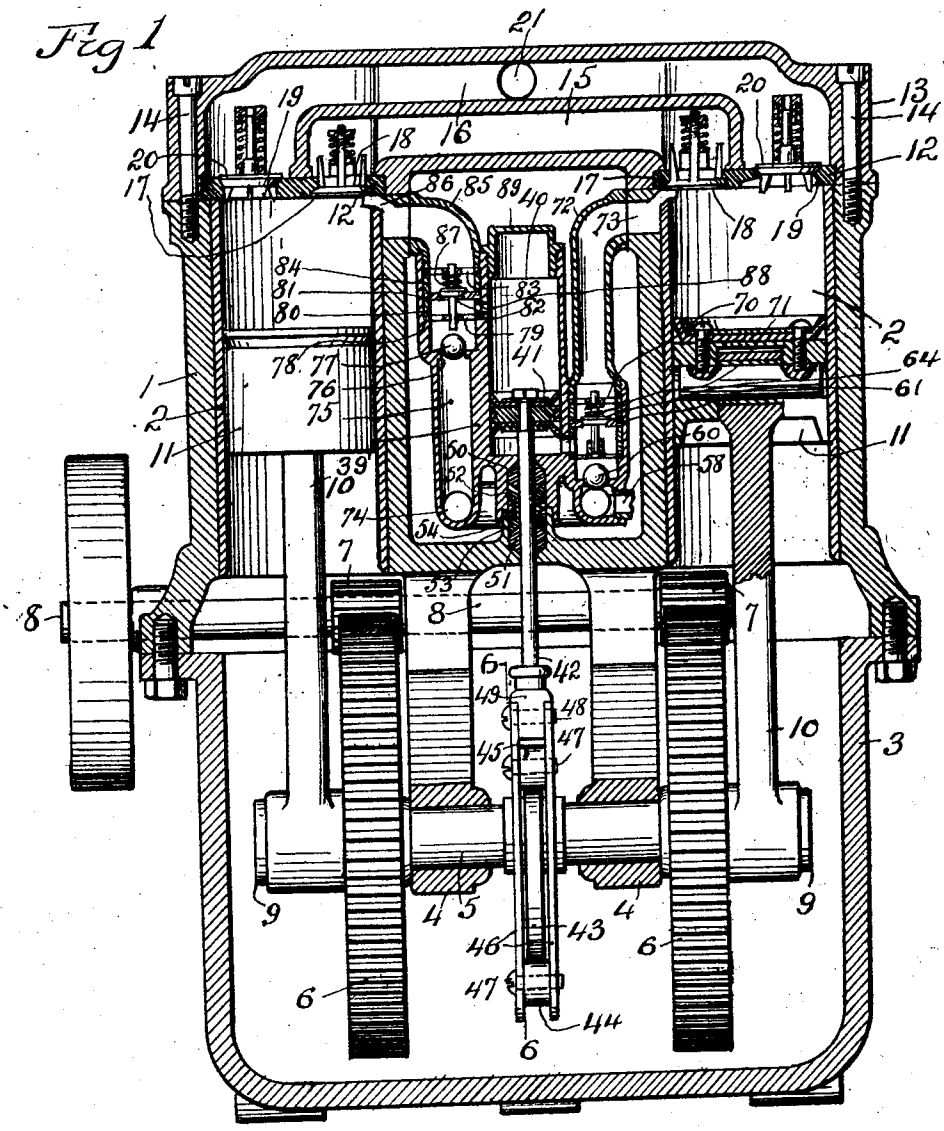
Jan. 12, 1926. 1,569,435

W. M. MYERS

AIR COMPRESSOR

Filed April 16, 1923 3 Sheets-Sheet 1

Fig 1



INVENTOR.

William M. Myers

BY

Warren D. House

His ATTORNEY.

