C. C. HARMON.

AIR OR GAS COMPRESSOR.

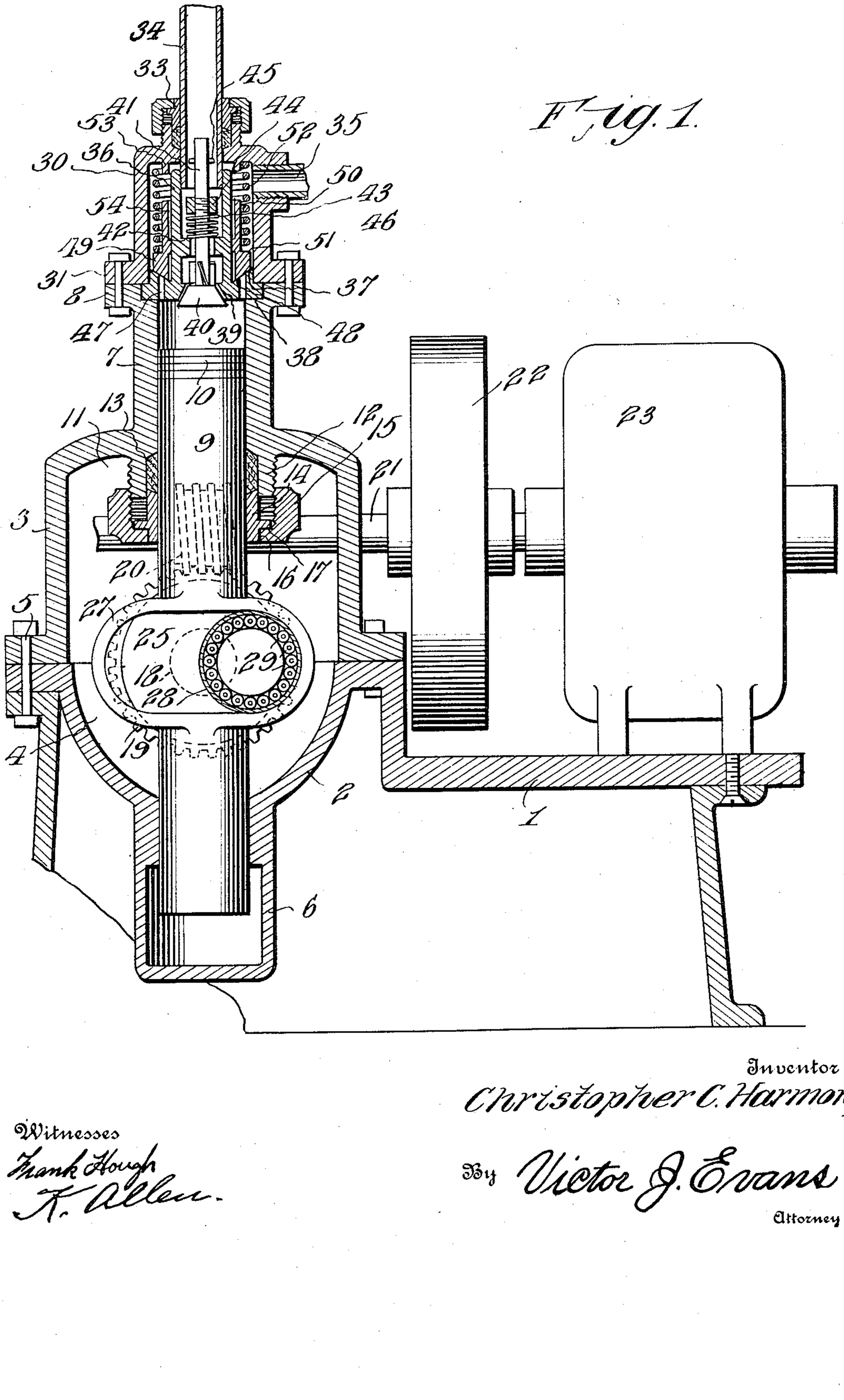
APPLICATION FILED JUNE 20, 1910.

