No. 801,599. PATENTED OCT. 10, 1905.

W. R. LEROY.

AIR COMPRESSOR.

APPLICATION FILED NOV. 25, 1903.

4 SHEETS—SHEET 1.

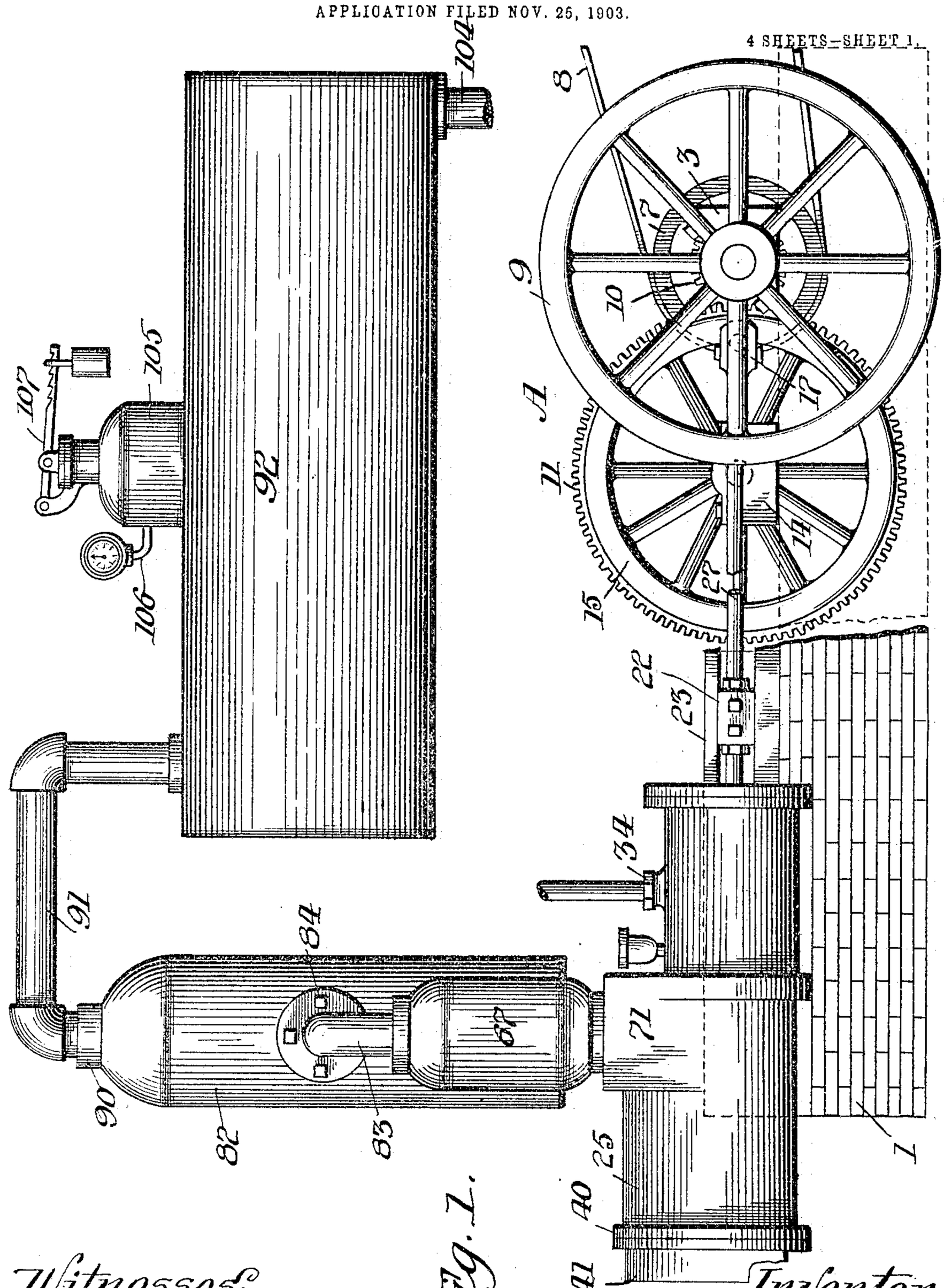

Fig. 1.

Witnesses:
A. H. Butler.
E. E. Pettit.

Inventor
W. R. Leroy,
By H. C. Everett & Co.
Attorneys

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4 SHEETS—SHEET 2.

