different diameters, leaving a space between the adjacent surfaces which is filled with absorbent material, as shown at 63. These two disks subdivide the chamber below the diaphragm into a middle chamber 59 and a lower chamber 64. The tube 56 extends within the passage 65, in the switch diaphragm case stem 66, from which a pipe 67 communicates with the tank or receptacle 14.

Referring now more particularly to Figs. 3, 5, 6, 7 and 8. The switch 15 comprises an outer casing 68 within which is secured a bracket 69, of insulating material, on which is seated a pair of mercury or other contacts 70. Communicating wires 71 from a source of electricity, not shown, are secured to the contact posts 72. A bell crank lever 73 comprising a graduated arm 74, extending outside the casing and provided with a weight 75, is pivoted at 76; the other arm 77 extends upwardly and is turned over, as shown at 78, forming a finger adapted to actuate the circuit closing device. Pivotally mounted within the casing at 79 is an oscillatory member 80 provided with a pair of stops 81—82. One end 83 of the arc of this member is arranged to strike against a shoulder 84 secured to the case, while the opposite end terminates in an insulating button 85, to which is secured a forked connection 86. The ends 87 and 88 of this connection are adapted to enter the mercury contacts 70 when the member 80 is oscillated. Mounted on the same pivotal point 79, as the member 80, is a striking arm or lever 89, provided with a ball or weight 90. At the lower end, this arm is extended below the pivot 79 into a fork or yoke, the arms 91—92 of which are adapted to be alternately engaged by the finger 78 to work the lever 89. This lever works between the stops 81—82 which are so located as to be at all times on opposite sides of a vertical line through the pivot 79. The diaphragm case 55 is located between the switch case and the pipe leading to the tank, and is divided into an upper and lower chamber 93—94, separated by a diaphragm 95. A foot 96 provided with a rod 97 passes through the top of the diaphragm casing, and extends into the switch casing, the lever 74 resting on the end 98 at a point between the pivotal point 76 and the weight. It is understood that the switch casing is screwed or secured to the top of the diaphragm casing by a threaded nipple 99, or in any desired manner, leaving a free passage 100 for the rod 97. A small port or passage 101 is provided communicating with the interior of the diaphragm casing 13 below the diaphragm, the purpose of which will be explained later. Any surplus oil that may find its way, or be forced in suspension in the air within the lower diaphragm chamber, may be prevented from passing upwardly by the absorbent disk 63, and collects at the bottom of the chamber where it may be drawn off by means of a valve or passage indicated at 104.

Referring now to the operation of my device, let us consider the tank empty and the motor at rest, the switch being in the position indicated by dotted lines in Fig. 3. The switch is thrown, closing the circuit to the motor and starting it into operation. The pressure within the diaphragm chambers and passages being atmospheric, the starting torque of the motor is sufficient to start the motor without difficulty. The pump being geared directly to the rotor shaft, then opens the valve 39, forcing the air into the lower diaphragm chamber 64 through the filtering medium and into the middle chamber 59. When the pressure reaches a predetermined point, the diaphragm rises against the pressure of the spring 102, unseating the valve 57 from the seat 52, thus permitting the air to pass through the tube 56 and pipe 67 to the compressed air tank. When the pressure reaches a predetermined point, it raises the diaphragm 95, carrying the rod 97, and raises the lever 74, thus tripping the switch. This operation in detail is as follows: The raising of the lever 74 presses the finger 78 against the member 92, forcing the weighted arm 89 from the stop 81 and toward the stop 82. As soon as the arm passes the vertical line, passing through the pivotal point 76, the weight 90 causes it to drop by gravity against the stop 82, thus moving the member 80 into the position shown in the dotted lines in Fig. 3. This breaks the circuit and stops the operation of the motor. The supply of compressed air within the tank is now used until the pressure is reduced to such a point that the weight on the lever 74 trips the arm 89 against the stop 81, thus closing the circuit and putting the motor again in operation. While the contents of the tank are being used and the motor at rest, the high pressure on the under side of the diaphragm 44 is removed and the spring 102 forces it down, temporarily seating the valve 57 and closing communication between the system above and below the diaphragm. The pressure on the upper side of the diaphragm relieves the spring and holds the valve in place after it is once seated. The compressed air within the system between the closed pump valve 38 and the diaphragm 44 then begins to leak out through the port or passage 101 (not shown), which is very small; an imperfect

