W. F. RUWELL.

COMPRESSOR PUMP.

APPLICATION FILED MAY 10, 1911.

1,023,685.

Patented Apr. 16, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

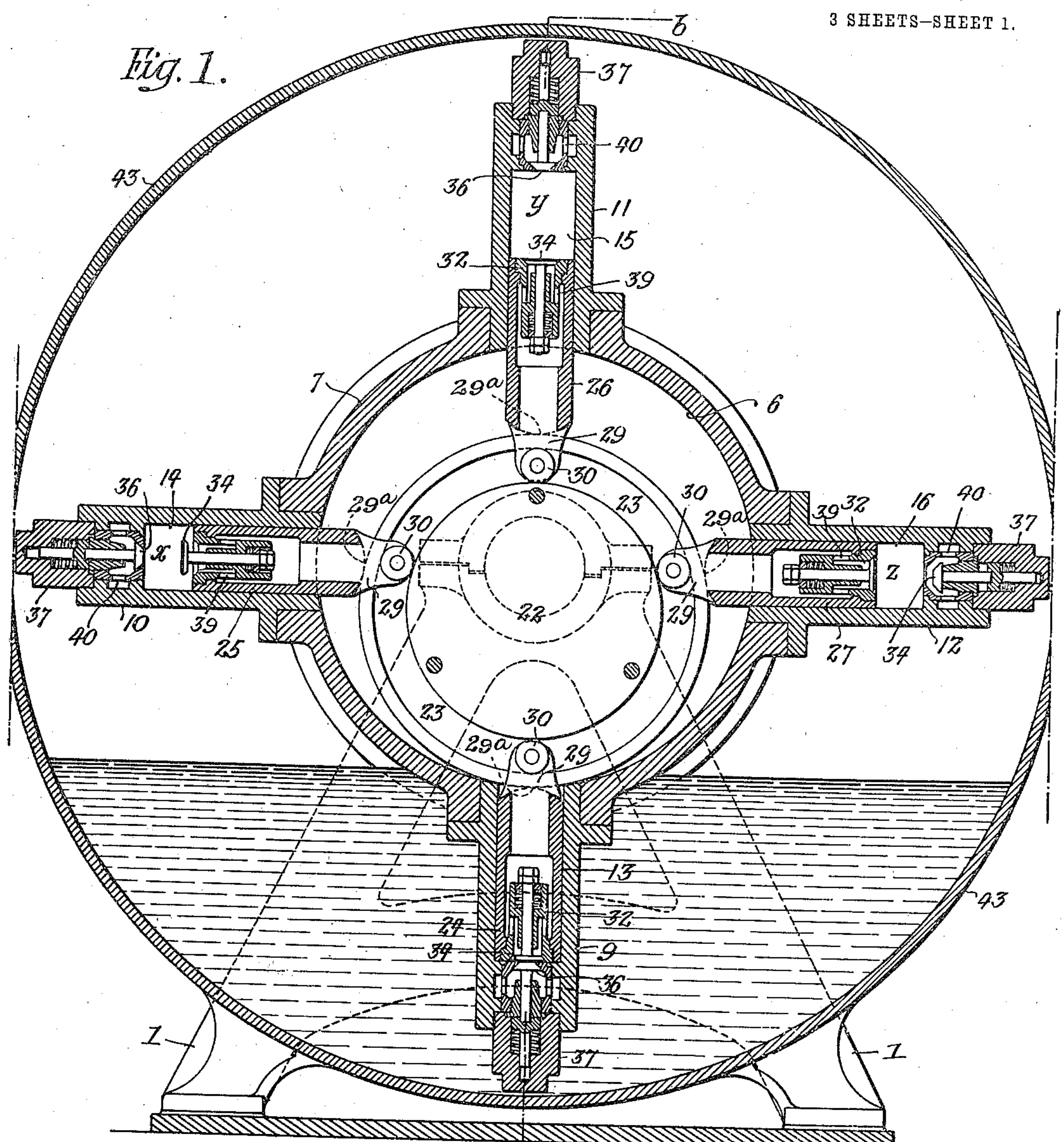
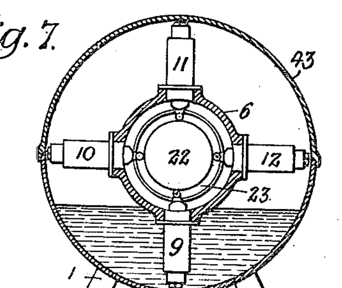


Fig. 7.