Witness:

R. C. Hamilton

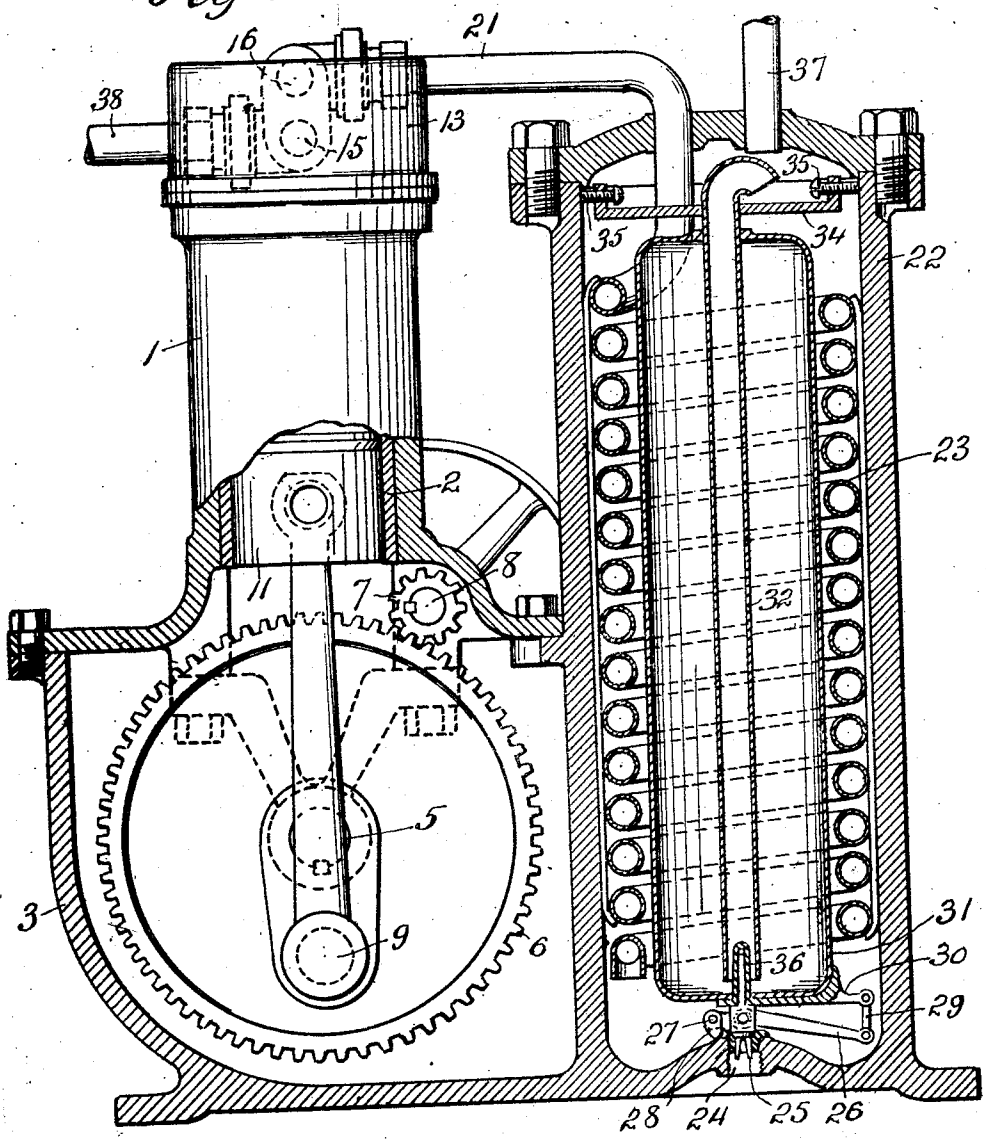
Jan. 12, 1926. 1,569,435

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AIR COMPRESSOR

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Fig 2



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Jan. 12, 1926. 1,569,435

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AIR COMPRESSOR

Filed April 16, 1923 3 Sheets-Sheet 3

Fig 3

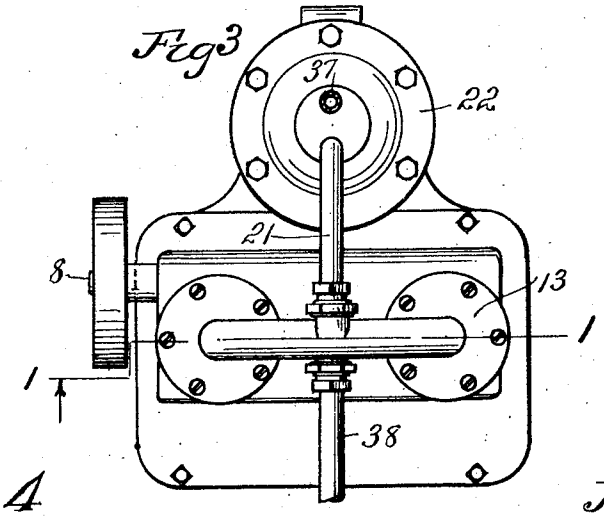


Fig 4

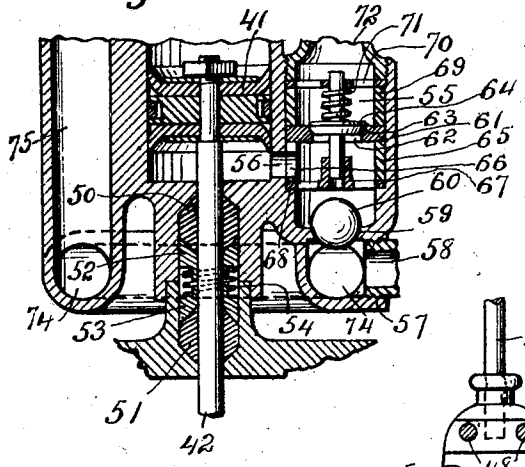


Fig 5

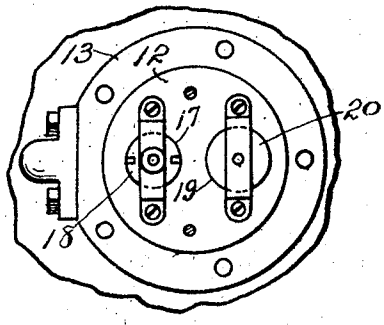
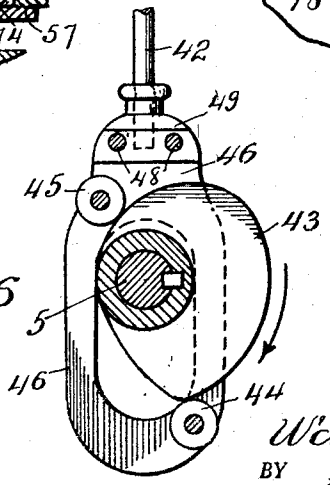


Fig 6



Witness:

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William M. Myers

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Patented Jan. 12, 1926. 1,569,435

UNITED STATES PATENT OFFICE.

WILLIAM M. MYERS, OF ST. JOSEPH, MISSOURI, ASSIGNOR TO THOMAS H. GILL, OF MILWAUKEE, WISCONSIN.

AIR COMPRESSOR.

Application filed April 16, 1923. Serial No. 632,420.

To all whom it may concern:

Be it known that I, WILLIAM M. MYERS, a citizen of the United States, residing at St. Joseph, in the county of Buchanan and State of Missouri, 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.

One of the objects of my invention is to provide novel means for cooling an air compressor which embodies forcing water into the air compressing cylinder or cylinders.

A further object of my invention is to provide a construction in which the water which is forced into the cylinder will displace all of the compressed air from the cylinder at the compressing end of the stroke.

My invention provides further novel means for effecting lubrication as well as cooling of the running parts.

Another object of my invention is to provide a closed crank case which communicates with two air compressing cylinders, whereby water passing the pistons will enter the crank case and will be forced therefrom alternately into the cylinders behind the pistons.