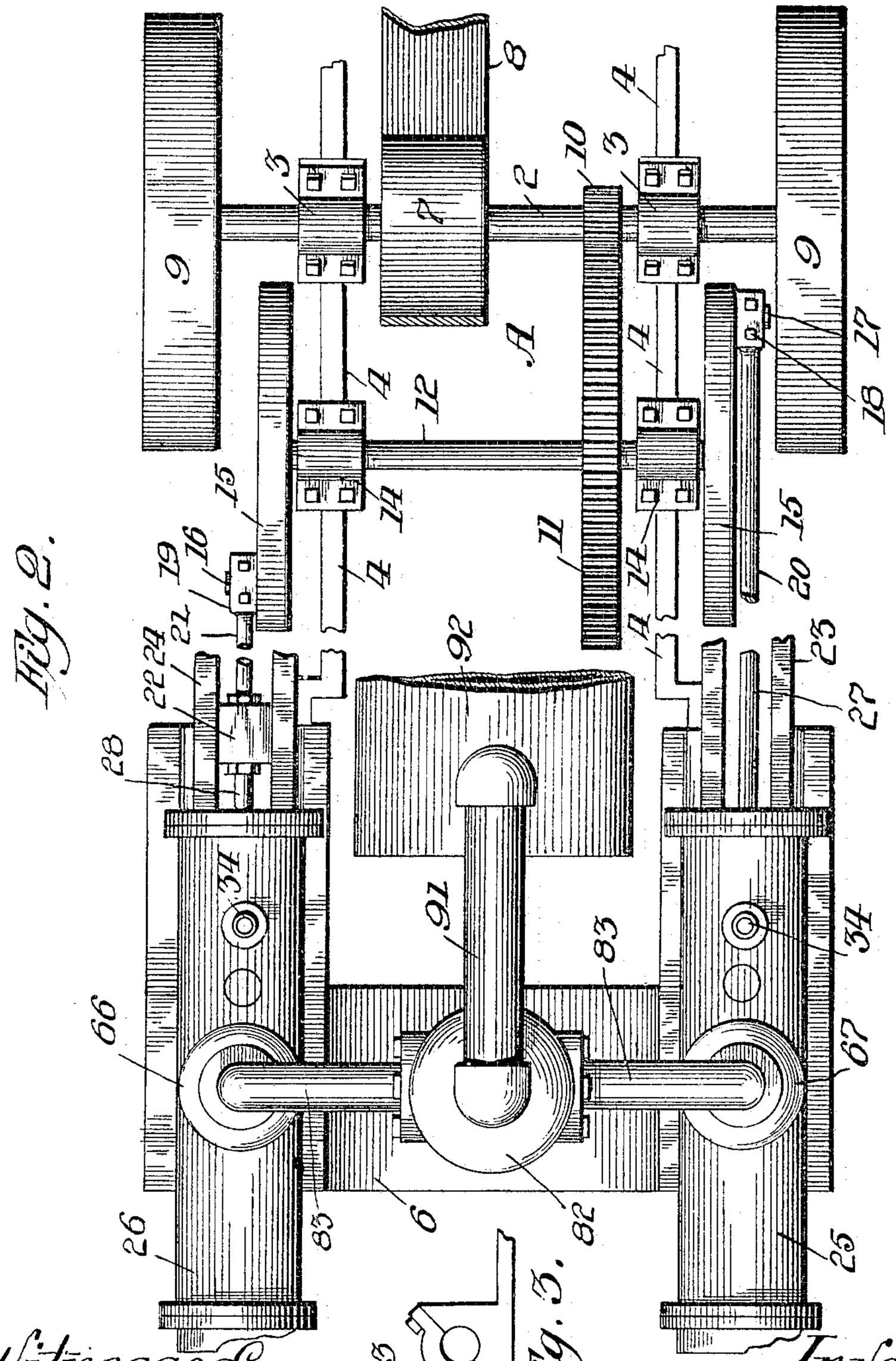

Fig. 2.

Witnesses:
A. H. Butler,
E. E. Potter.

Inventor
W. R. Leroy,
By H. C. Evert Co
Attorneys.

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4 SHEETS—SHEET 3.