Witnesses.—

Wills A. Burrowes

Walter F. Pullinger

Inventor.—

William F. Ruwell.

by his Attorneys.—

Howson & Howson

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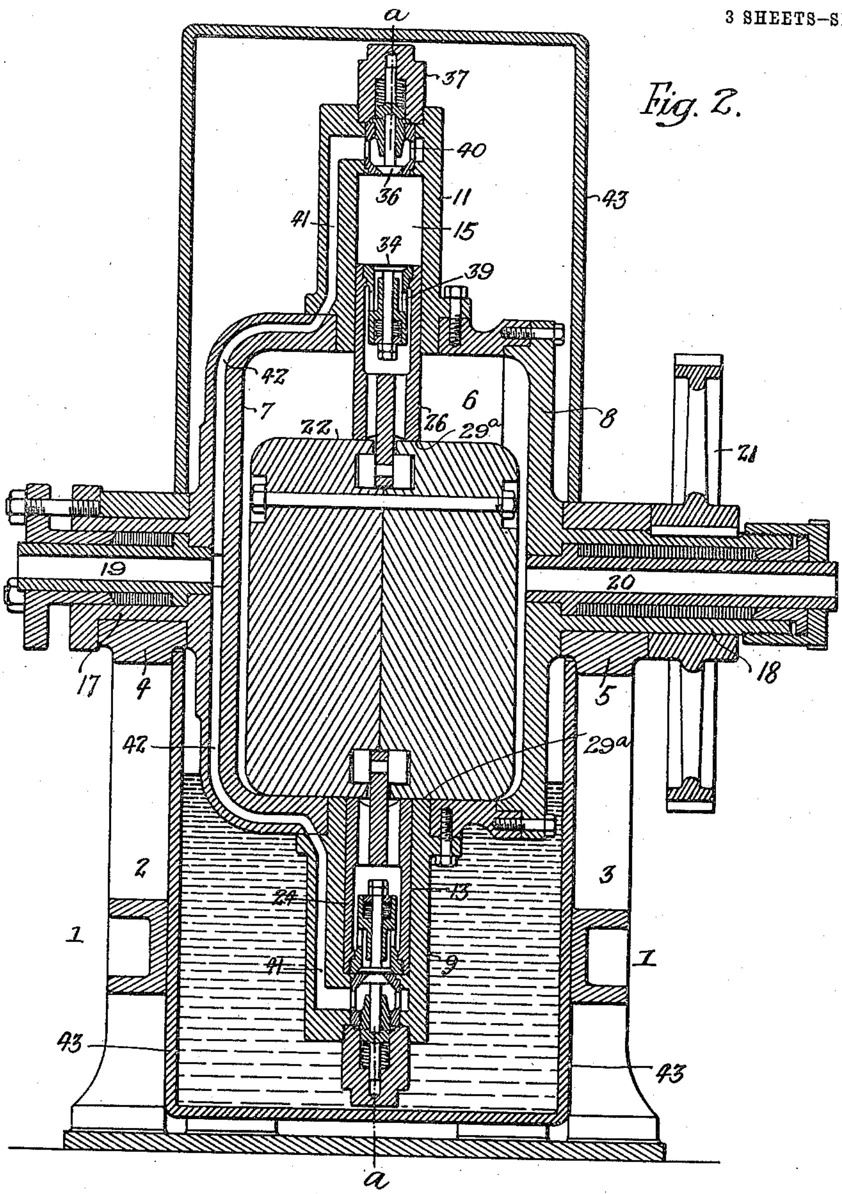
3 SHEETS—SHEET 2.

Fig. 2.



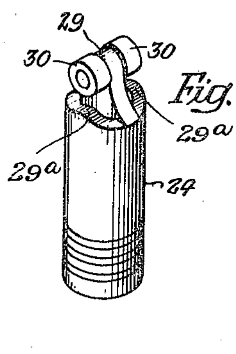


Fig. 6.