My invention provides further a double acting packing around the piston rod which extends into the crank case and into a pumping cylinder adjacent thereto.

My invention provides further novel valve mechanism.

My invention provides still further novel float mechanism, by which a hollow float with a thin shell may be used in a receptacle subjected to high pressure without danger of collapsing the walls of the float.

The novel features of my invention are hereinafter fully described and claimed.

In the accompanying drawings, which illustrate the preferred embodiment of my invention,

Fig. 1 is an enlarged vertical sectional view on the line 1—1 of Fig. 3.

Fig. 2 is a side view, partly in elevation and partly in vertical section, of my improved air compressor.

Fig. 3 is a reduced plan view of the same.

Fig. 4 is an enlarged vertical sectional view of a portion of the water pump.

Fig. 5 is an under view of one of the cylinder heads.

Fig. 6 is an enlarged sectional view of the cam mechanism on the line 6—6 of Fig. 1.

Similar reference characters designate similar parts in the different views.

1 designates the body of an air compressor having therein two vertical cylinders 2, which are supported on and have open communication at their lower ends with a closed crank case 3, adapted to hold water and into which projects from the body 1 two bearing members 4, in which is rotatably mounted a horizontal shaft 5, to which are rigidly secured two large gear wheels 6, which respectively mesh with two pinions 7, secured to and rotatable with a drive shaft 8, rotatably mounted in the body 1.

The gear wheels 6 are respectively provided with crank pins 9, which have respectively pivoted to them two piston rods 10 which are respectively pivoted at their upper ends to two pistons 11, respectively vertically reciprocative in the cylinders 2.

Each cylinder 2 is provided at its upper end with a horizontal circular plate 12, fitted in a recess in the under side of a cylinder head body 13, which is secured by bolts 14, to the top of the body 1. The body 13 is provided with an air passage 15 and a water passage 16, Fig. 1, adapted also to carry compressed air from the cylinders.

Each plate 12 has an air inlet 17, communicating with the passage 15, and arranged to be closed by an inwardly opening spring actuated valve 18.

Each plate 12 has a compressed air and water outlet 19 communicating with the passage 16, and arranged to be closed by an outwardly opening spring seated valve 20.

Connected with the passage 16 is a pipe 21, Figs. 2 and 3, which extends through the top of a closed water receptacle 22, and which in said receptacle is formed into a vertical coil 23, the lower end of which discharges into the receptacle 22, adjacent to the lower end thereof.

The bottom of the receptacle 22 is provided with a water outlet opening 24, arranged to be closed by a valve 25, pivotally connected in the receptacle 22 to a lever 26, pivoted by a horizontal pin 27, to a lug 28, on the upper side of the bottom of the receptacle 22. A vertical link 29 is pivoted at its lower end to the lever 26, and at its

upper end to a bracket 30, secured to the lower end of a hollow float 31, which is encircled by the coil 23, and which is of air tight construction and is adapted to be lifted by water in the receptacle 22, so as to open the valve 25, as the water lifts the float, and close the valve when the float lowers.

In order to prevent the walls of the float from being crushed by the pressure to which it is subjected, and to guide its upper end, there is fastened in it a vertical air pipe 32, which is vertically slidable in a horizontal plate 34, which is held in position by horizontal screws 35, the outer ends of which bear against the inner wall of the receptacle 22. The upper end of the pipe 32 is open and its lower open end is adjacent to but spaced apart from the bottom of the float 31. The lower end of the latter is guided by the stem of the valve 25, which is slidable in a tubular projection 36, of the bracket 30, which extends centrally through the bottom of the float 31. The pipe 32 permits air to enter the float to equalize the pressure against the inside and the outside thereof.

The top of the receptacle 22 is provided with a discharge pipe 37 for compressed air.

Connected to the passage 15 is an air inlet pipe 38, Figs. 2 and 3.

