

Oct. 9, 1945.

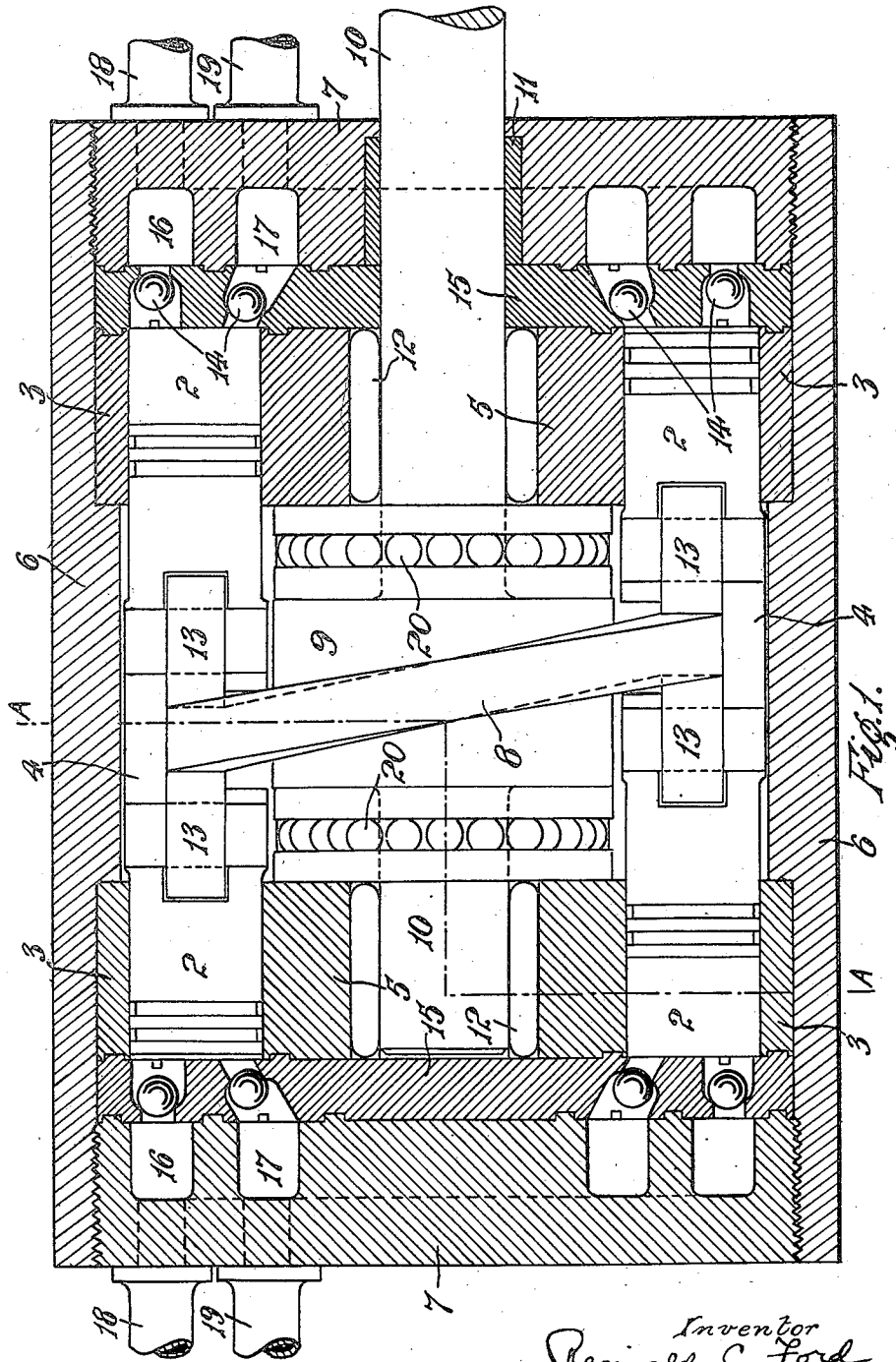
R. C. FORD

2,386,675

PUMP OR COMPRESSOR

Filed Feb. 18, 1944

2 Sheets-Sheet 1



Inventor
Reginald C. Ford
by Babcock & Babcock
Attorneys

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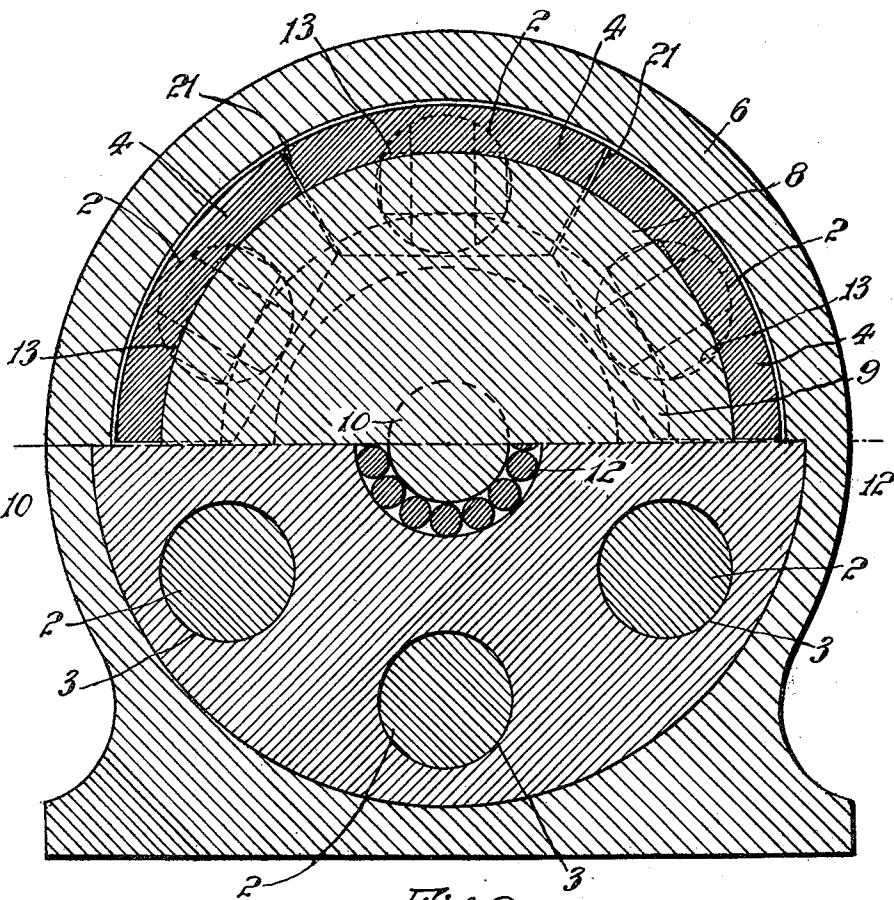


Fig. 2.

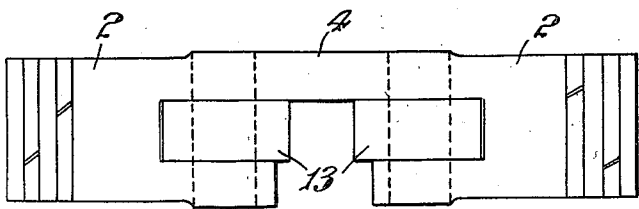


Fig. 3.

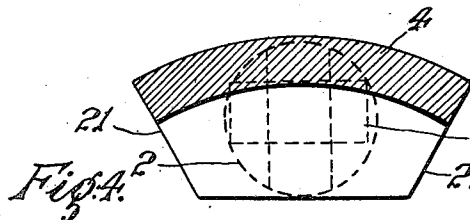


Fig. 4.

Inventor
Reginald C. Ford
by Babcock + Babcock
Attorneys

UNITED STATES PATENT OFFICE

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PUMP OR COMPRESSOR

Reginald Clarence Ford, Allesley, near Coventry,
EnglandApplication February 18, 1944, Serial No. 522,946
In Great Britain February 20, 1943

2 Claims. (Cl. 103—173)

This invention relates to pumps or compressors of the reciprocating plunger type and has for its object to provide an improved construction of multiple pump or compressor of this type.

For this purpose according to the present invention the plungers of one or more series of pump or compressor units are arranged for operation in any desired sequence directly and in a positive manner by a rotatable driving member common to all of the several units and arranged with its axis parallel with those of said units.

The said units are arranged in annular series around the axis of the driving member. The fluid to be compressed may be supplied to the barrel of each unit from a common annular supply duct and all the units may deliver into an annular delivery duct common to all the units each of which is provided with suitable non-return inlet and outlet valves.

The rotatable driving member consists of a cam in operative engagement with the several plungers. The said cam may be driven either by means of a central shaft, or by an external pulley or gear member.

The formation of the cam surface is such that the plunger of each unit makes one or more complete reciprocations during each complete revolution of the cam, and is further such that the several units are operated either in succession to one another or in any other desired sequence.

In the accompanying drawings,

Figure 1 is a view in axial plane section of a multiple pump or compressor constructed in accordance with the present invention.

