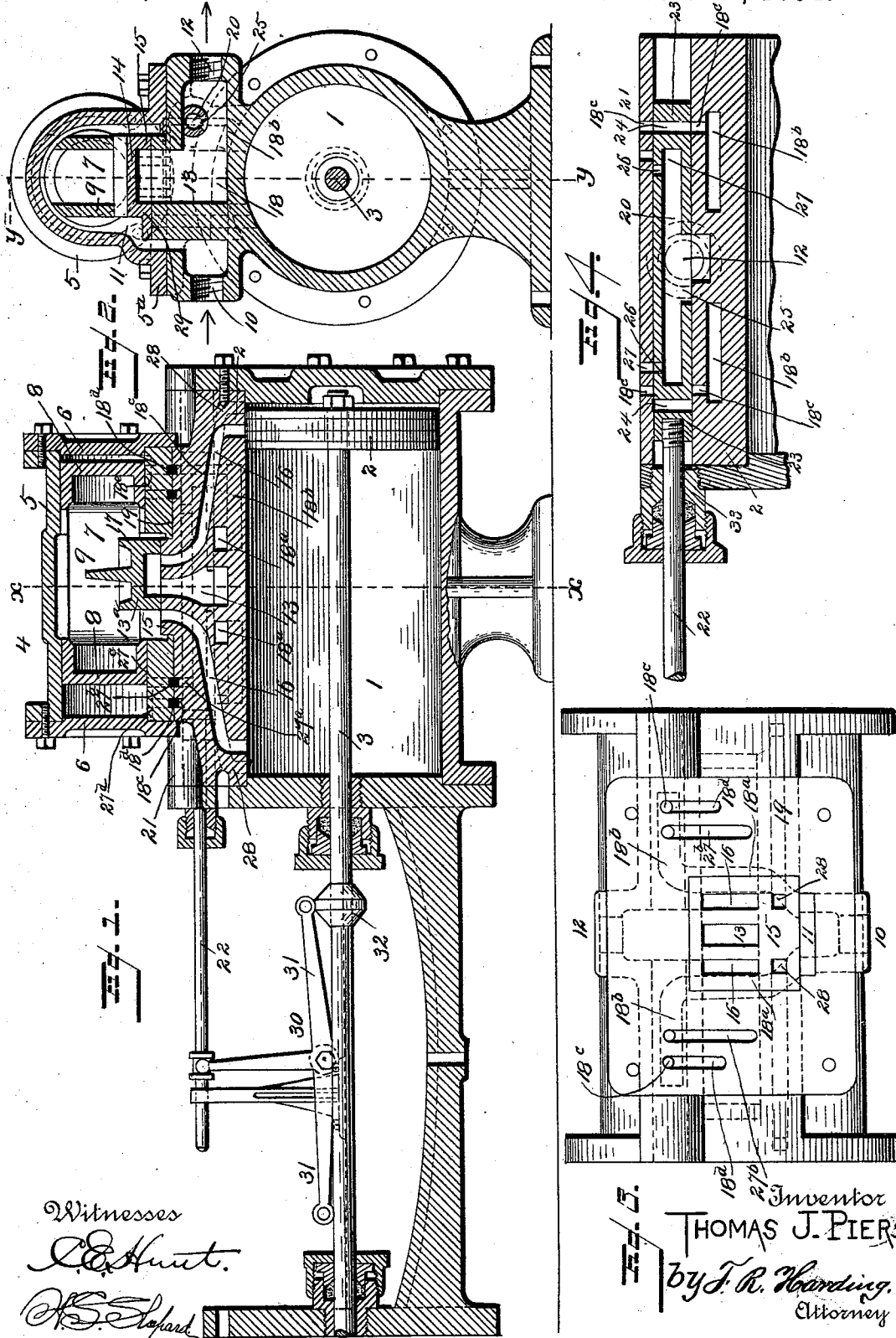


(No Model.)

T. J. PIERS.
STEAM ACTUATED VALVE.

No. 514,962.

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UNITED STATES PATENT OFFICE.

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STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 514,962, dated February 20, 1894.

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To all whom it may concern:

Be it known that I, THOMAS J. PIERS, a citizen of the United States, residing at Jeffersonville, in the county of Clark and State of Indiana, have invented certain new and useful Improvements in Steam-Actuated Valve Mechanism; and I do hereby 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.

My invention relates to valve-mechanism for use in connection with steam-actuated pumps; and it contemplates increasing the accessibility of the co-operating parts, especially the several valves, by providing means for exposing and removing the same, without disconnecting or disarranging the couplings, so objectionable on account of the consumption of the time of the engineer.

A further object of my invention is to reduce to a minimum the number and simplify the construction of the component parts, and dispose the steam-channels, ports, and the controlling valves in a simple and compact manner, whereby space is economized and the cost of manufacture is materially lessened.