For pumping water alternately into the cylinders 2, I provide a pumping mechanism comprising a body 39, located between the cylinders 2 and attached at its bottom end centrally to the body 1, and which is provided with a vertical cylinder 40 in which is reciprocative a piston 41, having a piston rod 42, which extends through the body 1 into the crank case 3. The piston rod 42 is reciprocated by means of a cam 43, Figs. 1 and 6, which is rigidly secured to the shaft 5, in the crank case 3. The cam 43 has its periphery in contact with a lower roller 44, and an upper roller 45 rotatably mounted between two vertical plates 46, which are connected by bolts 47, on which the rollers 44 and 45 are respectively rotatable. The plates 46 are attached by bolts 48 to a block 49 which is secured to the lower end of the piston rod 42.

Encircling the piston rod 42 in the body 39 and body 1 respectively are two packing rings 50 and 51, Figs. 1 and 4, which are respectively held in their seats by two collars 52 and 53, which are normally forced apart by a coil spring 54.

The body 39 at one side of the cylinder 40 is provided with a vertical hole 55, which is connected by a lateral passage 56 with the lower end of the cylinder 40, and which is provided at its lower end with an intake opening 57, which connects with a water supply pipe 58.

Above the intake 57, the hole 55 has a seat 59, in which is normally seated, below the passage 56, a ball valve 60, which seats by gravity.

Above the passage 56, there is fitted in the hole 55 a seat plate 61 having a vertical hole 62 provided with a seat 63 in which is seated a valve 64, which opens upwardly. The seat plate 61 rests on a collar 65 having a passage 66 communicating with the passage 56, the collar being supported on a guiding member 67 which is perforate and which rests on an annular shoulder 68 in the hole 55. On the seat plate 61 rests a collar 69 upon which rests a guiding member 70, which is perforate and which has a central vertical hole in which is slidably fitted the upper portion of the stem of the valve 64, the lower portion of the stem of the valve being slidably mounted in a vertical central hole in the guiding member 67. A coil spring 71 encircles the stem of the valve 64 and bears at its lower end on the valve 64, the upper end of the spring bearing on the under side of the guiding member 70. The spring 71 in addition to holding the valve 64 normally seated also prevents the valve from being opened by the suction effected by the piston 11, at the right, as viewed in Fig. 1, in its downward movement. The upper end of the hole 55 is threaded and has fitted in it the lower threaded end of a pipe 72, the upper end of which communicates with a water inlet opening 73 in the side wall near the upper end of the right cylinder 2, as viewed in Fig. 1.

Connected with the hole 55 below the valve 60 is a passage 74 which communicates with the lower end of a vertical hole 75, at the opposite side of the cylinder 40 from the hole 55, said hole 75 having a seat 76 in which is seated a ball valve 77. In the hole 75 above the seat 76 is an annular shoulder 78 on which rests a valve guiding member 79 which is perforate and which supports a collar 80, which in turn supports a perforate seat plate 81, similar to the plate 61, and in which seats a valve 82, the stem of which is guided in the member 79 and in a guiding member 83 supported in the hole 75 by a collar 84 which rests on the seat plate 81, and which is held in place by a pipe 85 having threaded connection at its lower end with the upper end of the hole 75, the upper end of the pipe 85 communicating with a water inlet opening 86 in the left cylinder 2, as viewed in Fig. 1, the opening 86 being above the upper end of the upstroke of the adjacent piston 11. Above this piston 11 is a plate 12, corresponding in form and function to the plate 12 already described, and having an air inlet 17 communicating with the passage 15 and adapted to be closed by an inwardly opening valve 18. The plate 12, at the left, Fig. 1, is provided also with a compressed

air and water outlet 19 communicating with the passage 16 and arranged to be closed by an upwardly opening spring actuated valve 20, the valve 18 just above referred to, also being spring closed.

A coil spring 87 encircles the stem of the valve 82 and bears at its lower end on the plate 81 and at its upper end on the member 83.

A passage 88 connects the hole 75 with the cylinder 40 above the piston 41 and between the member 79 and plate 81.

The cylinder 40 may have a removable head 89.

