April 15, 1930. C. C. FARMER 1,754,231

FLUID COMPRESSOR

Filed May 11, 1928 2 Sheets-Sheet 1

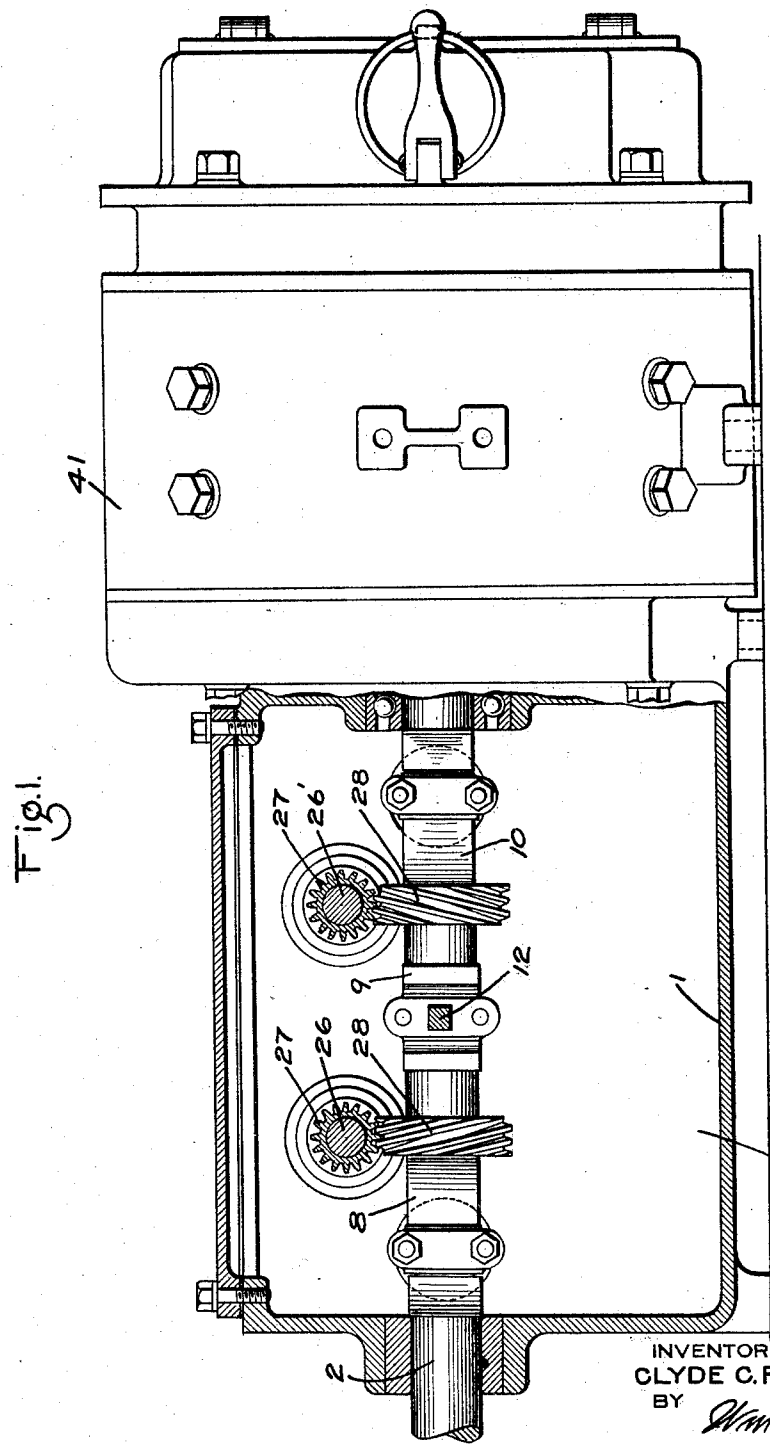



Fig. 1.

INVENTOR
CLYDE C. FARMER
BY Wm. A. Eady
ATTORNEY

April 15, 1930. C. C. FARMER 1,754,231

FLUID COMPRESSOR

Filed May 11, 1928 2 Sheets-Sheet 2

Fig. 2.

