June 2, 1936. P. MANISCALCO 2,042,673

AIR COMPRESSOR

Filed May 11, 1935 2 Sheets-Sheet 1

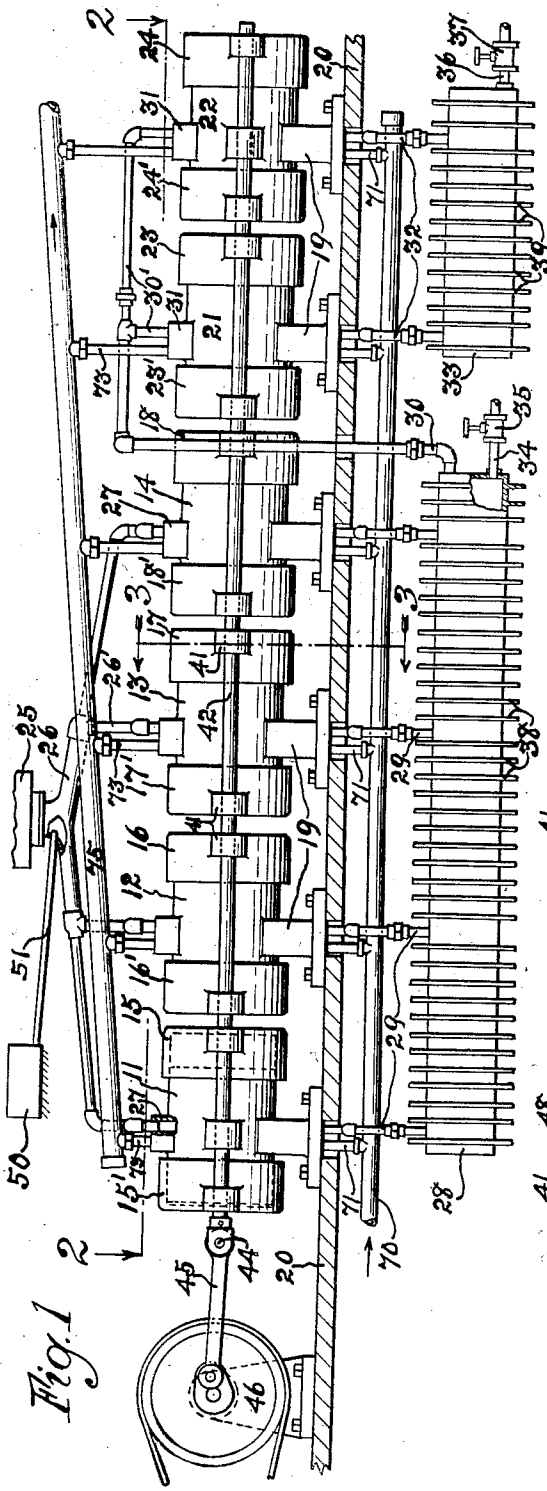


Fig. 1

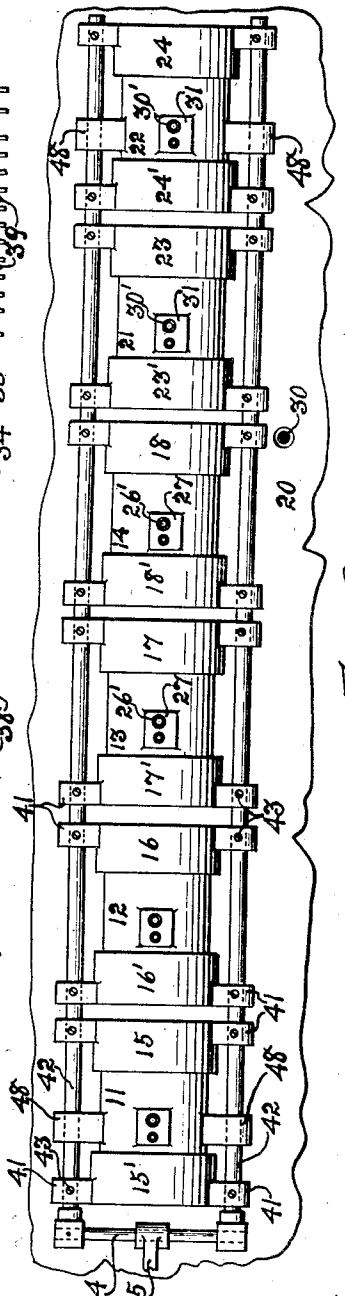


Fig. 2

Inventor
Pietro Maniscalco
by J. Daniel Stuwe
Attorney