In the operation of the invention, when the shaft 8 is rotated by any suitable means, as a pulley 90 secured to the shaft and connected by a belt, not shown, with suitable motive power, the pistons 11 will be reciprocated simultaneously in opposite directions by the connecting rods 10, crank pins 9, gears 6 and pinions 7. As viewed in Fig. 1, when the right piston 11 moves downwardly, air will be drawn into the right cylinder 2 through the right inlet 17 past the right valve 18. On the upward movement of the piston in question, the air will be compressed and will be ejected through the outlet 19 past the valve 20 into the passage 16, from which the compressed air will pass by the pipe 21 into the receptacle 22, Fig. 2, through the coil 23, in which the air is cooled, and thence by the pipe 37 to the storage tank, or other receptacle for air, not shown.

In order to keep the cylinders 2 and other parts cool water is pumped alternately into the cylinders 2 from the pumping cylinder 40. The piston 41 in the cylinder 40 is operated by the cam 43, rollers 44 and 45 and connecting rod 12, see Fig. 6. The cam 43 is so set that when the right piston 11, as viewed in Fig. 1, is in its lowermost position, as shown in Fig. 2, the piston 41 will be in the uppermost position, and the left piston 11 will be in its uppermost position. As the shaft 9 is rotated, the right piston 11 will move upwardly and the left piston 11 and the piston 41 will move downwardly, whereby air will be drawn into the left cylinder 2 past the left valve 18, and water in the cylinder 40 below the piston 41 will be forced through the passages 56 and 66 upwardly past the valve 64 and through the pipe 72 and water inlet 73 into the right cylinder 2.

By the time that the piston 41 has reached the lower end of its stroke, the right piston 11 will be about the middle of its upward stroke, and the cam 43 will be in the position shown in Fig. 6. The piston 41 will remain in its lowermost position until the right piston 11 has reached the upper end of its stroke and the left piston 11 will have reached the lower end of its stroke. The air in the right cylinder 2 will have been compressed and with the same amount of water as has been forced from the cylinder 40 into the right cylinder 2 during the last downward stroke of the piston 41, will be ejected past the right valve 20 through the passage 16, pipe 21 and coil 23, into the receptacle 22. The compressed air will pass from the receptacle 22 through the pipe 37, and water will be discharged through the outlet opening 24 past the valve 25, the latter being lifted by the float 31 through the intermediacy of the link 29 and lever 26. By having the piston 41 complete its stroke in either direction before the completion of the stroke of either main piston, a relatively small amount of power is expended in forcing the water into the main cylinders, as the air therein has not reached a high degree of compression, when the piston 41 has completed its stroke, and is inactive.

When the right piston 11 starts on its downward movement, the piston 41 and the left piston 11 will start on their upward strokes, whereby air will be drawn into the right cylinder 2, water will be drawn into the pumping cylinder 40, through the pipe 58, past the valve 60 and through the passages 56 and 66. Water which has been drawn into the cylinder 40 on the downward stroke of the piston 41, past the valve 77 and through the passages 75 and 88, will be forced outwardly through the passages 88, past the valve 81 and through the pipe 85 and water inlet 86 into the left cylinder 2. When the piston 41 has reached the upper limit of its stroke, the left piston 11 will have moved upwardly to the position shown in Fig. 1. The further movement upward of the piston 11, at the left, will further compress air drawn into the left cylinder 2 past the left valve 18 and will force the compressed air and the water which has just been forced into the left cylinder 2 into the passage 16, past the left valve 19. The compressed air and water, thus discharged into the passage 16 will be discharged, as already described, into the receptacle 22, the air and water passing therefrom through the pipe 37 and outlet opening 24, as already described.

From the foregoing, it will be understood that as the pistons 11 reciprocate, air will be alternately compressed in the cylinders 2 and water will be alternately pumped into said cylinders and ejected with the compressed air into the receptacle 22, from which the air and water will be ejected in the manner already described.