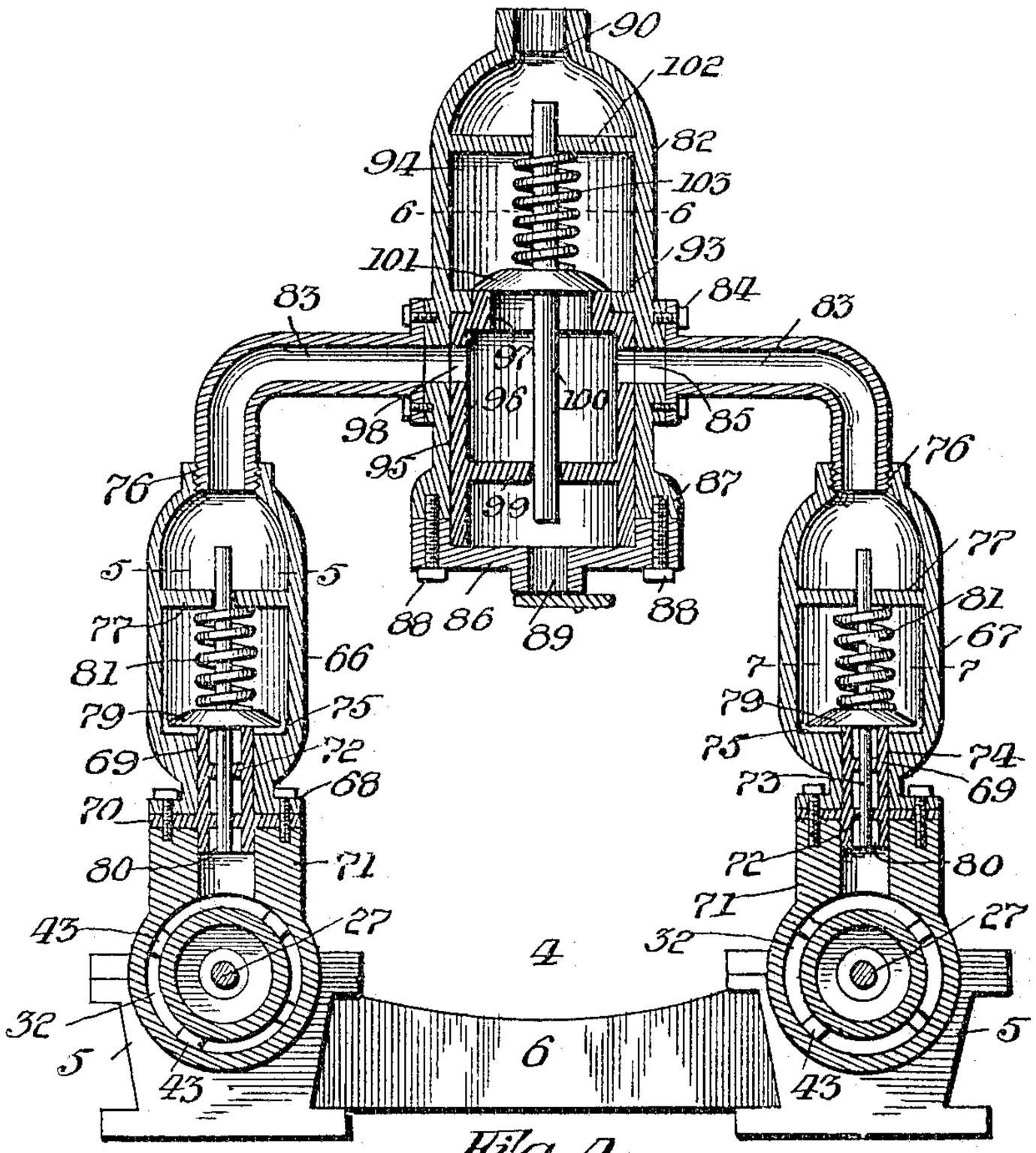

Fig. 4.

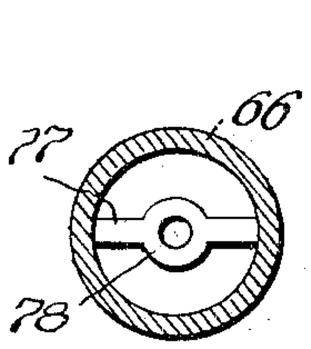

Fig. 5.

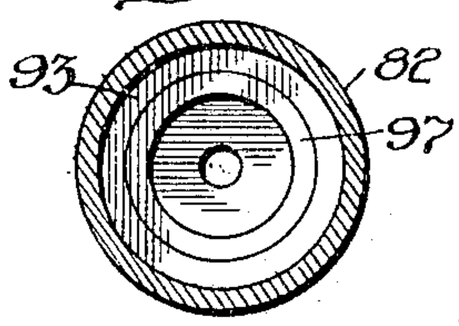

Fig. 6.