thread on a screw might be sufficient for this purpose, but in any event means are contemplated and provided whereby, during the period that the motor is at rest and the compressed air being used from the tank or receptacle, the pressure within the lower portion of the system, as above defined, is reduced to that of the atmosphere. It will thus be seen that regardless of the pressure within the tank, or the required pressure necessary to trip the switch and start the motor, there is no pressure other than atmospheric below the diaphragm to oppose the starting torque of the motor, thus insuring at all times the prompt starting of the motor.

It is evident that this mechanism can be so regulated as to automatically shut off the current when any desired pressure within the tank is reached, and also arranged so that when the pressure within the tank flows to a predetermined point, the switch operates to start the motor in operation again.

Compressed air is used very commonly by artists and lithographers in the making of wash drawings, and the use of air brushes, by physicians for atomizers, by barbers, for pyrography points, by dentists, and a very common use is for the raising of beer in bar rooms. It would also be most convenient and desirable as a means of inflating automobile tires. Heretofore it has been a common practice in the most successful devices now in use for generating this air pressure to use a light motor operating a pair of air pumps, pumping the air into a receiver at a pressure of from thirty to sixty pounds, when the pressure would fall to a given point, say thirty pounds, if the maximum was to be forty pounds, the motor would be automatically started operating the pump and again raising the pressure to the maximum, and automatically shut off the current. It must be understood that all of these uses cited above, would necessitate but a very light power, the motors generally used being of but one-eighth and one-quarter horse power. The motor was generally of the rotary fan type and of comparatively high speed. So high is the speed of these motors that it would be impractical to connect these air pumps direct to the armature shaft, necessitating the use of some other means of decreasing the speed—in other words, of gearing back. Again, as the alternating current is most commonly used for lighting office buildings and other places where this compressed air would likely be used, the induction motor would of necessity be used. Now, as the starting torque of an alternating motor is so weak, no motor of an eighth or quarter horse power could possibly start against a load equal to compressed air at twenty, thirty or forty pounds, or even less. All these objections are practically overcome in my invention, and an efficient and durable motor of positive action is the result.

It is evident that this system can be used in establishing a vacuum chamber, instead of storing a chamber with compressed air, it being only necessary to reverse the operation and make simple changes in the relative positions of the parts of the valves within the chambers.

Of course, it is understood that I do not limit myself to the use of an alternating current motor, but can, if desired, use a direct current motor of light power.

The diaphragm valve shown and described in this application is not claimed specifically herein, but is claimed in my copending application Serial Number 465,628, filed December 2, 1908.

I claim:—

1. In an air compressor, the combination with a motor, pumps, a compressed air tank, a diaphragm valve interposed between said pumps and tank, and means for reducing the pressure in the system between the pumps and diaphragm valve to atmospheric regardless of the pressure in the remainder of the system.

2. In an air compressor, the combination with a motor, pumps, a compressed air tank, a diaphragm valve interposed between said pumps and tank, means for reducing the pressure in the system between the pumps and diaphragm valve to atmospheric regardless of the pressure in the remainder of the system, and means located within the casing of said diaphragm valve for purifying the air passing therethrough.

3. In an air compressor, the combination with a motor, pumps geared directly to the shaft of said motor, a compressed air tank, a diaphragm valve interposed between said pumps and tank, and means for reducing the pressure in the system between the pumps and diaphragm valve to atmospheric regardless of the pressure in the remainder of the system.

4. In an air compressor, the combination with a motor, pumps geared directly to the shaft of said motor, a compressed air tank, a diaphragm valve interposed between said pumps and tank, means for reducing the pressure in the system between the pumps and diaphragm valve to atmospheric regardless of the pressure in the remainder of the system, and means located within the casing of said diaphragm valve for purifying the air passing therethrough.

