945,416.

C. F. PRESLAR.

AIR SWITCH.

APPLICATION FILED APR. 27, 1908.

Patented Jan. 4, 1910.

2 SHEETS—SHEET 1.

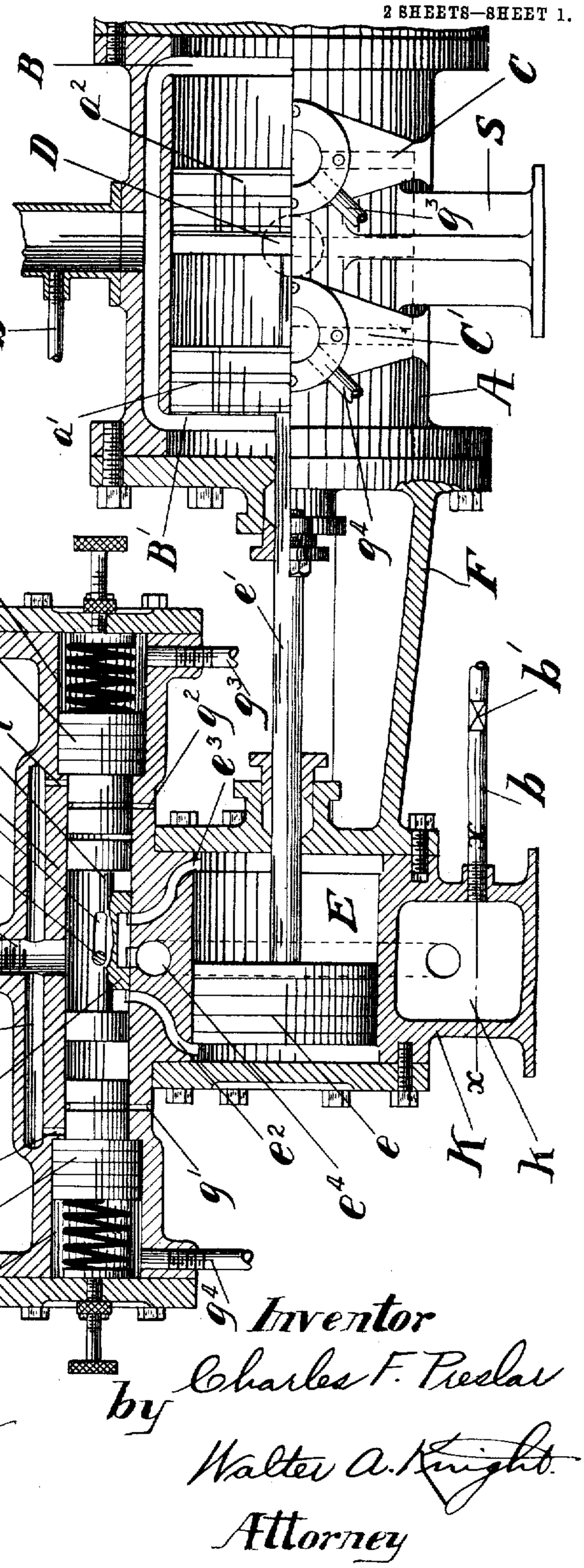

Fig 1

Witnesses

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2 SHEETS—SHEET 2.