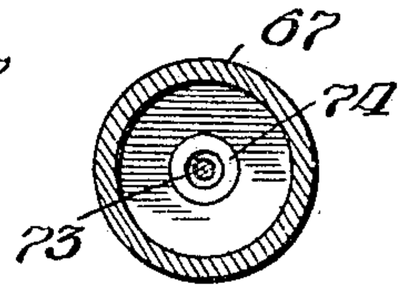

Fig. 7.

Witnesses:
F. H. Butler,
E. E. Potter

Inventor
W. R. Leroy,
By M. C. Smith
Attorneys.

No. 801,599. PATENTED OCT. 10, 1905.

W. R. LEROY.

AIR COMPRESSOR.

APPLICATION FILED NOV. 25, 1903.

4 SHEETS—SHEET 4.

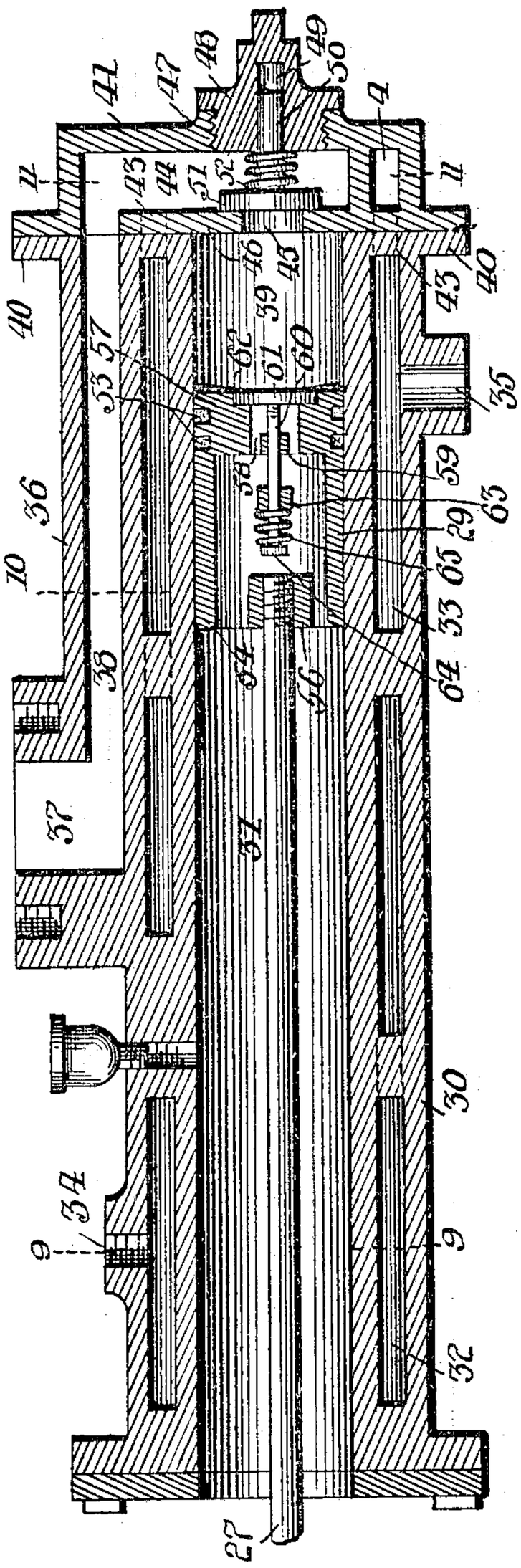

Fig. 8.

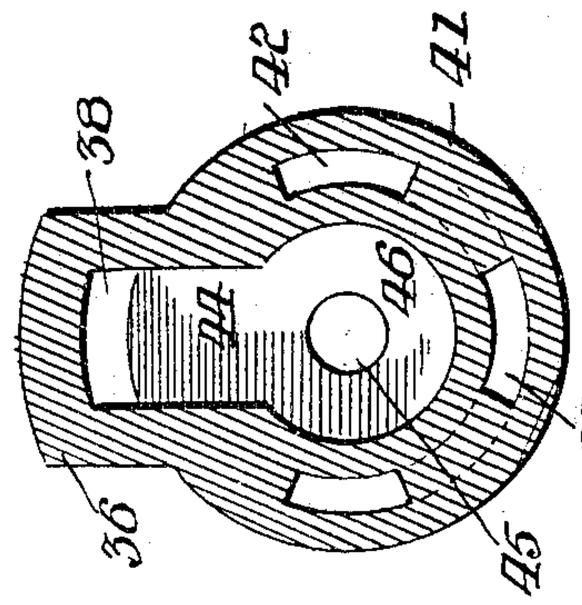

Fig. 11.

