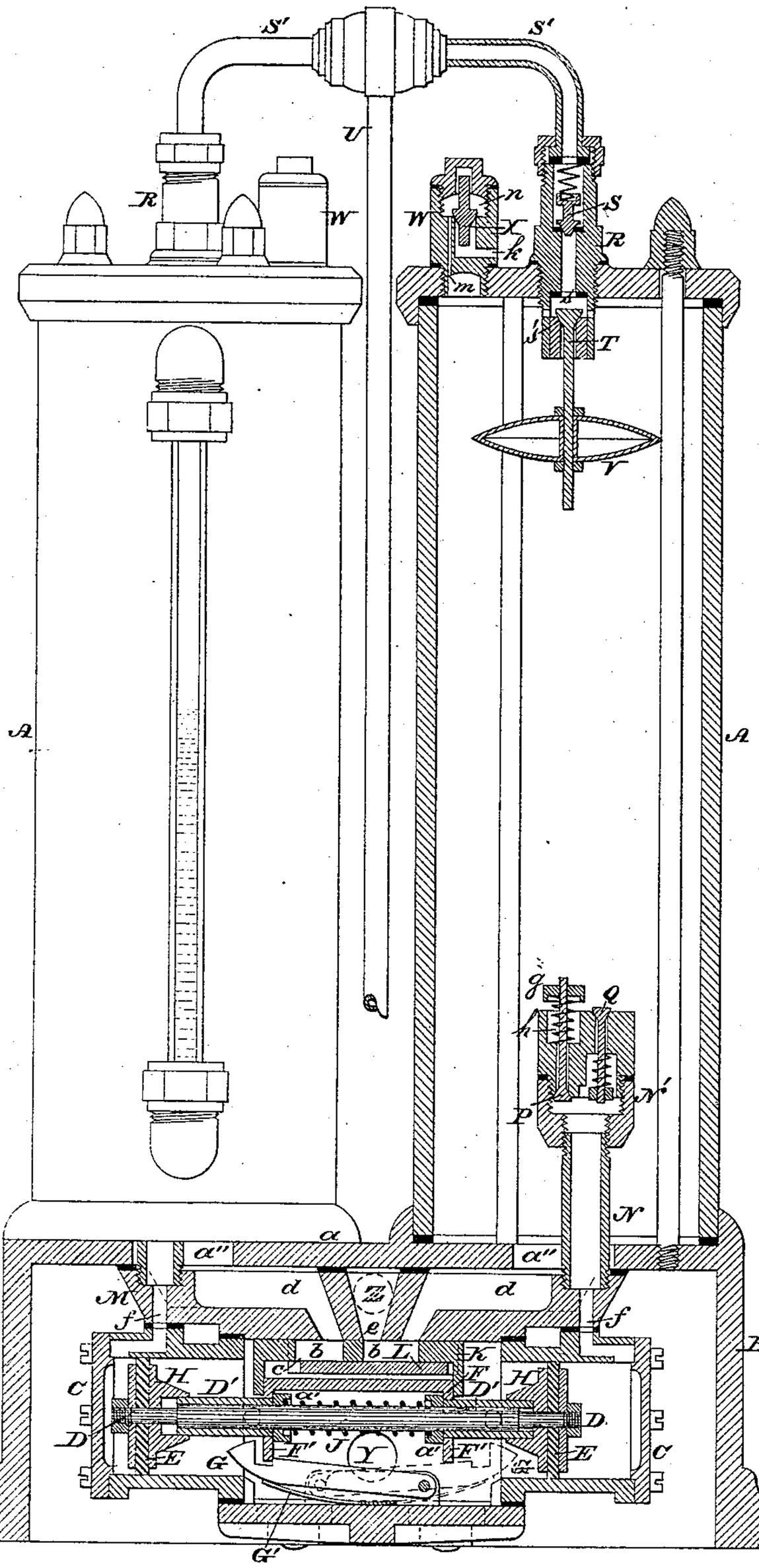
(No Model.)

W. WANG.

AIR COMPRESSOR.

No. 255,901 Patented Apr. 4, 1882.



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AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 255,901, dated April 4, 1882.