Witnesses.—
Walls A. Burrowes
Walter A. Pullinger

Inventor—
William F. Ruwell.
by his Attorneys.—
Howson & Howson

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3 SHEETS—SHEET 3.

Fig. 3.

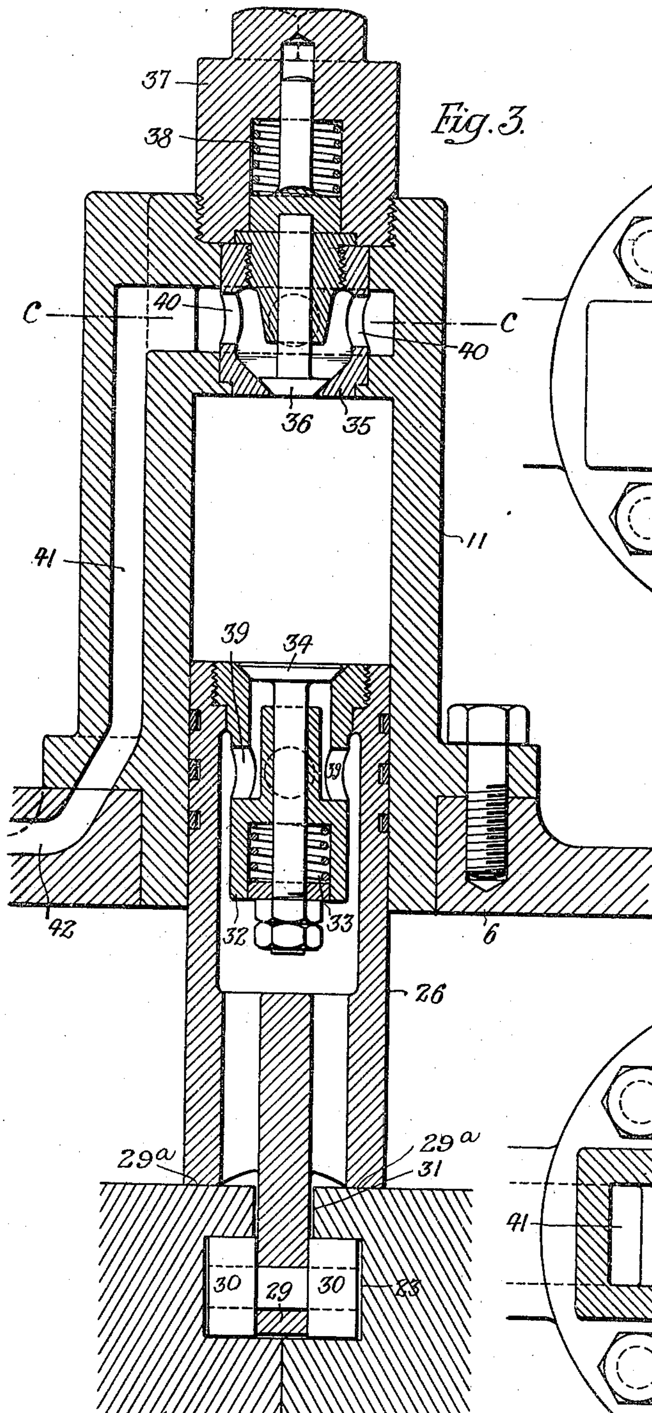


Fig. 4.

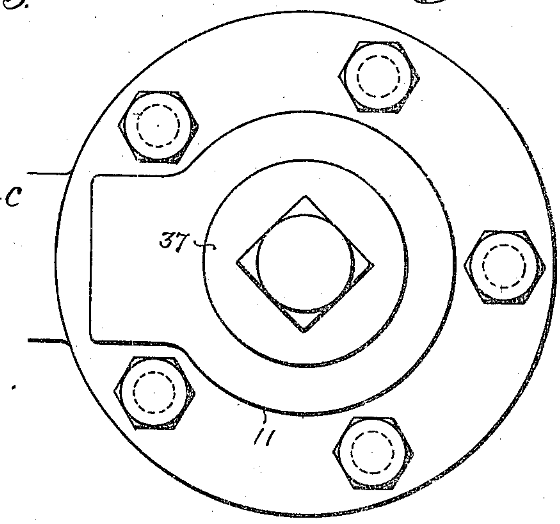
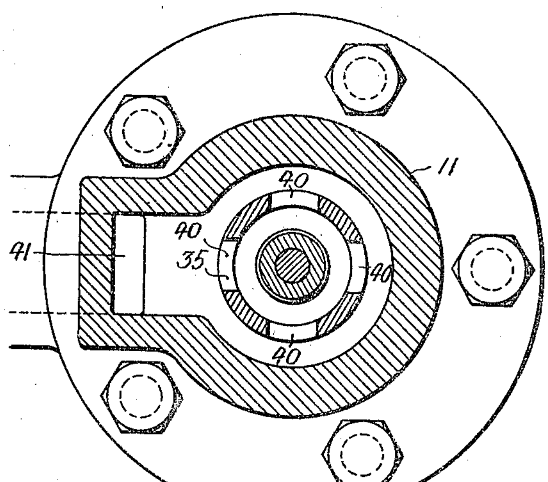