999,220.

Patented Aug. 1, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 2

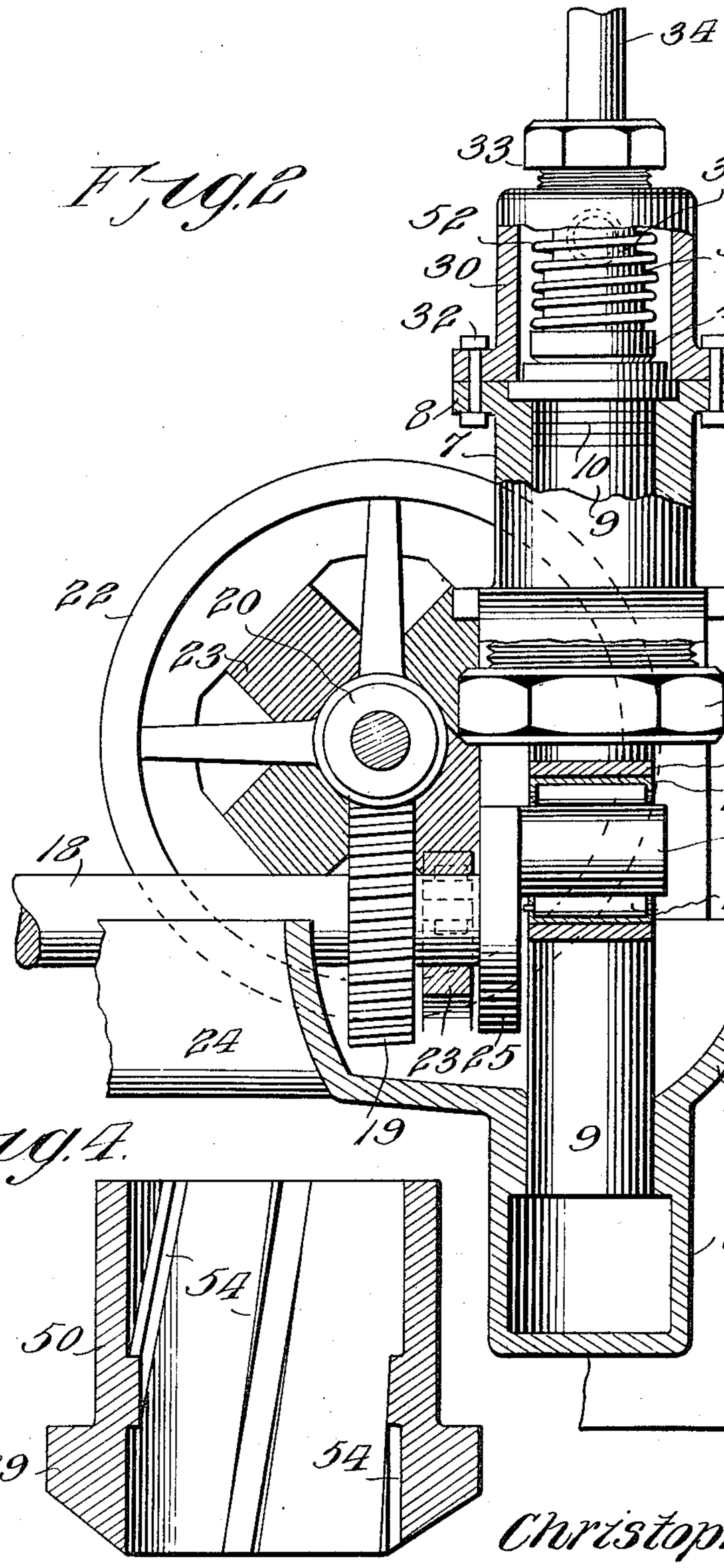

Fig. 3.