Figure 2 is a transverse sectional view thereof on the line A—A.

Figures 3 and 4 are detail views of one pair of plungers in elevation and cross-section respectively.

Referring to the construction shown in the drawings, the pump or compressor units are arranged in two annular series one at each side of a cam. Each unit consists of a plunger 2 and a barrel 3. The plungers of one series are arranged in axial alignment with those of the other series respectively and each opposed pair of plungers are connected together by means of a cross-head 4 which, as shown, may be formed integrally therewith. The barrels of each series are formed in a stationary barrel plate 5 mounted within a fixed outer casing 6, said plates being arranged in parallel planes and secured in position by means of end plates 7 screwing into and closing the ends of the casing 6.

The plungers of each opposed pair of units are

reciprocated in their barrels in opposite directions simultaneously by means of a face cam 8 arranged between the two series of units and carried by or formed integrally with an enlarged part 9 of a rotatable driving shaft 10. This shaft is arranged with its axis parallel with those of the plungers and is mounted centrally of the casing in bearings 11 formed in the end plates and is also supported by needle bearings 12 carried by the barrel plates. Each side of the cam bears against rollers 13 carried by the cross-heads of the plungers.

The admission and delivery of the fluid to and from the barrels is controlled by means of non-return ball valves 14 carried by a stationary valve plate 15 arranged between each barrel plate and the adjacent end plate and are secured in position by the latter. The inner face of each end plate is recessed to form annular admission and delivery chambers 16, 17 respectively, said chambers communicating with inlet and outlet connections 18, 19. Ball thrust bearings 20 are arranged between the barrel plates and each side of the enlarged part of the shaft to take the axial load on the cam.

As shown in Figures 2 and 4 the cross-heads connecting opposed pairs of plungers are formed at the sides with radial faces 21, the faces of one cross-head being in sliding contact with those of adjacent cross-heads. If desired or necessary anti-friction balls or rollers may be arranged between the contacting faces.

Instead of forming the end plates with annular admission and delivery chambers as shown, the barrel of each unit may have its own separate inlet and delivery connections in which case a distributor valve may be employed to control the admission and delivery of fluid to and from the several units, said valve being operated in timed relation with the cam.

In the example shown the cam is formed to operate the plungers of each series of units in succession but it will be obvious that by a suitable cam formation the said plungers may be operated in any other desired sequence and may be such that the plunger of each unit makes one or more complete reciprocations for each complete revolution of the cam.

The improved multiple pump or compressor herein described besides being of an extremely compact and simple construction and capable of giving a very high ratio of compression, has the important advantage that the working stresses are distributed at a large number of points thereby contributing to smooth working and in-

creasing the useful life of the pump. Another advantage which is obtained is the reduction or absence of pulsations in the delivery of the fluid.

I claim:

1. In a multiple pump of the character described, the combination of a stationary casing having a cylindrical bore, a shaft rotatably mounted co-axially therein, a cam secured to said shaft, a barrel plate fixed in said casing at each side of said cam and having a central hole to provide a bearing for said shaft, each of said plates also having an annular series of open-ended bores formed therein with their axes parallel with the axis of said shaft, said bores constituting pump barrels, a piston in the barrel of each series of said barrels, cross-heads severally connecting the pistons of one series of barrels at one side of said cam with the opposite pistons of the other series, each of said cross-heads having lateral extensions with radial edges in sliding contact with the edges of similar extensions on adjacent cross-heads for the purpose of preventing rotation of said pistons about their axes, rollers arranged between and in contact with each cross-head and said cam, and means for controlling the inlet and outlet of the working fluid to and from the barrels of each series thereof.

2. In a multiple pump of the character described, the combination of a stationary casing having a cylindrical bore, a shaft rotatably mounted co-axially therein, a cam secured to said shaft, a barrel plate fixed in said casing at each side of said cam and having a central hole to provide a bearing for said shaft, each of said plates also having an annular series of open-ended bores formed therein with their axes parallel with the axis of said shaft, said bores constituting pump barrels, a piston in the barrel of each series of said barrels, cross-heads severally connecting the pistons of one series of barrels at one side of said cam with the opposite pistons of the other series, each of said cross-heads having lateral extensions with radial edges in sliding contact with the edges of similar extensions on adjacent cross-heads for the purpose of preventing rotation of said pistons about their axes, a valve plate fixed in each end of said casing and closing the outer ends of said barrels, inlet and outlet valves in said plate for each barrel, an end plate closing each end of said casing and having a central hole for said shaft and annular inlet and outlet ducts communicating with said valve controlled barrels.

REGINALD CLARENCE FORD.