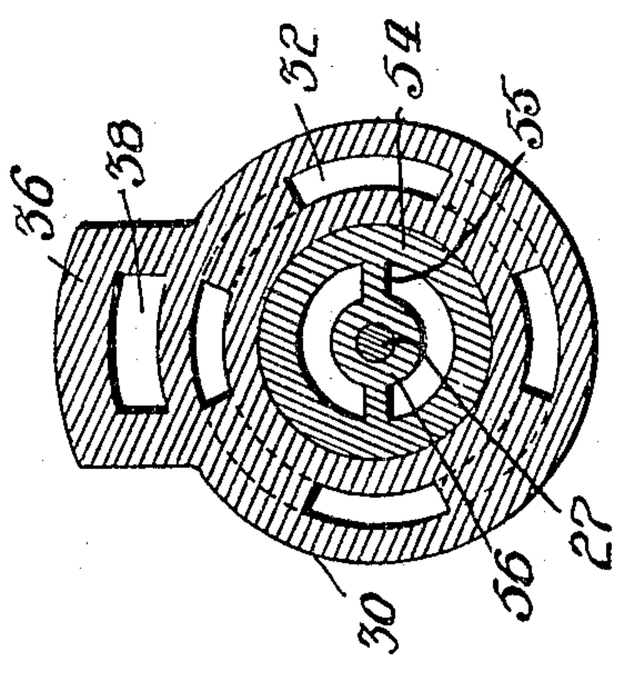

Fig. 10.

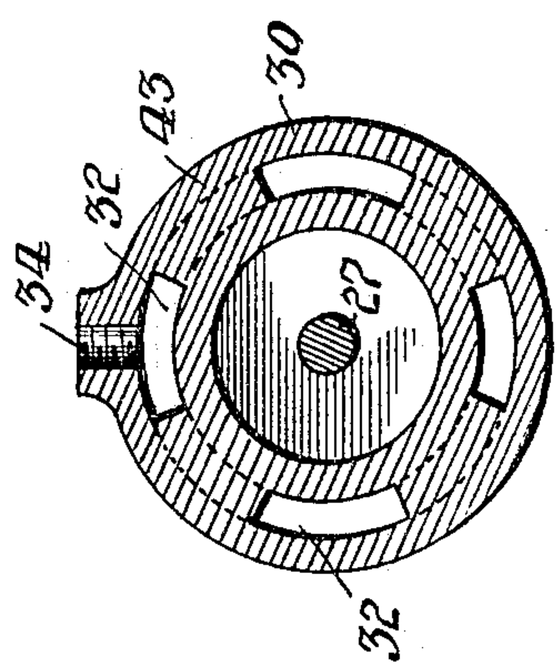

Fig. 9.

Witnesses:
F. H. Butler,
E. C. Potter.

Inventor,
W. R. Leroy,
By McCourt & Co.
Attorneys.

UNITED STATES PATENT OFFICE.

WILLIAM R. LEROY, OF WASHINGTON, PENNSYLVANIA.

AIR-COMPRESSOR.

No. 801,595. Specification of Letters Patent. Patented Oct. 10, 1905.

Application filed November 25, 1903. Serial No. 182,614.

To all whom it may concern:

Be it known that I, WILLIAM R. LEROY, a citizen of the United States of America, residing at Washington, in the county of Washington and State of Pennsylvania, have invented certain new and useful Improvements in Air-Compressors, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in air-compressors, and has for its object to provide an apparatus whereby the air may be compressed to any desired pressure and delivered into a reservoir or storage-tank from which the same may be utilized for any desired purpose.

Briefly described, my invention comprises a pair of pumping-cylinders, a plurality of controlling or feed engines, and a suitable reservoir. The pistons of these cylinders are so connected to the engine that while one cylinder is receiving the air the other will be compressing the same and forcing it into the controlling-valve, from where it is delivered to the storage-tank or reservoir.