Fig 2

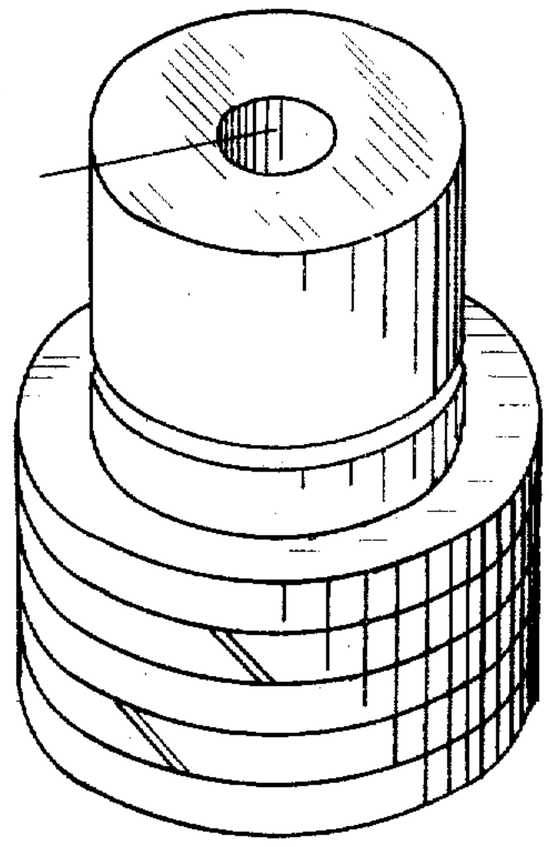


Fig 3

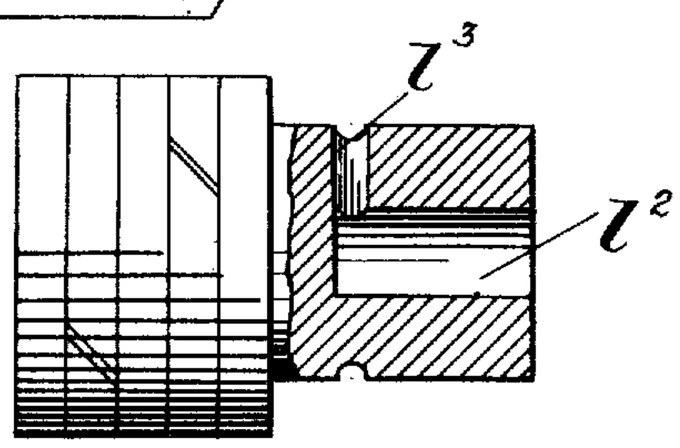


Fig 4

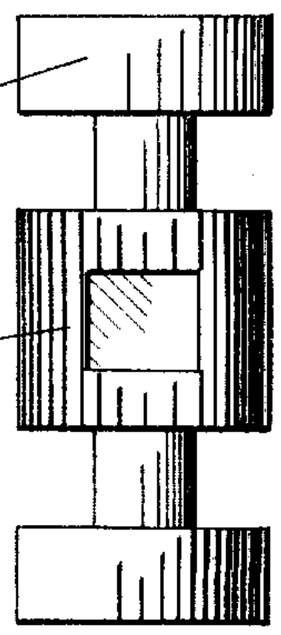
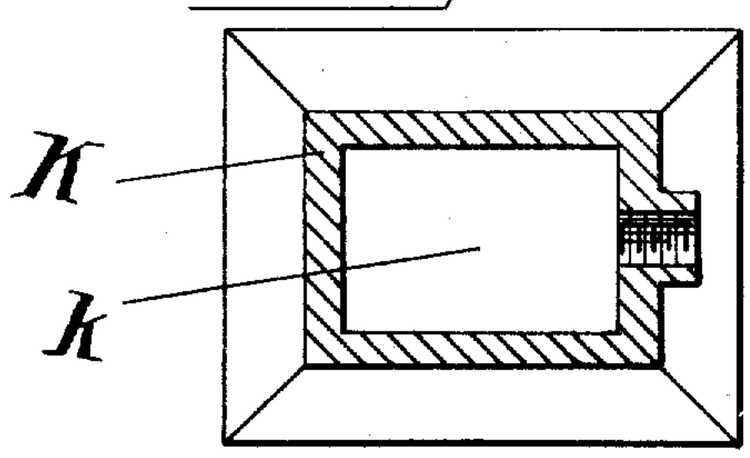


Fig 5



Witnesses

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UNITED STATES PATENT OFFICE.

CHARLES F. PRESLAR, OF CINCINNATI, OHIO.

AIR-SWITCH.

945,416. Specification of Letters Patent. Patented Jan. 4, 1910.

Application filed April 27, 1908. Serial No. 429,366.

To all whom it may concern:

Be it known that I, CHARLES F. PRESLAR, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented new and useful Improvements in Air-Switches, of which the following is a specification.

This invention relates to new and useful improvements in "air switches" and especially that type of switch used in plants where water is lifted by compressed air.