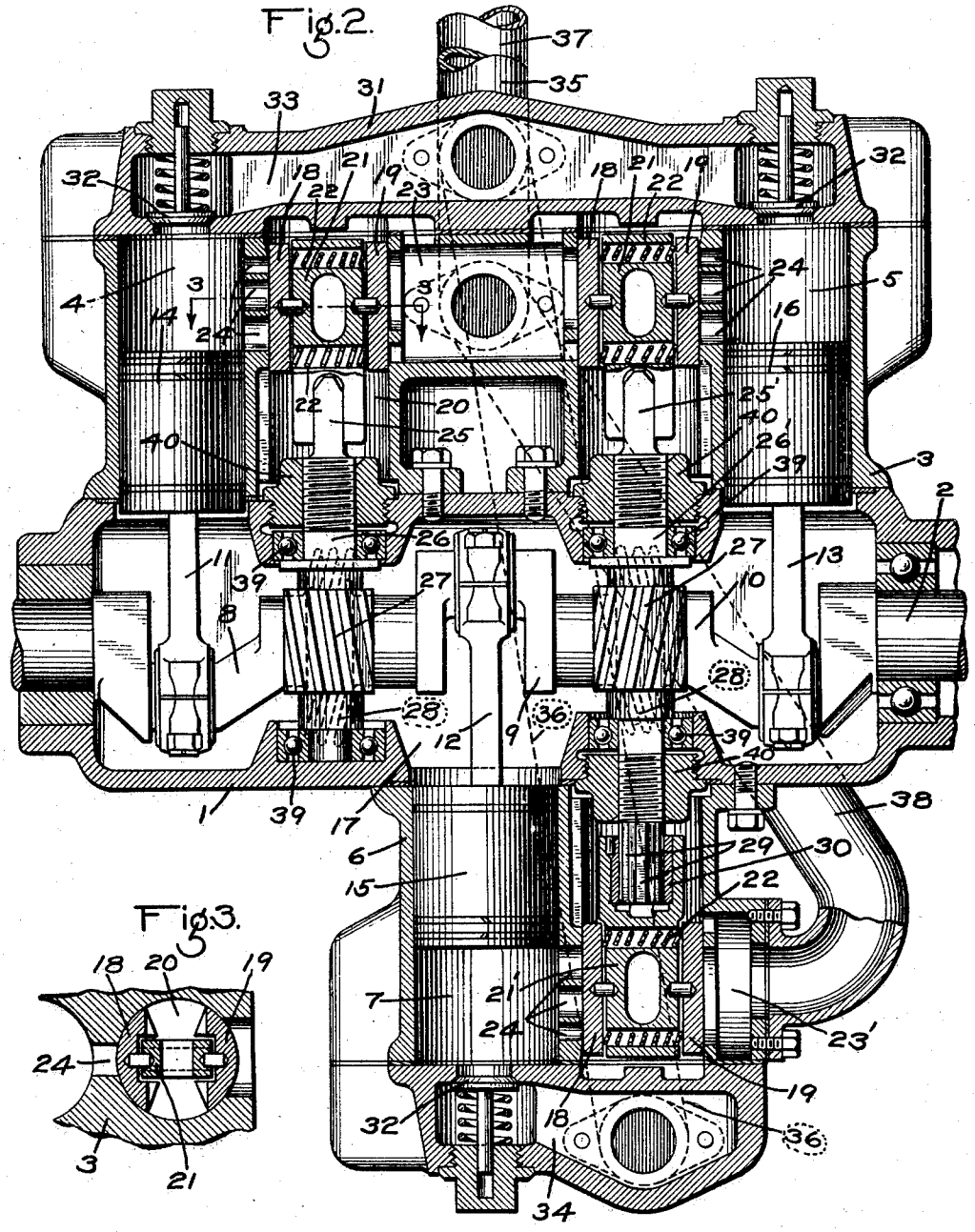



Fig. 3.




INVENTOR
CLYDE C. FARMER
BY Wm. M. Cady
ATTORNEY

Patented Apr. 15, 1930

1,754,231

# UNITED STATES PATENT OFFICE

CLYDE C. FARMER, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF WILMERDING, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

## FLUID COMPRESSOR

Application filed May 11, 1928. Serial No. 276,856.

This invention relates to fluid compressors, and more particularly to an electric motor driven compressor.

Compressors of the reciprocating piston type have heretofore been run at relatively low speeds, the speed of the compressor having been limited by the nature of the fluid inlet valves employed.

A fluid inlet valve is now available which is capable of running at a high speed, and in turn permitting the running of the compressor at a high speed, the valve in question being disclosed in Patent No. 1,503,261, of F. L. Broussouse, dated July 29, 1924.

By running the compressor at a high speed, the compressor may be directly connected to an electric motor, without the use of speed reducing gears.

A high speed compressor provides high capacity in proportion to the size of the compressor, so that a relatively small size, light weight compressor will have a capacity corresponding with a larger and heavier slow speed compressor.

The principal object of my invention is therefore to provide a high speed direct connected fluid compressor.

Other objects and advantages will appear in the following more detailed description of the invention.

In the accompanying drawing; Fig. 1 is a side elevation, partly in section, of a direct electric motor driven compressor unit embodying my invention; Fig. 2 a diagrammatic horizontal sectional view of the compressor; and Fig. 3 a section on the line 3—3 of Fig. 2.

As shown in the drawings, the compressor is provided with three cylinders disposed in a horizontal plane and comprises a base casting 1 having a crank case chamber 17 containing a crank shaft 2 and provided with bearings in the end walls for the crank shaft.

Secured to one side of the casting 1 is a cylinder casing 3 having piston cylinders 4 and 5 and secured to the diametrically opposite side of the casting is a casing cylinder 6 having a piston cylinder 7 disposed intermediately of the cylinders 4 and 5, the cylinder 7 being of greater bore than the cylinders 4 and 5.