Fig. 5.



Witnesses—

Wells A Burrows

Walter F. Fullinger

Inventor—

William F. Ruwell.

by his Attorneys.—

Howson & Howson

UNITED STATES PATENT OFFICE.

WILLIAM F. RUWELL, OF PHILADELPHIA, PENNSYLVANIA.

COMPRESSOR-PUMP.

1,023,685. Specification of Letters Patent. Patented Apr. 16, 1912.

Application filed May 10, 1911. Serial No. 626,183.

To all whom it may concern:

Be it known that I, WILLIAM F. RUWELL, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Compressor-Pumps, of which the following is a specification.

My invention consists of a compressor of the rotary type and is particularly adapted for refrigerating purposes where ammonia gas, or the like, after passing through the refrigerating coils, is drawn by suction into the inlet pipe; then compressed and forced into liquefying pipes or condensers. There have been many machines designed for this purpose, but owing to the construction being complicated and cumbersome and requiring a great amount of power for their operation they have not been entirely satisfactory.

It is therefore the object of my invention to produce an efficient compressor that will require a small amount of power for its operation and which will be of a durable and simple construction. This object I attain in the following manner, reference being had to the accompanying drawings, in which;

Figure 1, is a sectional elevation of my improved compressor taken on the line *a*—*a* Fig. 2; Fig. 2, is a transverse sectional view taken on the line *b*—*b* Fig. 1; Fig. 3, is an enlarged sectional view of certain of the elements shown in Fig. 2; Fig. 4, is a plan view of Fig. 3, Fig. 5, is a transverse sectional view taken on the line *c*—*c* Fig. 3; Fig. 6, is a perspective view of one of the hollow pistons which I employ, and Fig. 7, is an elevational view of my compressor on a reduced scale, showing a possible position of the several elements.

Referring to the drawings, 1 is the supporting structure in this instance comprising side frames 2 and 3 having journal bearings 4 and 5. A cylindrical drum 6, made in two sections 7 and 8 is provided with a series of radially disposed cylinders 9, 10, 11 and 12, and these cylinders have bores 13, 14, 15 and 16 respectively to provide communication with the hollow interior of the drum 6. The sections 7 and 8 of the drum 6 have extensions or trunnions 17 and 18 respectively. The extension 17 is rotatably mounted in the bearing 4 and is provided with a port 19. The extension 18 is rotatably mounted in the bearing 5 and is provided with a port 20, which communicates with the interior of the drum 6. A driving wheel 21 is keyed to the extension 18 and may be a gear wheel, as shown in the accompanying drawings, or a pulley.

A cylindrical weight 22, in the present instance made in two sections, is mounted within the drum 6 and, owing to gravity, rests on the lowest portion of the inner face of the said drum. The weight is smaller in diameter than the inner diameter of the drum, so that the axis of the drum is eccentric to the axis of the weight. Also the weight has each of its sections provided with an annular groove 23 and is sufficiently heavy to prevent its being raised from contact with the lower surface of the drum when the latter is rotated.