The function of switches of the type specified above, is the alternate switching of the air under pressure from one well or set of wells to another well or set of wells. In this manner, each well or set of wells is alternately connected with the compression and suction ports of the air compressor, and the pressure on the liquid to be raised is periodically exerted and released, the whole plant operating cyclical. Heretofore switches of this type have been very unsatisfactory, as they could not be depended upon to operate continuously. Sticking of parts on account of the dependence upon weights to aid in the operation necessitated close attention to keep the plant operating properly, and the air used in their operation has been discharged from the plant into the atmosphere.

The object of this invention is to provide an air switch which will be positive in its operation, will discharge less air into the atmosphere and will retain more air in the plant for repeated use. To attain these features, a switch has been provided whose operation depends upon the pressure and vacuum made by an air compressor, operating in connection with a plant which practically uses the same air, only taking enough air from the outside to supply intrinsic leakage of the plant.

The apparatus comprises a switching cylinder, embracing a plurality of rigidly connected pistons and a plurality of ports indirectly or directly connecting with the wells, the receiver, and the intake of the compressor. The pistons of the switching cylinder are connected to a piston, which operates in the motor-cylinder by means of air under pressure. The motor-cylinder is similar to a slide valve steam pump cylinder.

The valve of the motor-cylinder is a slide valve and operates in a valve chest, which incloses a chain of mechanism whose function is to control the operation of the slide valve. The operation of this mechanism depends upon the existing conditions of the motor fluid of the plant, namely the variances of its pressure above and below atmospheric pressure, these conditions being produced by the compressor.

My invention is illustrated in preferred form in the accompanying drawings, in which:

Figure 1 is a full longitudinal section of the entire device. Fig. 2 is an isometric view of one of the auxiliary pistons. Fig. 3 is a detail of one of the auxiliary pistons, with part in section. Fig. 4 is a bottom plan view of the double piston and slide valve. Fig. 5 is a full transverse section of the support K, taken along the line x, x in Fig. 1.

Referring to the drawings, A designates the valve casing or cylinder in which operates the switching valve, and E the motor-cylinder, these cylinders being secured to supporting bases S and K respectively, in a common axial line and connected by rigid bridging member F. Within the switching cylinder A, operates a piston valve having pistons a^1 and a^2, secured at suitable distances apart to a piston rod e^1 extended through stuffing boxes to a piston in the motor-cylinder E in the usual manner. The pistons a^1 and a^2, as valves, control ports opening through the shell of cylinder A as follows: a central port D connected with a source of air under pressure; ports C and C^1 equidistant on opposite sides of port D and connected respectively to the feed pipes of the well or set of wells; and exhaust ports B and B^1 having a common connection to the compressor.

The motor-cylinder E is provided with a cylindrical valve chest G cast integrally therewith, having supply ports and passages e^2 and e^3 connecting the valve chest with opposite ends of the motor-cylinder E and entering the valve chest G at opposite sides of a common exhaust port e^4, said ports being connected by a D-slide valve h operated by a double piston H reciprocated in the valve chest by means of compressed air, acting against the outer ends of the double piston H, whose motion is limited by a pin h^1 loosely piercing slot h^2. The exhaust port e^4 is connected by a passage (shown by dotted lines) with a chamber k, which may be located in the base K, which chamber is connected by piping b with the exhaust mains B and B^1 leading to the intake of the compressor (not shown). The pipe b is pro-

vided with a check valve b^1 opening toward the chamber k. The function of chamber k is to receive the exhaust of the motor-cylinder, and aid in cushioning the piston in the said cylinder. However, this chamber could be dispensed with and an ordinary throttle valve placed in the pipe line connecting the exhaust and the pipe leading to the air compressor.

The cylindrical valve chest G has extensions of slightly enlarged diameter at its ends respectively, in which extensions reciprocate pistons L and L^1 of correspondingly enlarged diameter having short trunks extending into the chest proper G. The trunk portion of each cylinder is provided with an axial aperture opening at one end into the valve chest G and at the other by a radial passage into a circumferential groove surrounding the trunk near the enlarged piston. The apertures and groove described have the function of an under cavity of a D-valve to connect the interior of casing G with the exhaust port g^1 and g^2 at the ends respectively. The grooves in other positions of the pistons L and L^1 register with compressed air ports i^1 and i^2, which open into a common passage I, through which compressed air is fed through aperture i^3 from the compressor.