5. In an air compressor, the combination with a motor, comprising a magnetic field and a vertical rotor, pumps, a compressed air tank, a diaphragm valve interposed between said pumps and tank, and means for reducing the pressure in the system between the pumps and diaphragm valve to atmos-

pheric regardless of the pressure in the remainder of the system.

6. In an air compressor, the combination with a motor, comprising a magnetic field and a vertical rotor, pumps, a compressed air tank, a diaphragm valve interposed between said pumps and tank, means for reducing the pressure in the system between the pumps and diaphragm valve to atmospheric regardless of the pressure in the remainder of the system, and means located within the casing of said diaphragm valve for purifying the air passing therethrough.

7. In an air compressor, the combination with a motor, comprising a stationary magnetic field and a rotor, pumps geared directly to the shaft of said rotor, a compressed air tank, a diaphragm valve interposed between said pumps and tank, and means for reducing the pressure in the system between the pumps and diaphragm valve to atmospheric regardless of the pressure in the remainder of the system.

8. In an air compressor, the combination with a motor, comprising a stationary magnetic field and a rotor, pumps geared directly to the shaft of said rotor, a compressed air tank, a diaphragm valve interposed between said pumps and tank, means for reducing the pressure in the system between the pumps and diaphragm valve to atmospheric regardless of the pressure in the remainder of the system, and means located within the casing of said diaphragm valve for purifying the air passing therethrough.

9. In an air compressor, a motor, compression means, a compressed air tank, a chamber adjacent thereto through which the air passes on its way to the tank, valve means interposed between said motor and said tank, a leak located on one side of said valve of such character as not to affect the operation of the device while the air is being compressed but sufficient to restore the pressure to atmospheric on one side when the motor is at rest.

10. In an air compressor, a motor, compression means, a compressed air tank, valve means located between said tank and motor, a leak in the air passage on one side of said valve of such character as not to affect the operation of the device when the air is being compressed but sufficient to restore the pressure to atmospheric on one side when the motor is at rest.

11. In an air compressor, the combination with a motor, pumps, a compressed air tank, a diaphragm valve interposed between said pumps and tank, and means for restoring atmospheric pressure in the system between the pumps and diaphragm valve regardless of the pressure in the remainder of the system.

12. In an air compressor, the combination with a motor, pumps, a compressed air tank, a diaphragm valve interposed between said pumps and tank, means for restoring atmospheric pressure in the system between the pumps and diaphragm valve regardless of the pressure in the remainder of the system, and means located within the casing of said diaphragm valve for withdrawing impurities from the air passing therethrough.

13. In an air pump, the combination with a motor, pumps, an air tank, a diaphragm valve interposed between said pumps and tank, and means for restoring atmospheric pressure in the system between the pumps and diaphragm valve regardless of the pressure in the remainder of the system.

14. In an air pump, the combination with a motor, pumps, an air tank, a diaphragm valve interposed between said pumps and tank, means for restoring atmospheric pressure in the system between the pumps and diaphragm valve regardless of the pressure in the remainder of the system, and means located within the casing of said diaphragm valve for withdrawing impurities from the air passing therethrough.

15. In an air compressor, the combination with a motor, pumps, a compressed air tank, a diaphragm valve interposed between said pumps and tank, means for restoring atmospheric pressure in the system between the pumps and diaphragm valve regardless of the pressure in the remainder of the system, and means for withdrawing impurities and vapors from the air passing therethrough.

16. In an air pump, the combination with a motor, pumps, an air tank, a diaphragm valve interposed between said pumps and tank, means for restoring atmospheric pressure in the system between the pumps and diaphragm valve regardless of the pressure in the remainder of the system, and means for withdrawing impurities and vapors from the air passing therethrough.

17. In an air pump, a motor, pumps, an air tank, valve means located between said tank and motor, a leak in the air passage on one side of said valve of such character as to not affect the operation of the device when the machine is running but sufficient to restore atmospheric pressure on one side when the motor is at rest.

Signed by me at Chicago, Illinois, this 30th day of October 1908.

MIKE MINTZ.

Witnesses:

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