Application filed December 7, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WANG, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Air-Compressors, which improvement is fully set forth in the following specification and accompanying drawings, in which the figure is a view, partly side elevation and vertical section, of the air-compressor embodying my invention, which consists of an apparatus for compressing air by the action of two cylinders, into and from which air is alternately admitted and discharged, the discharge being effected by the admission of water alternately to said cylinders. The discharge-water from the cylinders is employed to throw the piston of the supply-cylinder in opposite directions, so as to shift the valve, whereby when one cylinder is being emptied the other cylinder will be replenished.

Referring to the drawing, which represents a front elevation, partly in vertical section, of an air-compressing machine embodying my invention, A represents two upright cylinders, which are supported on a base, B.

C represents a horizontally-arranged piston-cylinder, which is properly sustained within the base or from the plate *a*, which is either the bottom of the cylinders A or top of the base B, the piston-rod D having at each end a piston, E. The rod D is partly encircled by a sliding sleeve, D′, and on the latter, between the pistons, is supported a sliding saddle, F, whose pendent legs F′ are adapted to be engaged by dogs G, which project in opposite directions within the cylinder C, and are pivoted to the wall thereof below the piston-rod, said dogs G being pressed upwardly by springs G′, which are secured to the cylinder, and adapted to be depressed by the action of cone-shaped or tapering heads H, secured to the piston-rod on the inner sides of the pistons E.

Fitted loosely on the piston-rod, within the legs F′ of the saddle, are collars *a′*, and bearing against the collars is a spring, J, which is coiled on the piston-rod, it being noticed that the sleeves D′ project through the legs F′ of the saddle and abut against the collars *a′*.

Fitted to the top of the saddle F is a sliding valve, K, which is provided with ports *b*, and between said valve and the top of the saddle is a seat-plate, L, having ports *c* at opposite ends, said plate being cast with the chest M, which is secured to the upper side of the cylinder C, and is formed with supply-ports *d* and exhaust-port *e*. The ends of the chest have ports *f*, which communicate with the ends of the cylinder C, and with pipes N, which project upwardly into the cylinders A A through openings *a″* in the plate *a*, said openings being larger than the diameter of the pipes N, and communicating with the ports *d d* of the chest M.

On the upper end of each pipe N is a head, N′, having a downwardly-opening valve, P, and an upwardly-opening valve, Q, the stem of the valve P carrying a nut, *g*, and having a spring, *h*, which bears against said nut *g* and the head N′, whereby by means of the nut the tension of the spring may be adjusted, and the valve thus set to open at different degrees of pressure of the water admitted into the cylinders.

In the top of each cylinder A is a tube, R, having at its upper end an upwardly-opening valve, S, and below the same an upwardly-opening valve, T, said tube communicating with the cylinder A and with a pipe, S′, whereby the air from the cylinder A is directed through said tube R and pipe S′ to a pipe, U, which leads to the place of service of said air.

To the stem of each valve T is secured a float, V, the object of which is to close said valve when the water in the cylinder attains a certain height, it being noticed that said valve T has two seats, *s s′*, in the tube R.

W represents an air-supply tube, which is provided with a downwardly-closing valve, X, and has a duct, *k*, which opens into the atmosphere below said valve, and a duct, *m*, which opens into the cylinder A, and a chamber, *n*, in the tube W, above said valve X.

Y represents the water induction or inlet of the cylinder C, and Z the water-eduction or exhaust-discharge of the chest M.

The operation is as follows: As the parts are shown the exhaust-discharge Z is in communication with the right-hand cylinder A,