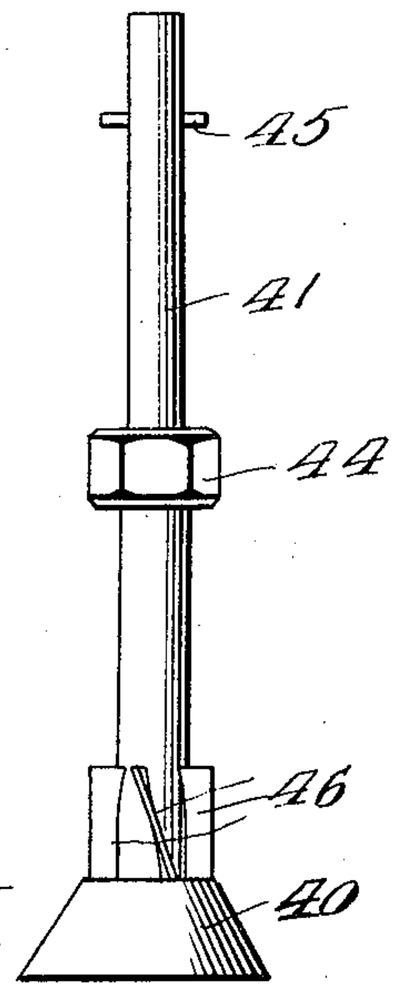

Fig. 4.

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UNITED STATES PATENT OFFICE.

CHRISTOPHER C. HARMON, OF CHARLOTTE, NORTH CAROLINA.

AIR OR GAS COMPRESSOR.

999,220. Specification of Letters Patent. Patented Aug. 1, 1911.

Application filed June 20, 1910. Serial No. 567,904.

To all whom it may concern:

Be it known that I, CHRISTOPHER C. HARMON, a citizen of the United States, residing at Charlotte, in the county of Mecklenburg and State of North Carolina, have invented new and useful Improvements in Air or Gas Compressors, of which the following is a specification.

This invention relates to improvements in air or gas compressors, and particularly to a pump for use in ammonia refrigerating plants for compressing the gas from the coils into the condenser, although it may be used for compressing fluids of various kinds for various purposes.

The objects of the invention are, first, to provide a novel, simple and compact type of gearing for driving the pump piston, which gearing obviates the necessity of employing the usual rod connection between the crank shaft and piston and enables the piston to be driven at a desired reduced rate of speed from a high speed motor; second, to provide a gearing of the character described whereby one or more compressors may be driven from the same shaft; third, to provide a novel arrangement of stuffing box to prevent the escape of gas from the compressor and entrance of air into the system; fourth, to provide a novel construction and arrangement of the suction and delivery valves, whereby the parts of the valve mechanism may be conveniently assembled and disassembled as occasion requires; fifth, to provide means for rotating the valves under the pressure of the gas to secure an even wear upon the valves and valve seats; and, finally, to generally simplify and improve the construction and increase the practical efficiency of compressors of this type.

With these and other objects in view, the invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a central vertical section through an air compressor embodying my invention, showing the piston at a point about midway of its suction stroke. Fig. 2 is a vertical section, partially in elevation, taken on a plane at right angles to the plane of section shown in Fig. 1, and illustrating the piston at the end of its working stroke. Fig. 3 is an enlarged detail side elevation of the suction valve. Fig. 4 is an enlarged central vertical transverse section through the outlet or delivery valve.

Referring to the drawings, 1 designates a suitable hollow base or frame which supports the parts of the pump and may also serve as a support for the driving motor. Carried by this frame is a crank casing or frame composed of a bottom section 2 and a top section 3. The bottom section 2 is in the form of a trough providing a well or chamber 4 to contain a supply of oil for lubricating the drive gearing of the pump mechanism. This section may be cast integral with the frame or independently thereof and bolted or otherwise properly secured thereto. The upper section 3 is in the form of a yoke open at front and rear and flanged at its lower end for the passage of bolts 5 to secure the same to the bottom section and frame.