The crank shaft 2 is provided with three cranks 8, 9, and 10 to which are connected the respective connecting rods 11, 12, and 13. The rods 11, 12, and 13 are connected in the usual manner to the respective pistons 14, 15, and 16, contained in piston cylinders 4, 7, and 5.

The inlet valve construction is of the type disclosed in Patent No. 1,503,261 of F. L. Broussouse, dated July 29, 1924 and comprises segmental, oppositely disposed valve members 18 and 19 adapted to be rotated in a valve cylinder 20 by means of a rotatable valve rod 21, the valve segments 18 and 19 being yieldingly maintained in contact with the cylinder wall by means of coil springs 22.

The valve segments control communication from a fluid inlet chamber 23 through ports 24 to the respective piston cylinders.

The inner end of the valve rod 21 which operates the valve segment for the piston cylinder 4 is slotted to receive the flattened end 25 of a rotatable shaft 26, the shaft having secured thereto a worm gear 27, the teeth of which are adapted to mesh with a worm wheel 28, secured to the crank shaft 2.

The shaft 26′ for operating the valve segments associated with the piston cylinder 5 is extended to the opposite side of the crank shaft and is provided at the outer end of the extension with the splines 29 adapted to engage corresponding recesses in a bushing 30 which is secured in a bore provided in the valve rod 21′ for operating the valve segments associated with the piston cylinder 7.

The construction is such that by reversing the cylinder head 31, the inlet valve mechanism may be withdrawn or assembled as desired. Each piston cylinder is provided with a discharge valve 32, the discharge valves 32 for the piston cylinders 4 and 5 permitting the discharge of compressed fluid to the chamber 33 and the discharge valve for the cylinder 7 permitting the discharge of compressed fluid into chamber 34.

The chamber 33 is connected to a discharge pipe 35 and chamber 34 is connected through pipe 36 with said discharge pipe. The inlet chamber 23 is connected to a fluid inlet pipe

37 and inlet chamber 23′ is connected through pipe 38 with said inlet pipe.

The valve operating shafts 26 and 26′ operate in ball bearings 39 and extend through plugs 40 having screw-threaded engagement in the casing walls.

As shown in Fig. 1, an electric motor casing 41 is secured to the compressor casting 1 and is directly connected to the crank shaft 2.

By means of the opposed cylinder construction and by making the intermediate cylinder 7 of larger diameter than the cylinders 4 and 5, the compressor may be mechanically balanced, to permit the running of the compressor at a high speed.

While one illustrative embodiment of the invention has been described in detail, it is not my intention to limit its scope to that embodiment or otherwise than by the terms of the appended claims.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a fluid compressor, the combination with a crank shaft, of three piston cylinders, one opposing the other two and fluid compressing pistons in said cylinders, and rods connecting each piston with said shaft.

2. In a fluid compressor, the combination with a crank shaft, of three piston cylinders having their axes and the axis of the crank shaft in the same plane and one cylinder opposing the other two cylinders and fluid compressing pistons in said cylinders operatively connected to said shaft.

3. In a fluid compressor, the combination with a crank shaft, of three piston cylinders having their axes in the same plane and one cylinder disposed intermediate of and opposing the other two cylinders and fluid compressing pistons in said cylinders, and a connecting rod for each piston and connected to said shaft.

4. In a fluid compressor, the combination with a crank shaft, of three piston cylinders having their axes in the same plane and one cylinder disposed intermediate of and opposing the other two cylinders and fluid compressing pistons in said cylinders, operatively connected to said shaft, the piston in the opposing cylinder being of larger diameter than the other two pistons, such that the effort of said piston substantially balances the effort of the two smaller pistons.

5. The combination with a fluid compressor comprising a crank shaft, three piston cylinders, one opposing the other two, and fluid compressing pistons in said cylinders, operatively connected to said shaft, of an electric motor directly connected to said shaft to thereby drive the shaft at the same speed as the motor.

6. In a fluid compressor, the combination with a crank shaft, of three piston cylinders, one opposing the other two, a fluid compressing piston in each cylinder operatively connected to said crank shaft, a valve means for controlling the inlet of fluid to each cylinder, and a single operating means for operating the valve means of the opposing cylinder and one of the other cylinders.

7. In a fluid compressor, the combination with a crank shaft, of three piston cylinders, one opposing the other two, a fluid compressing piston in each cylinder operatively connected to said crank shaft, a valve means for controlling the inlet of fluid to each cylinder, a shaft detachably connected to the valve means for the opposing cylinder and one of the other cylinders, and means for operating said shaft from the crank shaft.

8. In a fluid compressor, the combination with a crank shaft, of three piston cylinders, one opposing the other two, a fluid compressing piston in each cylinder operatively connected to said crank shaft, an inlet valve for the cylinder opposing the other two cylinders, and an inlet valve for each of the other two cylinders, said last mentioned inlet valves being disposed intermediate said two cylinders, and means for operating said valves from the crank shaft.

In testimony whereof I have hereunto set my hand.

CLYDE C. FARMER.