In the position of parts shown in the drawing, the switching valve is at the extreme limit of its movement, in which compression passage D of the valve casing is connected, by means of the valve, with passage C^1 of one well or set of wells, while passage C of the other well or set of wells is connected by the valve with exhaust passage B. The passages C and C^1 have pipe connections g^3 and g^4 respectively with the terminal extensions G^1 and G^2 of valve chest G of the motor-cylinder; so that in the position of parts here shown, air under pressure is delivered from the compressor through passages D, C^1 and port g^4 into extension chamber G^2 behind and against the large end of trunk piston L^1, and by pressure holds same against its ledge at the inward limit of its movement. Correspondingly, the space G^1 behind the opposite trunk piston L is open to the exhaust by the connection of its port g^3 with passage C and through valve casing A to exhaust passage B. In the position of the trunk pistons L and L^1, their radial passages stand open to the atmosphere through ports g^1 and g^2 respectively, which connections extend through the axial passage l^2 to the interior portion of the valve chest G, so that the valve H has equal atmospheric pressure against both ends. But the air compressors used in plants of the character and for the purpose here described, are air exhaustors as well; since it is desirable at times during a cycle to maintain a partial vacuum in one well or set of wells in order to stimulate the flow of water thereto from surrounding earth veins, while maintaining pressure in the other to force the accumulated water to the surface—and this is the usual method. It will be understood therefore that in establishing connection between the interior of the extension G^1 and the pipe C, a condition of vacuum will be established behind the larger portion of the trunk piston L enabling the atmospheric pressure at the opposite end to move the trunk piston outward. In this movement at its outer limit, the radial passage l^3 registers with the port i^1 thereby admitting compressed air into the valve chamber G at the small end of trunk piston L which forces the double piston H to the opposite limit of its movement and this in turn operates the motor piston e, and brings the switching valves a^1 and a^2 into opposite positions, reversing the described conditions, and leading in turn to a subsequent return to the condition first described, etc.

It will be manifest that the rapidity of these recurring movements depend upon the relative degree of compression at one side and a vacuum at the other of the atmospheric line; and to clog this rapidity when desirable and thus prolong the periods of pressure or vacuum, I arrange an adjustable spring to bear inwardly against the outer end of each trunk piston, which obviously would cause a greater vacuum to be maintained before the pistons L and L^1 would operate.

What I claim as my invention and desire to secure by Letters Patent of the United States, is:

1. In an air-switching apparatus of the character indicated, a switch-motor comprising a cylinder, with piston reciprocating therein, pressure and exhaust ports, a valve seat, and a D-slide-valve—all of the usual construction—said cylinder being provided with a cylindrical valve chest with enlarged extensions, pistons connected with and operating the D-slide-valve, and trunk piston valves occupying the outer portions of said cylindrical valve chest, actuated outwardly by a vacuum produced alternately in the extreme ends of said valve chest to admit air under pressure to reciprocate the D-slide-valve.

2. A fluid-pressure switch comprising a switching cylinder; a motor cylinder; connected pistons operating respectively therein; a valve chest connected by suitable passages with the motor cylinder; a double piston adapted to be reciprocated in said valve chest; a slide valve actuated thereby over ports of the motor cylinder; auxiliary pistons in said valve chest regulating the admission of motor fluid to the double piston, and adjustable springs seated and acting

upon said auxiliary pistons to regulate the responsiveness of their action according to the degree of available power to be applied thereto.

3. In a compressed air motor for actuating air-switching mechanism, the combination of the motor cylinder provided with a reciprocating piston, and the usual passages, ports and a slide valve governing the same, of a cylindrical valve chest, a double piston operating therein and connected with and operating the valve, two independent pistons for regulating the admission of fluid pressure to actuate the double piston, said independent pistons each being provided with internal passages opening outwardly through the peripheral surface and ports opening through the valve chest registering with the said peripheral ports of the last named valves.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES F. PRESLAR.

Witnesses:
CARROLL H. RICHARDS,
JOSEPH R. GARDNER.