(No Model.)

# H. C. REAGAN, Jr.

## AIR PUMP.

No. 496,898. Patented May 9, 1893.

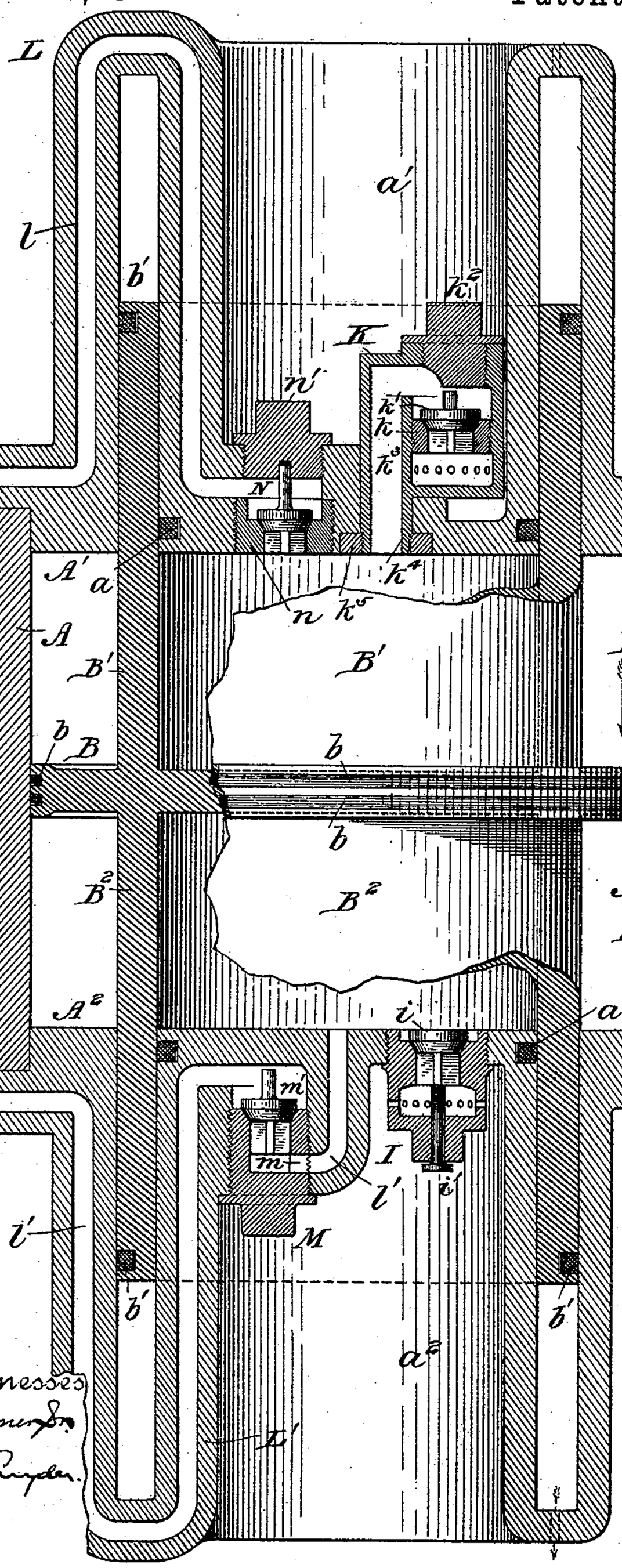
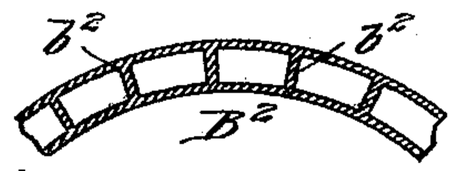



Fig. 1.

Fig. 2.

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# UNITED STATES PATENT OFFICE.

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## AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 496,898, dated May 9, 1893.

Application filed June 30, 1891. Serial No. 397,989. (No model.)

*To all whom it may concern:*

Be it known that I, HARRY CLIFTON REAGAN, Jr., a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Air-Pumps; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to pumps for compressing air or other elastic fluids, being especially intended for use with a system of fluid pressure brakes for railway trains.