June 2, 1936. P. MANISCALCO 2,042,673

AIR COMPRESSOR

Filed May 11, 1935 2 Sheets-Sheet 2

Fig. 4

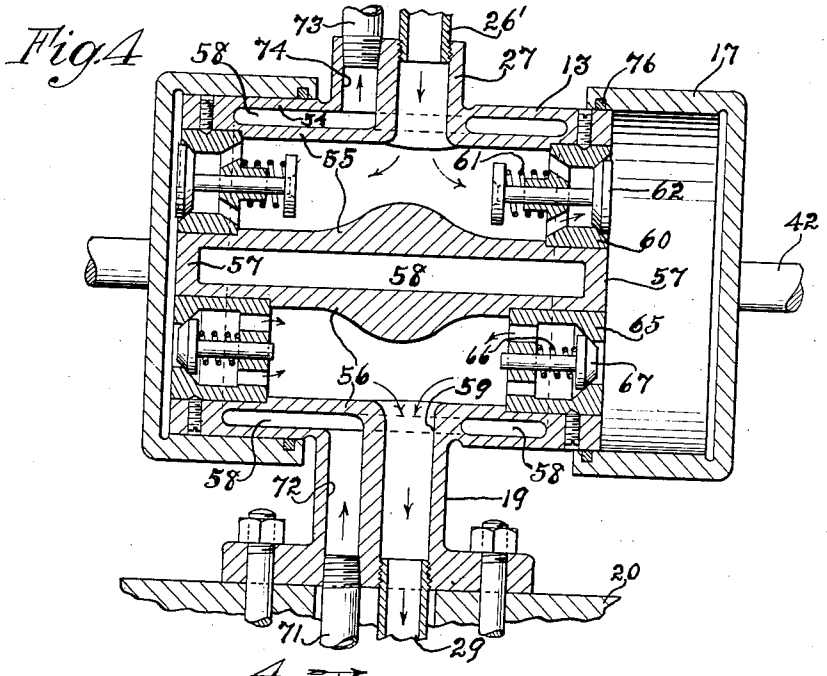
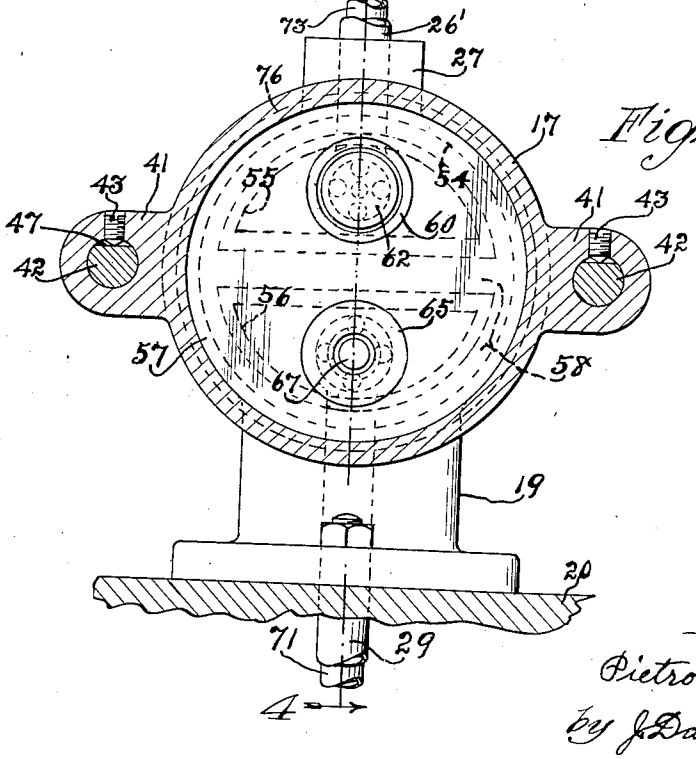


Fig. 3



Inventor
Pietro Maniscalco
by J. Daniel Stuwe
Attorney.