Hollow pistons 24, 25, 26 and 27, of equal length are adapted to operate within the bores or chambers 13, 14, 15 and 16, respectively of the several cylinders. Each of the said pistons has a projection 29 supporting anti-friction rolls 30. These projections are designed to pass through a slot 31 formed in the weight 22 adjacent the grooves 23. The anti-friction rolls are adapted to the grooves 23 and tend to keep the inner ends of the pistons close to the peripheral surface of the weight. Auxiliary bearings 29^a are formed by extending the inner ends of the pistons for the purpose of cutting down the width of the apertures over which the roller weight has to travel and to take the direct weight of the said roller.

Secured within each piston and adjacent the outer end thereof is an inlet valve casing 32 having a cushion chamber in which is mounted a spring 33. A valve seat is formed in each casing and a valve stem 34 is so arranged therein that when the valve is closed the head of the stem is flush with the outer end of the piston; the said springs 33 acting on the valve stems to keep the latter closed.

Mounted in the end of each cylinder, and having one end flush with the end of each cylinder bore, is an outlet or discharge valve casing 35 in which is mounted a valve stem 36. These stems are oppositely disposed to the inlet valve stems 34 and are in longitudinal alinement therewith. In the present instance each of the cylinders is provided with a screw cap 37, which forms an extended bearing for the valve stems 34 and provides a housing for springs 38. These springs

38 tend to keep the stems of the discharge valves against their seats and flush with the ends of the casing 35 and chambers 13, 14, 15 and 16.

The casings 32 have perforations 39 to form a communication between the interior of the drum 6 and the valve seats. In like manner the valve casings 35 are perforated at 40 to form a communication between a discharge passage 41 in each cylinder and a main discharge passage 42 formed in the drum, the main passage being in connection with the discharge port 19.

It will be noticed that in addition to the operable construction the parts have been so designed as to facilitate the manufacture of the machine and allow for the repair and rapid replacement of any of the parts.

For the purpose of keeping the cylinders and drum cool, I incase the said drum and cylinders within a jacket 43 containing water or other cooling medium.

In operation the discharge end of the refrigerating tubes is connected in any suitable manner with the port 20, so that the ammonia gas can enter the interior of the drum 6, and the port 19 is connected to one end of the usual water cooled gas liquefying pipes or condenser.

The operation is as follows: The drum is rotated through the medium of the wheel 21 and as the weight and grooves 23 therein are eccentric to the drum and also to the cylinders, the pistons will reciprocate in their respective cylinders. Each cylinder as it passes below the point of contact between the drum 6 and the weight 22 will have its piston forced into its extreme inward position as shown by the position of the piston 24 in the cylinder 9, Figs. 1 and 2. On the other hand each cylinder as it passes directly above the said contact point will have its piston drawn to the extreme outward position as shown in Figs. 1 and 2 at the cylinder 11 and the piston 26. At the various positions of the several cylinders between those above described the pistons will occupy relatively various positions within the cylinders, *i. e.* for each rotation of the drum each piston will have a reciprocating movement within its respective cylinder. In so doing the ammonia gas will be sucked in through the port 20, compressed and forced out of the port 19 to the liquefying coils in the following manner. As the construction and action of each of the cylinders is the same we will take for example, the cylinder 9 having its piston 24 in the extreme inward position and the drum rotating in the direction of the arrow. Then, as the drum rotates, the piston will be retracted (owing to the anti-friction roller 30 operating in the groove 23). This movement forms a suction which opens the inlet valve. Owing to the interior of the drum being in communication with the port 20 and the inlet valve seats open to the interior of the drum, gas will be drawn into the cylinders between the inner end of the piston and the discharge valve shown at *x* Fig. 1, until the piston has reached its extreme outward position. Then, as there is no further suction, the spring 33 will seat the valve-stem inclosing the volume of gas as shown at *y*. A continued movement of the drum forces the piston into the cylinder and compresses the gas. When the pressure of the gas becomes greater than that of the springs 38 and the back pressure, the valve stems 36 are forced from their seats, as shown at Z, and the gas passes through the passages 40, 41 and 42 to the port 19, thence to the condenser.

By having the weight 22 heavy and of such a shape that it will be free to roll in contact with the inner surface of the rotatable drum, I find that a great pressure is exerted against each piston as the latter passes thereunder and that the friction between the several elements is extremly slight. Also, as the discharge pressure of my compressor is proportionate to the heaviness of the roller weight there is no danger of the internal pressure of the condenser becoming too high and exploding, as has often been the case. The reason for this is that as soon as the back pressure of the discharge valves, which is the internal pressure of the condenser, reaches the pressure of the discharge, the gas instead of being ejected will remain in the several cylinders; thus lifting the weight to a point concentric with the drum (Fig. 7) where it will stay until the internal pressure of the condenser lowers, when it will again contact with the surface of the drum. Thus it will be seen that my invention acts as its own governor.