It consists in certain features of construction hereinafter set forth and particularly pointed out in the claims.

In the accompanying drawings, Figure 1, represents a longitudinal section of my improved pump. Fig. 2, is a modification.

The cylinder A, contains the piston B, which is rendered steam-tight by means of the usual packing rings, *b*. Cast integral with, or rigidly secured to the piston, are two (2) cylinders or cylindrical shells, B′, B², arranged concentric with the cylinder A, and in length about equal with said cylinder. The diameters of these shells are preferably the same, being somewhat less than that of the piston, so as to leave an annular space between the shells and the cylinder. The relative areas of the two portions of the piston, one inside the shell and the other surrounding it, may be made to suit the requirements of the service to be performed. These shells are fitted to work smoothly in annular wells or chambers cored out in cylindrical projections, *a*′, *a*², extending from the cylinder heads, A′, A². Packing rings *a*, inserted in grooves in the cylinder heads, make a tight joint with the inside of the shells where they enter the wells, and similar rings, *b*′, carried in grooves near the ends of the shells, pack the joint between the ends of the shells and the outer walls of the wells. The shells therefore, divide the interior of the cylinder A, into two (2) concentric cylinders, having pistons moving simultaneously with each other. By admitting steam to the outer annular cylinder, the inner one can be utilized as an air cylinder, or vice versa. The drawings show the pump arranged with the steam cylinder outermost.

The steam chest C, has preferably a cylindrical interior which may be provided with a removable bushing *c*. Steam enters at the supply port, D, and exhausts through the port E. The slide valve F, is semi-cylindrical, and is prevented from rotating by a stud or studs, *f*, extending into or across the steam chest, just back of the valve. A valve stem G, fits into a groove in the back of the valve, and has shoulders *g*, engaging with the valve to actuate it when the stem is moved. Secured upon the stem are four (4) pistons, *g*′, *g*², *g*³, *g*⁴, of which *g*², *g*³, may fit the bushing *c*, while *g*′, *g*⁴ are preferably smaller, to fit cylindrical chambers in the heads, C′, C², screwed into the ends of the steam chest or otherwise secured thereto. When the valve is in the position shown in the drawings, the upper steam port, H, is open, and the lower steam port H′, is connected with the exhaust E. A small duct *h*, leads from the upper end of the cylinder A, to the chamber containing the piston *g*′, entering said chamber at such a point that the piston closes it when moved down into the position shown. A simular duct *h*′, leads from the other end of the cylinder to the chamber in which the piston *g*⁴, slides. These ducts enter the cylinder A, at such points that the piston B, will pass and uncover them at each end of its stroke.

In the drawings the piston B, is moving downward. When it reaches the bottom of the cylinder, the duct *h*′ will be open to the live steam above the piston. The steam will pass through the duct to the under side of piston *g*³, and drive it up, thereby shifting the valve F, and admitting steam below the piston B. Just before the valve reaches the end of its stroke, the piston *g*⁴ will close the duct *h*′ thus relieving the valve stem from shock. Meanwhile the lifting of the piston *g*′ will open the duct *h*, which thus stands ready to

take steam (when the piston B, reaches the top of the cylinder), and conduct it to the upper side of piston $g^2$, to reverse the valve to the position in which it is shown. The rise of piston $g^4$, also opens the exhaust port $c^2$, leading from below piston $g^3$ to the atmosphere. This permits the escape of the steam which has lifted the valve stem, and leaves no pressure to resist the downward movement of the stem when the reverse stroke takes place. There is a similar exhaust port $c'$, at the upper end of the steam chest. It will be seen that this valve motion is automatic, and dispenses with all but the simplest mechanism. It is positive in its action and is easy to manufacture and repair.

The air cylinder is provided with suitable inlet and outlet valves, those shown in the drawings being preferred. The lower inlet is composed of a plug I, screwed into an opening in the head $A^2$, inside of the cylindrical projection $a^2$. In the plug is a cavity, communicating with the air by a number of small holes, and with the interior of the cylinder by a cylindrical aperture at the upper end of which is a valve seat. A valve $i$ is arranged to open inwardly and provided with guide wings sliding in the cylindrical aperture. The lift of the valve is adjustable by means of a headed stem $i'$, screwed into the bottom of the valve and projecting through a hole in the end of the plug I, against which the head on the stem strikes and checks the upward movement of the valve.