The section 2 carries a depending hollow piston guide 6, while the section 3 carries the pump cylinder 7 which is provided at its normally open upper end with an outturned annular horizontal flange 8. The piston 9 extends vertically through the crank casing and has its lower end movable in the guide 6 and its upper end movable in the cylinder 7 and provided with packing rings 10 to prevent as far as possible leakage of gas outwardly between the same and the wall of the cylinder. Supported by the section 3 is a stuffing box 11 through which the piston works, said box comprising an externally threaded collar 12 forming the body of the box within which is arranged suitable packing 13. A gland or follower 14 surrounds the piston and is adjustable within the collar to force the packing into engagement with the piston. A flanged nut 15 engages the threaded collar and its flange 16 is arranged to bear against a flange 17 on the gland, whereby the latter may be adjusted. By this construction and arrangement of the stuffing box the exhaust of any gas which may pass the packing rings 10 and the inlet of air to the lower end of the cylinder from internal suction is prevented, with obvious advantages.

The crank shaft 18 carries a worm wheel 19 meshing with a worm pinion 20 on a driving shaft 21. This driving shaft may receive motion from any suitable source of power but in the present instance is shown

as provided with a fly wheel 22 and driven by a motor 23 mounted on the base 1. This type of gearing adapts the crank shaft to be driven at a properly reduced rate of speed for operating the pump from a high speed motor. One end of the crank shaft 18 is shown as journaled in a bearing 23 on the casing section 2, and its opposite end may be journaled in a properly arranged bearing, (not shown). Said shaft may also extend beyond the primarily driven compressor to one or more other compressors for operating the pistons thereof, in which event the section 2 of the crank casing may be provided with an oil channel 24 leading therefrom to the oil chamber 4 of the adjacent compressor or to the points where the bearings of the shaft are arranged to supply the same with lubricant. The end of the shaft journaled in the bearing 23 carries a crank wheel or disk 25 which is provided with a crank pin 26 operating within and in conjunction with an eccentric yoke 27 carried by the piston 9 for reciprocating the latter as the shaft revolves. In order to prevent undue friction and grinding and sliding of the surfaces of the crank pin and yoke upon each other, I provide said crank pin with a channeled bearing ring 28 between which and the periphery of the pin is disposed an annular series of anti-friction bearing balls or rollers 29. By this construction a free and easy motion of the parts upon one another is secured, with a reduction of wear and friction. This means for imparting motion from the crank shaft to the piston dispenses with the use of the ordinary connecting rod and effects sufficient economy of space to enable the stuffing box 11 to be disposed as shown for the purpose described.

The valve mechanism comprises a bonnet or casing 30 mounted upon the upper end of the cylinder and provided with a flange 31 at its base secured to the flange 8 of the cylinder by bolts 32. This bonnet or casing is provided with a stuffing box 33 at its upper end, through which enters the suction pipe 34, said stuffing box preventing leakage of gas on the discharge action, and leading from one side of said bonnet at the upper end thereof is the outlet or discharge pipe 35. Arranged within the bonnet is a guide tube 36 having a threaded engagement at its upper end with the suction pipe 34 and having its lower end provided with a horizontal seat flange 37 which engages a recess 38 formed in the upper end of the cylinder and is held clamped therein by the bonnet 30. The base of the guide tube is formed centrally with an inlet port 39 the wall of which is beveled to form a seat for an inwardly opening suction valve 40, the stem 41 of which extends upwardly through the guide tube and into the end of the pipe 34. Within the guide tube is provided an annular shoulder 42 against which bears the lower end of a coiled spring 43 which surrounds the stem and engages at its upper end the nut 44 on the stem whereby the tension of the spring may be regulated, said spring acting to normally hold the suction valve closed. The upper end of the stem 41 carries a cross pin 45 acting as a stop to limit the downward movement of the valve in the event of the loosening of the nut and its disengagement from the threaded portion of the stem, whereby the valve will be prevented from dropping far enough into the cylinder to derange or impair the working efficiency of the valve mechanism. Formed or provided upon the valve stem are spiral vanes or blades 46 arranged in the path of the entering gas and acting as propeller blades whereby the valve will be rotated by the pressure of the gas to adjust it so as to secure equal grinding wear upon the face of the valve and its seat.