Patented June 2, 1936

2,042,673

UNITED STATES PATENT OFFICE

2,042,673

AIR COMPRESSOR

Pietro Maniscalco, Toledo, Ohio

Application May 11, 1935, Serial No. 21,042

9 Claims. (Cl. 230—211)

This invention relates to new and improved air compressors.

One of the main objects of this invention is to provide an air compressor which comprises a plurality of cylinders so arranged that they can be readily divided into any number of stages for high pressure, or can be coupled in series for a single stage machine of high volume.

Another object of this invention is to provide an air compressor wherein the weight of the reciprocating parts, and consequently the resulting power losses, are reduced to a minimum, the same being preferably accomplished by reciprocating the cylinders on the companion plungers which are mounted stationary.

A further object is to arrange the construction so that the valves are totally inclosed, in order to prevent leakage at the suction stroke and at the discharge stroke, and to assure uniform valve action.

Another object is to provide an air compressor construction wherein each plunger and its cylinders are easily demountable to permit individual inspection, repairs and replacements.

A further object is to provide such an air compressor which is so arranged that the plunger and the internal air passages and valves will be readily and effectively cooled, to reduce pressure losses and increase final output.

A further object is to utilize a plurality of cylinders arranged in alinement, so that they may be mounted under or inward of the running board of an automobile, and may be divided into a plurality of stages, each stage connected with a separate compressed air reservoir for accumulating and holding a predetermined volume at a given pressure.

These and various other objects and advantages will become apparent from the following description, taken in connection with the accompanying drawings, in which the invention is illustrated in its preferred form of construction, it being understood that various other arrangements and forms of construction may be resorted to for carrying out the objects and purposes of this invention.

In the drawings:

Fig. 1 is an elevational view illustrating my invention, somewhat diagrammatically.

Fig. 2 is a plan view thereof, taken substantially along lines 2—2 of Fig. 1.

Fig. 3 is an enlarged vertical cross-sectional view, taken on lines 3—3 of Fig. 2.

Fig. 4 is a vertical longitudinal sectional view, taken on lines 4—4 of Fig. 3.

In the drawings I have illustrated an embodiment of my invention, which I have shown as including six cylinder means arranged in the form of a two stage compressor. A set of four cylinder means are utilized in the first stage for placing the air under light compression, and a set of two cylinder means are utilized in the second stage for placing the air under heavy compression.

For the purpose of conventiently mounting the sets of cylinder means on an automobile and the like, I place them end to end with their longitudinal axes in alinement, as shown in Figs. 1 and 2. The first set includes stationary plungers 11, 12, 13, and 14, with their respective companion pairs of reciprocating cylinders 15 and 15', 16 and 16', 17 and 17', and 18 and 18'. The second set includes the stationary plungers 21 and 22 provided respectively with their pairs of reciprocating cylinders 23 and 23', and 24 and 24'. Each of the plungers is held stationary by means of a pedestal 19 depending from the plunger and secured upon the floor or supporting base 20.

The air is conveyed from an air intake member 25 through a main conduit 26 and therefrom through branch conduits 26' to the intake ports 27 of the first set of plungers.

A reservoir 28 is connected with the first set of plungers and associated cylinders for receiving the air therefrom through pipes 29 which extend from the plungers through the pedestals 19, thus receiving and holding the air under the first stage of compression. The air is conducted from this reservoir through a conduit 30 and branch conduits 30' to the intake ports 31 of the second set of plungers; and from the discharge ends of these plungers the heavily compressed air is conducted through pipes 32 into a second reservoir 33. A discharge pipe 34, provided with a valve 35, is connected to reservoir 28, adapted to conveying air therefrom; and a similar discharge pipe 36, provided with a valve 37, is connected to reservoir 33, adapted to convey air therefrom. Cooling fins 38 are provided around reservoir 28, and similar fins 39 around reservoir 33, to serve as air cooling means therefor.