The water will serve as a lubricant for the parts with which it is in contact and also as a means for cooling the heated parts. Water leaking past the pistons 11 and the packing around the connecting rod 42 will serve to fill the crank case 3 and the cylin-

ders 2 below the pistons 11. All the internal parts will thus be water cooled and lubricated.

As the pistons 11 reciprocate, water below the said pistons in the cylinders 2 will be alternately forced from one cylinder into the other cylinder.

I do not limit my invention to the structure shown and described, as many modifications, within the scope of the appended claims, may be made without departing from the spirit of my invention.

What I claim is:—

1. In an air compressor, a crank case adapted to contain water, two cylinders each in open communication at one end with said crank case, two pistons respectively reciprocative in said cylinders, the pistons being arranged to move simultaneously in opposite directions, and means by which, when the pistons are reciprocated air and water will be pumped into and out of said cylinders, substantially as set forth.

2. In an air compressor, a crank case adapted to hold water, two cylinders each in open communication at one end with said crank case, each cylinder having an inlet for air, an inlet for water, and an outlet for air and water, two pistons respectively reciprocative simultaneously in opposite directions in said cylinders, and pumping means communicating with said water inlets by which water is pumped into said cylinders alternately when the pistons are reciprocated, substantially as set forth.

3. In an air compressor, a cylinder having an inlet for air, an inlet for water, and an outlet for water and air, a piston reciprocative in said cylinder, and pumping means inactive during the final portion of the stroke of the piston by which on each compression stroke of the piston sufficient water is pumped into said cylinder through said water inlet to eject all of the air which has been compressed in the cylinder, substantially as set forth.

4. In an air compressor, a vertical cylinder having an inlet for air, an inlet for water and an outlet for air and water at the upper end of said cylinder, a piston reciprocative in said cylinder, and pumping means by which when the piston is moving upwardly water is pumped into said cylinder through said water inlet above the piston only during a portion of the upstroke of the piston, substantially as set forth.

5. In an air compressor, an air compressing cylinder having an air inlet and a water and an air outlet, a water pumping cylinder, two pistons reciprocative respectively in said cylinders, a water conductor connecting said cylinders, and driving means connecting said pistons by which the piston in the water pumping cylinder makes a full stroke while the other piston makes only a part of a stroke.

6. In an air compressor, an air compressing cylinder having an air inlet and a water and air outlet, a water pumping cylinder, two pistons reciprocative respectively in said cylinders, a water conductor connecting said cylinders, a check valve in said conductor opening toward the air compressing cylinder, and driving means connecting said pistons by which the piston in the water pumping cylinder makes a full stroke while the other piston makes only a part of a stroke.

7. In an air compressor, two vertical air compressing cylinders each having an air and water outlet and an air inlet, a water pumping cylinder, a piston reciprocative in the pumping cylinder, two water conductors connected respectively to said water pumping cylinder at opposite ends of the stroke of the piston in the water pumping cylinder, the conductors connecting respectively with the two vertical cylinders, two pistons reciprocative respectively in said two air compressing cylinders below said connections of the latter with said conductors, two check valves in said conductors opening respectively toward said air compressing cylinders, and means connecting said three pistons by which the air compressing pistons move simultaneously oppositely, and the other piston makes a full stroke while the two pistons make each only a part of a stroke.

8. In an air compressor, two air compressing cylinders, each having an air inlet and a water and air outlet, two pistons respectively reciprocative in said cylinders, a water pumping cylinder, a piston reciprocative in said water pumping cylinder, two water conductors connected respectively to said air compressing cylinders and connected to said water pumping cylinder at opposite ends of the stroke of the piston in the water pumping cylinder, two check valves in said two conductors opening respectively toward said air compressing cylinders, and driving means by which the air compressing pistons are simultaneously reciprocated oppositely and including a revoluble cam and connections by which the water pumping piston completes a full stroke while the other two pistons make each but a portion of a stroke.

In testimony whereof I have signed my name to this specification.

WILLIAM M. MYERS.