A further object in view is to furnish means under the control of the slide-valve for forming an air-cushion to prevent pounding, and for giving an initial impetus to the piston to overcome its static inertia, thereby avoiding both jarring and straining at the respective terminals of the strokes, or in other words, at the points of reversal of the direction of movement of the piston.

My invention has for its object, furthermore, to produce means whereby the slide-valve casing and cylinder exhaust alternately into a common port, the communication therewith of the cylinder being cut-off approximately at the same time that the communication therewith of the valve-casing is established so that the entire force of steam is turned upon the live end of the valve to insure the prompt reversal thereof.

For the attainment of these objects, and for other purposes hereinafter enumerated, this improvement comprises, in brief certain details of construction, arrangement and com-

bination of parts, all of which are more fully described hereinafter.

The novel features of my invention are embraced in the appended claims, which are intended to accord in their scope and meaning with the prior state of the art and the existing law.

In the accompanying drawings forming a part of this specification I have shown certain features which I deem adequate for successfully carrying out my invention in practice, however, I do not limit myself to this preferred arrangement since various departures may be made as regards form, proportion, and details of structure, all of which fall within the domain of mechanical skill, and are therefore within the scope of the invention.

Referring to said drawings:—Figure 1 is a longitudinal central sectional view of an organization of apparatus embodying the generic features of my invention. Fig. 2 is a transverse section on the plane indicated by the line $x-x$ of Fig. 1. Fig. 3 is a top plan view of the valve-seat. Fig. 4 is a longitudinal vertical sectional view of the auxiliary valve and its casing.

In all the views of the drawings like numerals of reference denote like or corresponding parts.

1 designates the cylinder in which operates the usual piston, 2, of any approved construction; and 3 is the piston-rod which is adapted for connection to the pump-mechanism (not shown).

4 indicates the slide-valve chest having a domed cap, 5, provided with base-flanges, 5^a, which are bolted to the main casting of the cylinder, and also having heads 6, which are bolted to the ends of the cap. In the casing is fitted an auxiliary-valve, 7, which consists of hollow or cup-shaped heads, 8, arranged with their concaved sides facing, and connected for movement in unison by the webs, 9. The inlet-port, 10, communicates directly with the interior of the valve chest, between the heads of the auxiliary-valve, by means of a vertically disposed channel, 11, and the exhaust-port, 12, communicates in the usual manner with a central or exhaust-channel, 13,

which is covered by the main-slide-valve, 13^a, mounted upon the valve seat 15. The main steam ports, 16, which are arranged upon opposite sides of the exhaust channel, 13, communicate with the main cylinder at points near its opposite ends and are covered at their upper terminals alternately by the slide-valve, 13^a, when in operation.

The webs, 9, which connect the heads of the auxiliary valve, are cut-away, as at 17, to form a saddle which receives the upper portion of the slide-valve and thus connects the same together for simultaneous movement.

Communicating with the inlet port, 10, are twin feed channels, 18, which extend transversely through the casing or wall of the cylinder, as shown at 18^a, thence longitudinally, as at 18^b, toward the heads, respectively, then upwardly, as at 18^c, laterally, as at 18^d, between the base 19 of the valve-chest and the upper surface of the main casting or cylinder-casing, and finally, extend vertically to the floor of the valve-chest and communicate with longitudinally arranged channeled ducts, 18^e, which are cut in said floor and terminate flush with the inner surfaces of the heads of the valve-chest.

20 represents an auxiliary valve mounted in a casing, 21, and provided with a rod or stem, 22. Said valve is tubular in cross-section with closed solid ends, 23, which are perforated at diametrically opposite points to form ports, 24, adapted, in certain positions of the valve, to communicate with the inlet-channels, 18. The valve, 20, is further provided in its underside with a central opening, 25, which communicates directly with the exhaust-port, 12, and with exhaust-openings, 26, which are arranged to alternately register with exhaust-channels, 27, communicating with the slide-valve chest. These channels extend vertically from the auxiliary valve, as shown at 27^a, thence laterally, as at 27^b, between the base 19 and the main cylinder casing, and vertically, as at 27^c, to communicate with channeled ducts, 27^d, terminating short of the heads, 6.

Supplemental feed-ports, 28, which are arranged in a different vertical plane from the main feed-ports, 16, tap the main cylinder flush with its heads, or between the terminals of the main feed ports and the heads, as shown clearly in Fig. 1, and terminate at their inlet ends in the valve-seat adjacent to the main ports. The slide-valve is provided with a lateral wing, 29, to cover and close either of the supplemental ports.

Loosely connected to the auxiliary valve stem is a rocking trip-lever or tappet, 30, the terminals of the opposite arms, 31, of which are arranged in the path of, and are adapted to be engaged and tripped by, a trip detent or collar, 32, to give the necessary reciprocation to the auxiliary valve whereby it is reversed at the end of each stroke of the piston.