The arrangement of the valves and pistons is such that the entire amount of gas is expelled at each inward stroke of the piston. Also, the pistons are so formed at their outer ends that they act as auxiliary bearings 29^a for the weight to prevent the latter from "pounding."

While I have described my invention as having four cylinders and especially adapted for use in refrigerating purposes it will be understood that any number of cylinders can be employed and that my invention may be used to advantage as a compressor pump of any description.

I claim:—

1. The combination in a pump of a rotary casing having a plurality of cylinders and a drum; a free-rolling weight operative within the drum when the casing is turned; pistons operable within the cylinders, each of said pistons having a positive sliding connection to the said free-rolling weight,

there being a valved passage connecting each cylinder with the interior of the drum.

2. The combination in a compressor pump of a cylindrical drum rotatably mounted with its axis in a horizontal position, a cylindrical weight of smaller diameter than and rotatably contacting by gravity with the lowest portion of the inner surface of the drum, cylinders providing compression chambers and carried by the drum, said weight having a groove, a piston adapted to each of the chambers and to the groove in the weight, whereby gas is admitted to the chambers.

3. The combination in a compressor pump of a rotatably mounted cylindrical drum, a weight in rotatable contact with the inner surface of the drum and having a groove, cylinders providing chambers and carried by the drum, a hollow piston adapted to operate within each of the cylinders and having extensions engaging the groove in the weight, an inlet valve normally closing the inner end of each piston, a discharge valve at the inner end of each chamber and in alinement with the inlet valve of its respective piston, said hollow pistons permitting communication between the chambers and the interior of the drum, discharge ports leading from the discharge valves and an inlet port leading to the interior of the drum.

4. The combination in a compressor pump of a supporting structure, a cylindrical drum having hollow trunnions rotatably mounted in the supporting structure, a grooved weight supported by the inner surface of the drum and in rotatable contact therewith, cylinders providing chambers and carried by the drum, a hollow piston adapted to operate within each of the cylinders and having extensions engaging the groove in the weight, a valve casing carried by each of the pistons, an inlet valve mounted in each of said casings, a valve casing adjacent the inner end of each chamber, a discharge valve mounted on each of said latter casings and in alinement with the inlet valves, detachable caps closing the end of each cylinder, said hollow pistons permitting communication between the chambers and the interior of the drum and providing a contact surface for engagement with the weight, discharge ports leading from the discharge valve casings to one of the hollow trunnions, the other of said hollow trunnions forming an inlet port to the interior of the drum.

5. The combination in a compressor pump of a supporting structure, a cylindrical drum having hollow trunnions rotatably mounted in the supporting structure, a grooved weight supported by the inner surface of the drum and in rotatable contact therewith, cylinders providing chambers and carried by the drum, a hollow piston adapted to operate within each of the cylinders and having extensions engaging the groove in the weight, a valve casing carried by each of the pistons, an inlet valve mounted in each of said casings, a valve casing adjacent the inner end of each chamber, a discharge valve mounted in each of said latter casings and in alinement with the inlet valves, detachable caps closing the end of each cylinder, said hollow pistons permitting communication between the chambers and the interior of the drum and providing a contact surface for engagement with the weight, discharge ports leading from the discharge valve casings to one of the hollow trunnions, the other of said hollow trunnions forming an inlet port to the interior of the drum, and means for cooling said drum and cylinders.

6. The combination in a compressor pump, of a rotatably mounted cylindrical drum; a loose weight provided with a groove concentric to its axis and adapted to roll by gravity against the inner surface of the drum; compression chambers adapted to the said drum; a piston in each chamber; each of said pistons having a projection movably confined within the said concentric groove of the weight; each of said pistons also having projections forming auxiliary bearings for the weight when the latter is directly above the pistons.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WILLIAM F. RUWELL.

Witnesses:
AUGUSTUS B. COPPES,
WM. A. BARR.