The upper inlet valve is composed of a hollow block K having holes in its lower end to admit air to the valve chambers. A ring $k$ having peripheral threads, engaging with threads on the interior of the chamber, affords a seat and guide for the valve $k'$. A screw plug $k^2$ closes the top of the valve chamber, and acts as a stop to limit the lift of the valve, which has a stem that strikes against the bottom of said plug when the valve rises. A passage $k^3$, leads from the chamber above the valve down through a threaded neck $k^4$, which is inserted in a suitable hole in the cylinder head A', and is there secured by a nut $k^5$, or otherwise.

The outlet valves admit air from the cylinder to two (2) ports $l$, $l'$, cored out in ribs L, L', which run from the inner portion of the cylinder heads, out around the cylindrical projections $a'$, $a^2$, and back again, the ports uniting in a common discharge $l^2$. The lower outlet valve seat is found in a plug M, which screws into a threaded opening intersecting the port. The plug is hollow, and a lateral hole $m$ registers with the port $l'$, so that the air leaving the cylinder passes through the plug, lifting the valve $m'$, whose play is limited by a stem which strikes the top of the valve chamber. The upper outlet valve N, seats on a ring $n$, screwed into a suitable hole in the cylinder head A, said hole communicating with the port $l$. A screw plug $n'$ limits the lift of the valve. The upper valves $k'$, N, are accessible by removing the plugs $k^2$, $n'$. The lower valves can be got at by removing the plugs I, M, in which they are mounted.

In order to prevent the too rapid conveyance of heat from the steam in the outer cylinder, to the air in the inner cylinder, the shells B', $B^2$, may be double walled, with interposed webs $b^2$, as shown in Fig. 2, either cast in one piece or built up.

It is evident that my valve motion can be applied to the steam cylinders of pumps having separate air cylinders, the pistons being connected by a piston rod, as in the Westinghouse pump.

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

1. An air pump comprising a cylinder having heads, provided with cylindrical projections, containing annular wells, closed at their outer ends, a piston having cylindrical shells fitted to slide in said wells and dividing the cylinder into concentric chambers, a valve for controlling the admission of steam to one of said chambers, and valves for governing the inlet and outlet of air to and from the other chamber, substantially as described.

2. An air pump comprising a cylinder having heads provided with cylindrical projections cored out to form continuous annular wells, a piston carrying cylindrical shells fitted to slide in said wells, and dividing the cylinder into concentric chambers, a valve for controlling the admission of steam to the outer chamber, and valves located in the cylinder head within the annular projections, for governing the inlet and outlet of air to the inner chamber, substantially as described.

3. The combination with a cylinder, of heads containing annular wells, and a piston having annular shells adapted to slide in the wells, each shell being composed of double walls containing an air space between them, substantially as described.

4. The combination with the cylinder A, of the heads A', $A^2$ each having a cylindrical extension $a'$, $a^2$, containing an annular well, and having a thickened portion or rib, L, L', containing ports, $l$, $l'$, the piston B, having the shells, B', $B^2$, sliding in the wells, a steam valve controlling the admission of steam to the annular chamber surrounding said shells, inlet valves I, K, and outlet valves, M, N, the latter controlling the admission of air to the ports, $l$, $l'$, substantially as described.

5. An air pump having the inlet valve K, consisting of a block containing a valve chamber and air holes, leading into said chamber, an annular valve seat $k$ screwed into said

chamber, a valve $k'$ thereon, a plug $k^2$, affording access to said valve, and a neck $k^4$ containing a passage $k^3$ communicating with the interior of the air cylinder, substantially as described.

6. The combination with an air pump having a head $A^2$, containing an air outlet port $l'$, of a screw plug M, intercepting said port but having a passage through it, and a valve $m'$ controlling said passage, substantially as described.

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

HARRY CLIFTON REAGAN, JR.

Witnesses:
EDWARD F. PEACOCK,
HARRY O. BENDER.