In describing the invention in detail reference is had to the accompanying drawings, forming a part of this application, and wherein like numerals of reference indicate like parts throughout the several views, in which—

Figure 1 is a side elevation of my improved apparatus, a portion thereof being broken away. Fig. 2 is a top plan view of the same, showing the reservoir broken away. Fig. 3 is a detail view of one of the bearings which support the main shaft of the engine. Fig. 4 is a vertical sectional view of the pumping-cylinders and the controlling-valve. Fig. 5 is a cross-sectional view on the line 5 5 of Fig. 4. Fig. 6 is a cross-sectional view taken on the line 6 6 of Fig. 4. Fig. 7 is a cross-sectional view taken on the line 7 7 of Fig. 4. Fig. 8 is a longitudinal sectional view of one of the pumping-cylinders. Fig. 9 is a vertical sectional view of the pumping-cylinder, taken on the line 9 9 of Fig. 8. Fig. 10 is a cross-sectional view taken on the line 10 10 of Fig. 8. Fig. 11 is a similar view taken on the line 11 11 of Fig. 8.

Each compressor-cylinder, which is compound in form, is supported upon a suitable base, as indicated at 1, a portion of this base being broken away and shown in dotted lines to further illustrate the construction of the compressor, reference being had to Fig. 1 of the drawings. The driving mechanism or gear, as indicated at A, comprises a main drive-shaft 2, which is supported within the bearings 3, these bearings being carried by a base-plate 4, this base-plate serving to support the pumping or compressor cylinders and the other mechanism of the compressor upon the base 1. The base-plate 4 comprises two supporting-beds 5 for the pumping or compressor cylinders, these supporting-beds being connected at their outer ends by the brace 6, and from the forward end of the supporting-beds extends the base-plate which supports the mechanism of the driving-gear. The bearings 3 are constructed at an angle, as indicated in Fig. 3 of the drawings, whereby when the driving power is applied to the compressor all stress will be taken up by these specially-constructed bearings. Upon the main driving-shaft 1 and intermediate of the bearings 3 is mounted the belt-pulley 7, carrying a belt 8, which may pass to any suitable engine provided to operate the pistons in the pumping or compressor cylinders. Upon the outer ends of the shaft 2 are secured the fly-wheels 9, and upon this shaft is also mounted a pinion 10, which is adapted to mesh with a larger pinion, as indicated at 11, this pinion being carried by an auxiliary shaft 12, mounted in the horizontal bearings 14, which are secured upon the bed-plate 4. Upon the outer end of this shaft 12 I provide the drive-wheels 15, which carry the crank-pins 16 and 17, to which are connected the heads 18 and 19 of the connecting rods or pitmen 20 and 21. The other end of these connecting-rods are connected to slides 22, one of these slides being omitted in the drawings, owing to the position of the piston-head within one of the pumping-cylinders.

The slides 22 are of the ordinary construction and are mounted in the guides 23 24, which are carried by the ends of the pumping-cylinders or compressors 25 26, the guides being of the two-bar or four-bar construction, which is commonly used. To the slides 22 are connected the piston-rods 27 and 28, carrying upon their other ends the pistons 29, which operate in the cylinders 25 and 26. These cylinders, of which there are two in number, are each open at one end to receive the air delivered from the other end to the reservoir. Casings 30 about the cylinders provide water-jackets 32 and 33, which are adapted to keep the cylinder in the cool state when the

same is in operation, and I provide the openings 34 and 35, whereby the water may be admitted to the jackets for this purpose.

Formed integral with the casing 30, preferably upon its upper face, is the raised enlarged portion 36, which contains a vertical passage-way 37, and a longitudinal passage-way along the top of the cylinder, as indicated at 38. The inner end 39 of the cylinder is flanged, as indicated at 40, whereby a head 41 may be secured thereon to conduct the air from the chamber 31 to the passage-way 38 and thence to the reservoir. This head 41 is partially surrounded by a water-jacket 42, which when the head is secured upon the cylinder is in communication with the water-jacket 33 through the opening 43. (Shown in dotted lines in Fig. 8.) This head is provided with a vertical passage-way 44, which communicates with an opening 45, formed in the rear wall 46 of the head 41. The front wall of the head 41 is provided with a screw-threaded opening 47, in which is secured the plug 48, which has a recess 49 formed in its inner face to receive a stem 50, carrying upon its outer end a head 51, which is adapted to close the opening 45 in the rear wall 46 of the head when the piston 29 is receding from the end 39 of the cylinder, a spring 52 being provided upon the stem 50 between this head and the inner face of the plug 48.