and water of said cylinder is presumed to have escaped through the opening *a''*, port *d*, port *b*, and port *e*, the pistons being thrown to the left to full extent. The fresh water that has entered the cylinder C now passes through the uncovered port *c* at the left-hand of the seat-plate L into the port *b* of the valve K, and thus reaches the port *d* and opening *a''*, and so enters the left-hand cylinder A and fills it. The air which is forced from the cylinder A by the rising water lifts the valves T S and escapes through the pipes S' U to the storage-tank or place of service. When the water reaches the required height the float V rises and closes the valve T against its upper seat, *s*, and the back-pressure of the air closes the valve S. Some of the air in the cylinder A enters the duct *m* and reaches the chamber *n*, and so holds the valve X down on its seat, preventing escape of said air. When the desired pressure of air is obtained, determined by the pressure of water in the cylinder, said pressure is communicated to the valve P in the head N', the water reaching said valve through the enlarged duct in which the stem of said valve is fitted. The valve P is thus opened, and the water entering the pipe N reaches the port *f*, and so presses against the left-hand piston E and moves it to the right, the valve P then closing. It will be seen that the saddle F is rigidly held by the left-hand dog G. Now the left-hand collar D' is struck by the piston and begins to move with the piston, thus forcing the left-hand collar *a'* toward the right-hand collar, thus compressing the spring J. When the conical head H reaches the dog G it depresses it, thus relieving the leg of the saddle F of the dog, and the saddle, under the impulse of said spring J, is thrown forcibly to the right, and by it motion is imparted to the slide-valve K. This covers the left-hand port *c* of the seat-plate L and causes the exhaust-port *e* to be in communication with the left-hand ports *b d* and opening *a''*, and consequently with the left-hand cylinder A. The water in the latter cylinder now escapes to the exhaust, and as the float V falls the valve T falls and the back-pressure of air in the pipe S' closes the valve S, thus preventing the return of compressed air into the cylinder A. As the right-hand port *c* of the seat-plate L is now uncovered, the water in the cylinder C passes through said port *c*, and so begins to fill the right-hand cylinder, the other operations then being repeated, it being noticed that when the pistons are reversed or moved to the right the right-hand dog G engages with the right-hand leg of the saddle F, so as to hold the same when the pistons move back to the left. Whatever water remains in the cylinder C, between the head thereof and the relative piston, is forced by the advancing piston back into the pipe N, thus opening the valve Q and permitting the water to escape with that just leaving the cylinder. When the water begins to enter cylinder A, and the valve T is down on the bottom seat, air is permitted to enter the tube R through perforations in the base of said tube surrounding the valve-seat, or in the tube above the valve, thus preventing any sudden upward action of the said valve or clattering of the same. When the water flows from one of the cylinders A the vacuum created in the cylinder, and consequently in the chamber *n*, lifts the valve X, and fresh air enters the duct *k*, and so fills the cylinder.

The exhaust-port *e* is of greater area than the port *c* of the seat-plate L, thus causing discharge of the waste or spent water from one cylinder in a more rapid manner than the other cylinder is supplied with fresh water.

I am aware that it is not broadly new to compress air in two cylinders by the action of water in another cylinder. I do not claim this broadly; but in my apparatus the cylinder C has independent communication with each of the cylinders A A. Neither the water nor the air passes from one of these upright cylinders to the other; but the water in cylinder C acts on them directly and alternately, as described.

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

1. The water-supplying cylinder C and its piston-rod and pistons reciprocating longitudinally therein, in combination with chest M, which is formed with ports *d d* and exhaust-port *e*, and the air-compressing cylinders A A, each of which has communication with one of said cylinders A A, said cylinders being provided with suitable valves to allow the air to be compressed within them by the influx of the water and afterward expelled thereby, substantially as set forth.

2. The water-supply cylinder C and water and air receiving cylinders A A, in combination with the pipes N, having valves substantially as described, the plate *a*, with openings *a''*, and the chest M, whereby said cylinders A communicate both with said chest M and the ends of said supply-cylinder C, for the purpose set forth.

3. The valve K, seat-plate L, and chest M, in combination with the piston-rod with heads H, the saddle F, and dogs G, substantially as and for the purpose set forth.

4. The piston-rod having at each end a piston and an encircling sleeve, in combination with the sliding saddle and valve, the loose collars, and the spring between them, the chest and the water and air receiving cylinders A A, and the water-supply cylinder C, substantially as and for the purpose set forth.

5. The water-supply cylinder C, and water and air receiving cylinders A A, in combination with the pipes N, each having an adjustable valve, P, substantially as and for the purpose set forth.

6. The cylinder C and a cylinder, A, in combination with the pipe N, having an upwardly-

opening valve, Q, and downwardly-opening valve P, and the chest M, having a port, *f*, through which water passes from said pipe to cylinder C, a port, *d*, through which water passes to cylinder A, and a discharge-port, Z, all substantially as set forth.

7. In combination with the air-compressing cylinders A A and the water-supplying cylinder, pistons, and piston-rod, the pipes N, provided with downwardly-opening valves P and upwardly-opening valves Q, substantially as set forth.

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Witnesses:
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