The flange of the guide tube is provided with an annular series of discharge ports 47 and its upper surface is beveled to form a seat 48 for the outlet valve 49 which controls said ports. The said valve is provided with an upwardly extending tubular stem 50 which surrounds the guide tube and forms a shoulder 51 at its point of juncture with the valve. A coiled spring 52 surrounds the stem and bears at one end against said shoulder and engages at its upper end a retaining flange or projection 53 upon the top of the bonnet. On its interior the valve is formed with spiral vanes 54 acting as propeller blades whereby a portion of the discharging gas flowing upwardly between the guide tube and valve stem will rotate the valve, thus causing it to wear uniformly to maintain a tight engagement with its seat.

In the operation of the pump, it will be understood that through the action of the worm gearing and the crank connection between the driving shaft and the piston, the latter will be reciprocated. On the down or suction stroke of the piston the outlet valve will be closed by the suction and action of its spring, while the suction valve will be opened for the admission of the gas into the cylinder. Upon the upstroke of the piston the gas drawn into the cylinder will be compressed and the outlet valve lifted from its seat, the gas discharging through the ports 47 and the pipe 35. In the operation of the valves they will be rotated on their axes by the pressure of the flowing gas, whereby the faces of the valves and their seats will be uniformly worn at all points. Upon detaching the bolts 32 the valve casing and parts of the valve mechanism may be disconnected from the cylinder, thus enabling the elements of the valve mechanism to be readily and con-

veniently cleaned, repaired or replaced with new parts in the event that any of the elements thereof are injured or worn out.

Having thus described my invention, I claim:—

1. A compressor pump embodying a cylinder, a piston operating therein, a valve casing detachably secured to the cylinder and provided with inlet and outlet passages, a guide tube arranged within the casing and communicating with the inlet passage and provided with a suction port and discharge ports, a spring closed suction valve controlling said suction port and arranged within the guide tube, a spring closed outlet valve surrounding the guide tube and controlling said discharge ports, and means for actuating the piston.

2. A compressor pump embodying a cylinder, a piston operating therein, a valve casing mounted on the cylinder and having inlet and outlet passages, a guide tube arranged within the valve casing and communicating at one end with said inlet passage and provided at its opposite end with a suction port and discharge ports, a spring closed suction valve controlling said suction port and having a stem arranged within the guide tube, a spring closed outlet valve having a hollow body surrounding the guide tubes and controlling said discharge ports, propeller vanes upon the stem of the suction valve within the guide tube, and propeller vanes upon the interior of the hollow body of the outlet valve.

3. A compressor pump embodying a cylinder, a piston operating therein, a valve casing secured to the cylinder and having inlet and outlet passages, a guide tube arranged within the valve casing and connected at its upper end with the inlet passage and provided at its lower end with a suction port and an outwardly extending flange formed with discharge ports, a spring closed suction valve controlling said suction port and having a stem movable within the guide tube, a spring closed outlet valve comprising a hollow body surrounding the guide tube and arranged to seat against the flange to control the discharge ports, and means for actuating the piston.

4. A compressor pump embodying a cylinder, a piston operating therein, a valve casing detachably secured to the cylinder and provided with inlet and outlet passages, a guide tube communicating with the inlet passage and having a suction port and discharge ports, said tube being held in position by said casing, a spring-closed suction valve controlling said suction port and arranged within the guide tube, a spring-closed outlet valve surrounding the guide tube and controlling said discharge ports, and means for actuating the piston.

In testimony whereof I affix my signature in presence of two witnesses.

CHRISTOPHER C. HARMON.

Witnesses:

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BENNETT S. JONES.