The piston 29 is adapted to fit the cylinder or air-chamber 31 snugly and upon its periphery is provided with the packing-rings 53 to accomplish this purpose. The piston 29 is formed of a shell 54, and formed integral with this shell is the spider or web 55, (see Fig. 10,) which carries an annular collar 56 to receive the end of the piston-rod 27. The forward end of the piston is partially closed by the head 57, and formed in said head, centrally thereof, is a port or passage-way 58, forming communication between the rear part of the cylinder and the forward end thereof. Formed within this passage-way or port 58 is a spider or web 59, similar to the spider 55 carried by the rear end of the piston, and operating through the central portion of this spider is a stem 60, upon the forward end of which is secured the head 61, which is adapted when in the closed position to seat in the recess 62, formed in the face of the head 57. The stem 60 passes through a spider 63, which is formed integral with the shell 54 intermediate the end of the piston and the head 57, and upon the outer end of the stem 60 is secured a nut 64, and upon the stem between this nut and the spider 63 is secured a spring 65, which normally holds the head or valve 61 within the seat 62, formed in the face of the piston.

Mounted upon the raised or enlarged portion 36 of these cylinders are the feed or controlling-valve casings 66 and 67, which may be secured thereon by any desired means, preferably by screw-bolts, as shown in Fig. 4 of the drawings. These feed or controlling-valve casings are preferably circular in form, the lower end being flanged, as indicated at 68, whereby the same may be secured upon the upper face of the cylinder. Prior to securing these controlling-valve casings upon the cylinders a tubular guide 69, which carries extending flanges 70, is secured between the flanges 68 and the enlarged vertical portion 71 of the portion 36. These tubular guide-ways carry the guides or webs 72, through which passes the valve-stem 73. These tubular guides 69 are adapted to fit in an opening 74, formed in the base of the controlling-valve casings 66 and 67, the upper edges of said tubular guides extending slightly above seats 75, formed within the casings 66 and 67. The upper ends of these casings carry the screw-threaded flanged openings 76, and intermediate these openings and the seat 75 I provide webs or spiders 77, which carry an apertured annular portion 78, through which pass the stems 73, said stems carrying the valves or heads 79, which when in the closed position are adapted to rest upon the seats 75 and close the central passage 80, formed in the tubular guides, and intermediate the valve 79 and the spiders 70 are mounted the springs 81, whereby the valves 79 will be normally held against the seats 75.

Supported from the casings of the controlling-valves, which latter I herein term as "auxiliary controlling-valves," is the casing 82 of the main controlling-valve. This casing is supported by pipes 83, one end of which threads into the threaded openings 76 in the upper ends of casings 66 67, while the other end of these pipes is fastened by bolts 84 to the valve-casing 82. In order to establish communication between the chamber in the valve-casing 82 and the pipes 83, the said casing is provided with openings 85. The lower end of the valve-casing 82 is partially closed by a head 86, which is secured to the flanges 87 of the casing by means of the screw-bolts 88, and centrally formed in this head is an aperture 89, which in practice is controlled by a throttle secured to the base 86 of the main controlling-valve casing. The upper end of valve-casing 82 is provided with an opening 90, over which may be secured the pipe 91, which leads to the reservoir or storage-tank 92. Intermediate this end and the lower end of the casing I provide an annular collar 93, which partitions off the valve-casing into an upper chamber 94 and a lower chamber 95, and in the lower chamber 95 is placed the annular casing 96, which is contracted at its upper end, forming a collar 97, which fits within the collar 93 of the casing. Formed within the sides of this casing 96 and diametrically opposite each other are the openings 98, which when the casing has been placed in position are adapted to register with the openings 85 formed in the casing 82.

Intermediate the ends of the annular casing 96 and integral therewith is formed a spider 99, similar in construction to the spiders 77 of the auxiliary valves, and adapted to pass through the spider 98 is a valve-stem 100, which carries a valve or head 101, while the other end of the valve-stem passes through a spider 102, formed integral with the casing 82 in the chamber 94. This valve 101 is normally seated upon the seat formed by the contracted end 97 of the casing 96 and is normally held there by means of a spring 103, which surrounds the stems intermediate the spider 102 and the valve 101.

As heretofore stated, a pipe 91 is secured to the top of the main valve by any desired means and is adapted to lead to the reservoir 92, which may be situated in any desired position where the outlet 104 will be accessible. The reservoir 92 is of the ordinary construction, carrying a dome 105, a gage 106, and a safety-valve 107, whereby when the same is charged beyond its capacity an opening will be found for the excess amount of air.