With this arrangement the air under light compression may be drawn for use from reservoir 28, which constitutes the primary or low compression reservoir; and likewise the more heavily compressed air may be drawn for use from reservoir 33, which constitutes the secondary or high compression reservoir; thus enabling a person to utilize either the lightly compressed air or the heavily compressed air.

The plungers with their associated cylinders are all mounted in line, and the cylinders can then be readily reciprocated in unison upon their plungers. For that reason I provide a pair of ears 41 upon the opposite sides of each cylinder, and these ears contain openings through which a pair of rods 42 extend which are secured to the ears by means of set-screws 43. In this manner all the ears are secured on the pair of rods, and the rods are connected by a cross bar 44 actuated by a rod 45 which may be driven by any selected driving member 46, so that the cylinders will be reciprocated in unison. Notches 47 are preferably provided on top of the pair of rods 42, wherein the set-screws 43 engage, as shown in Fig. 3, so that the plungers and cylinders will be accurately positioned on the rods. Lugs 48 extend from the opposite sides of several of the plungers, through which the rods 42 slidably extend, to be supported and guided thereby.

The movable parts of the compressor are preferably lubricated by injecting an oil film into the stream of fresh air as it travels through or from the air intake means. This can be conveniently accomplished by means of a lubricant containing member 50 having a conduit 51 extending therefrom to the outlet portion of air inlet member 25 for introducing the lubricant into the fresh air as it passes from said member to conduit 26. The lubricant is thus carried with the air and applies itself to the various moving parts of the compressor.

As best shown in Fig. 4, the mechanism is arranged so that the valves are totally enclosed to prevent leakage, and so that the valves, plungers, and air passages can be effectively cooled. For this purpose the plunger is composed of an outer cylindrical shell 54 having an upper valve sleeve or casing 55, providing an air inlet chamber, and a lower valve sleeve or casing 56, providing an air outlet chamber, both extending longitudinally of the shell and from one end 57 to the other end thereof; thereby providing a cooling chamber 58 which extends around these sleeves, from end to end of the plunger, for receiving a suitable cooling medium. The upper valve sleeve 55 has the air inlet port 27 opening thereinto; and the lower valve sleeve 56 has an air outlet channel or port 59 extending therefrom through the pedestal 19, from which pipe 29 extends to reservoir 28.

The upper valve sleeve 55 has a valve seat 60 mounted in each end, and a spring 61 urges valve element 62 to its closed position on the seat, adapted to open and admit air from the sleeve into the associated cylinder 17. Similarly, a valve seat 65 is mounted in each end of the lower sleeve 56, and a spring 66 urges the valve element 67 to its closed position, adapted to open and enable the air from the cylinder 17 to flow through sleeve 56, port 59 and pipe 29 to reservoir 28.

A suitable cooling fluid or medium, for example water, is conducted to the plungers through a conduit 70 and therefrom through branch conduits 71, each of which leads up to a channel 72 extending through pedestal 19 and opening into the lower end of the cooling chamber 58, to conduct a cooling medium into the lower part of the plunger. A pipe 73 extends from a port 74 at the top of the plunger to a main conduit 75, for conducting the heated cooling medium from the upper end of chamber 58 to a suitable radiating device (not shown).

A sealing ring or gasket 76 is mounted in the inner surface near the open end of each cylinder, to engage tightly around the plunger, and thus only one gasket is needed in each cylinder, without any further packing or sealing means.

With this arrangement and construction of the air compressor, the valves are enclosed and protected, and the valves and plungers and air passages are properly cooled. The cylinders and plungers are also arranged compact and occupy a limited space, and the weight of the movable parts is greatly reduced; while the straight line arrangement of the cylinders enables convenient operation thereof by one pair of operating rods, and the cylinders can be subdivided into any number of stages for high pressure, or can be adapted as a single stage machine of high volume. The arrangement of the two reservoirs for this two stage compressor also enables air to be withdrawn for use at different degrees of compression.