The operation of my improved apparatus is as follows: Upon power being applied to the driving-gear A through the medium of the belt 8 or any other desired operating means the power of this shaft 2 is transmitted to the auxiliary shaft 12 by means of the pinions 10 and 11, respectively, and the pinion 11 being of a greater diameter than the pinion 10 the speed of the pinion 10 is increased many times, and this speed may be regulated by changing the pinions to different sizes or may be governed from the driving power. When the motion is transmitted to the auxiliary shaft 12, the arrangement of the connecting rods or pitmen upon the pulleys 15 provides an alternating movement between the two cylinders, whereby when one cylinder is taking air the other cylinder will be compressing air and forcing the same into the controlling-valves. In describing the operation of the pistons within the cylinders the same operation applies to both cylinders at alternate times, and upon the piston moving to the forward end 39 of the cylinder all air contained within this cylinder is forced through the opening 45, the pressure against the head or valve 51 causing the same to recede, permitting the air to pass through the vertical passage-way 44 into the passage-way 38, from whence it passes to the controlling-valve. Upon the piston receding to the outer end of the cylinder the air is admitted to the forward end of the piston by the pressure of the air passing through the port 58 and forcing the valve or head 61 out of engagement with its seat 62, whereby communication is established between the rear and forward sides of the piston, thus permitting another charge of air to be drawn within the cylinder preparatory to forcing the former charge into the auxiliary controlling-valve casings. Upon the air entering the controlling-valve casings from the passage-ways 38 37 it passes through the tubular guide 69 into the valve-casings 66 67, the pressure of the air forcing the valve-heads 79 upwardly, thus admitting the air, which then passes into the pipes 83 and into the main-valve casing 82. It will be observed that when the air is passing through valve-casing 67 valve 79 is seated within valve-casing 66, owing to the arrangement of the connecting-rods 20 21 with the drive-wheels 15, which provides this alternating pumping system. Prior to starting the engines the throttle carried by the head 86 of the main valve and controlling the opening 89 thereof is opened, whereby the air may have a direct and unretarded passage until the engines and cylinders have been placed in good working order, when the throttle is again closed and the pressure of the air upon the valve-head 101 will raise the same and permit the air to pass in its compressed state to the reservoir or storage-tank 92, the valve-head 101 remaining closed when the throttle is opened. The construction of the webs or spiders 77, 99, and 102 permits a direct passage of the air to the different valve-casings, and when the air has accumulated sufficiently to overcome the tension of the springs 81 and 103 the valves 79 101 will rise, whereby direct passage is obtained to the reservoir 92, from which the air may be used for any desired purpose, from the outlet 104.

It will be noted that I employ a cylinder having a long base and a small diameter, whereby a long stroke is accomplished, this having in practice been found more desirable than the employment of a cylinder of greater diameter and shorter stroke.

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

1. In an air-compressor a pair of water-jacketed parallel compressor-cylinders, pistons in said cylinders, means for operating said pistons alternately in their forward and backward strokes, ports in the pistons to permit air to pass therethrough during the stroke of the piston in one direction, valves closing said ports during the strokes of the piston in the opposite direction, an outlet-port in one end of the cylinder, auxiliary controlling-valve casings mounted on the cylinders intermediate their length, ports extending through the walls of the cylinders and establishing communication between said valve-casings and the cylinders, a main controlling-valve casing in communication with a reservoir, connections establishing communication between the main controlling-valve casing and the auxiliary controlling-valve casings, spring-pressed controlling-valves in the auxiliary controlling-valve casings, an annular casing arranged within the main controlling-valve casing and into which the air from the auxiliary-valve casings is discharged, and provided

with a port in its upper end, and a spring-pressed valve normally closing said port, substantially as described.

2. In an air-compressor, a pair of horizontally-disposed parallel compressor-cylinders, pistons in said cylinders, and means for driving said pistons alternately in their forward and backward strokes, ports in said pistons, and means for closing said ports during the stroke of the pistons in one direction, an auxiliary controlling-valve casing mounted on each cylinder and in communication therewith, spring-pressed valves in said valve-casings, tubular guides extending into the valve-casings and on which said valves seat, a main controlling-valve casing, pipes establishing communication between the main controlling-valve casing and the auxiliary-valve casings, an annular casing in said main controlling-valve casing into which the air from the auxiliary-valve casings is discharged, and provided with a port in its upper end, a spring-pressed valve normally closing said port, and a reservoir in communication with the main controlling-valve casing, substantially as described.

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

WILLIAM R. LEROY.

Witnesses:

A. M. WILSON,

E. E. POTTER.