I claim:

1. An air compressor comprising in combination a set of plungers and means for retaining them stationary, a set of cylinders on the plungers and means for reciprocating them thereon in unison, air containing means which provide inlet and outlet means in each plunger provided respectively with inlet and outlet valves for admitting air from said inlet means to the cylinder and therefrom to the outlet means, and air reservoir means and conduit means for conducting the compressed air thereto from the plungers, thus enabling the device to be readily adapted for a single stage or multi-stage compressor.

2. An air compressor comprising in combination a set of stationary plungers and reciprocating cylinders thereon, an air intake chamber and an air outlet chamber in each plunger provided respectively with inlet and outlet conduits thereon, valve means between said inlet and outlet chambers and the cylinders, a cooling chamber in the plunger for effectively cooling said air chambers and said valves, and a compressed air reservoir and conduit means to receive the air from the set of plungers.

3. A two stage air compressor comprising in combination a plurality of plungers and means for mounting them stationary with their longitudinal axes alined, a plurality of cylinders on said plungers and means for reciprocating the cylinders in unison, a plurality of reservoirs associated with said plungers, an inlet and an outlet chamber in each plunger provided respectively with inlet and outlet valves connecting said chambers with the associated cylinders, conduit means connecting a larger group of said plungers with the reservoir of the first stage, conduit means connecting said reservoir with a succeeding smaller group of plungers which provide the second set, and conduit means connecting the plungers of the second set with the reservoir of the second stage.

4. An air compressor comprising in combination a plunger and means for mounting it stationary, cylinder means reciprocably mounted on said plunger, an air inlet chamber and an air outlet chamber in said plunger, valve means connecting said chambers with the cylinder means, and a chamber within the interior of the plunger provided with conduit means for circulating a cooling medium to effectively cool said plunger with its air chamber means and valve means.

5. An air compressor comprising in combination a plunger and a pedestal for mounting it

stationary, a pair of cylinders mounted on the two ends of the plunger and means for reciprocating them in unison, an air inlet sleeve and an air outlet sleeve mounted in the plunger, an inlet valve in each end of the inlet sleeve for admitting air therefrom into the pair of cylinders, an outlet valve in each end of the outlet sleeve for admitting air thereto from the cylinders, and inlet and outlet ports in the cylindrical wall of the plunger extending respectively from the inlet and outlet sleeves.

6. An air compressor comprising in combination the subject matter of claim 5 and wherein a cooling chamber is provided and enclosed within the interior of the plunger around said sleeves for effectively cooling the plunger with its sleeves and valves.

7. An air compressor comprising in combination a plunger and a pedestal for mounting it stationary, a pair of cylinders mounted on the two ends of the plunger and means for reciprocating them in unison, an air inlet sleeve and an air outlet sleeve mounted in the plunger, an inlet valve in each end of the inlet sleeve for admitting air therefrom into the pair of cylinders, an outlet valve in each end of the outlet sleeve for admitting air thereto from the cylinders, inlet and outlet channels extending respectively from the inlet and outlet sleeves, a cooling chamber in the plunger for cooling the sleeves and valves therein, and an inlet channel on the cooling chamber, said air outlet channel and said inlet channel of the cooling chamber being positioned in said pedestal.

8. An air compressor comprising in combination a set of stationary plungers and reciprocating cylinders thereon, an air intake chamber and an air outlet chamber in each plunger provided respectively with inlet and outlet conduits thereon, valve means between said inlet and outlet chambers and the cylinders, a cooling chamber in each plunger for effectively cooling said air chambers and said valves, said cylinders and plungers being mounted in line, lugs extending from the cylinders, operating rods fastened to said lugs for operating the cylinders in unison, and a compressed air reservoir and conduit means for receiving the air from all of the plungers.

9. An air compressor comprising in combination a set of stationary plungers and reciprocating cylinders thereon, an air intake chamber and an air outlet chamber in each plunger provided respectively with inlet and outlet conduits thereon, valve means between said inlet and outlet chambers and the cylinders, a cooling chamber within each plunger for effectively cooling said air chambers and said valves, said cylinders and plungers being mounted in line, and operating means extending along said cylinders and being connected therewith for operating the cylinders in unison.

PIETRO MANISCALCO.