The construction of the auxiliary valve is such as to permit of the end of its casing being closed by a removable steam-tight stuffing box, 33, and hence, after disconnecting said stuffing-box, the valve may be withdrawn from within the casing for the purpose of cleaning or repairing, thus obviating the necessity of opening the cylinder. Furthermore, it will be obvious from the above description that the cap forming the main portion of the slide-valve chest may be detached from the valve-seat to give access to the piston and slide valves.

The operation of the apparatus is as follows:—With the parts in the positions shown in Figs. 1 and 4, in which the piston is shown at one end of its stroke and the auxiliary valve having been just reversed by the action of the trip-mechanism, the main feed port, 16, at the adjacent end of the cylinder which has just been acting as the exhaust port from the cylinder, is closed by the piston, the main port, 16, at the opposite end, which has been acting as a supply port, is closed or rather idle, the steam channel, 18, is opened to establish communication between the valve-chest and the inlet-port, 10, and the exhaust-channel 27 is opened to establish communication between the opposite end of the valve-chest and the exhaust-port, 12, whereby the full force of the live steam is directed against the end of the auxiliary valve, thus moving the latter to its opposite position, connecting the former supply port, 16, with the exhaust-port 12, and exposing the former exhaust port, 16. The said movement of the slide-valve simultaneously opens the main feed-port, 16, and the adjacent supplemental port, 28, whereby steam is fed through the supplemental port to the cylinder to start the piston on its return movement, and communication is established through the main feed-port when the piston has moved a sufficient distance to expose its impact end thereto. As the piston approaches the end of a stroke, the adjacent main feed-port, 16, which has been acting as an exhaust-port, is closed, and as the corresponding supplemental port, 28, is covered by the wing of the slide valve in the position it then occupies, the body of steam which is inclosed between the forward face of the piston and the head of the cylinder forms a cushion to prevent pounding of the piston.

It will be understood that the channeled ducts, 18^e, and 27^d, which are formed in the floor of the valve-chest, serve as means of communication, respectively, with the ports 18 and 27, in order that steam may pass from the ports 18 to the chest and from the chest to the ports 27 continuously during the movement of the auxiliary-valve. The ducts, 27^d, terminate short of the heads, 6, preferably about three sixteenths of an inch in order to form a cushion to prevent the pounding of the auxiliary valve.

Having thus fully described my invention,

what I claim, and desire to secure by Letters Patent, is—

1. In a steam actuated valve mechanism, the combination, with the cylinder casing; of
5 an auxiliary valve seat formed in said casing; an auxiliary valve fitted therein; a valve-stem carried by said auxiliary valve and projecting to the exterior of the casing; and a removable steam-tight stuffing box fitted to
10 the opening through which the valve-stem projects.

2. In a steam actuated valve mechanism, the combination of a cylinder; ports communicating with the cylinder; a slide valve
15 controlling said ports; an auxiliary valve operatively connected to the slide valve; steam channels connecting the main inlet port with the casing of the auxiliary valve; an auxiliary valve intercepting said steam channels
20 and provided with a cavity communicating with the main exhaust and diametrical openings adapted to register alternately with said channels; and means for operating the auxiliary valve.

3. In a steam-actuated valve mechanism, the combination of a cylinder; ports communicating therewith; a slide-valve controlling
25 said ports; an auxiliary valve operatively connected to the slide valve and having separated heads forming an intervening space bounded upon one side by the slide-valve
30 seat, the main inlet port being in communication with said space; steam channels connecting the main inlet port with the chest of the auxiliary-valve outside of the separated heads; an auxiliary valve intercepting the
35 steam channels; and means for operating the auxiliary valve.

4. In a steam actuated valve mechanism, the combination of a cylinder having steam
40 ports formed in its wall; a cylindrical valve chest surmounting the cylinder and inclosing a slide-valve seat; an auxiliary valve arranged in said valve chest and having separated
45 heads forming an intervening space above the valve seat with which the main inlet port communicates; a slide valve operatively connected to the auxiliary valve and mounted upon the valve seat to control said steam
50 ports; steam channels connecting the main inlet ports with the ends of the valve chest; an auxiliary valve intercepting the steam channels and having a cavity communicating with the main exhaust; and means for oper-
55 ating the auxiliary valve.

5. In a steam actuated valve mechanism, the combination of a cylinder; a valve-chest; steam ports connecting said chest at its center with the cylinder; a main inlet port com-
60 municating with the center of the valve chest; steam channels connecting the main inlet port with the ends of the valve chest; an auxiliary valve intercepting and controlling the steam channels and operatively connect-
65 ed with the piston rod; and an auxiliary valve arranged in the valve chest and carry-

ing a slide valve to control the steam ports, said auxiliary valve comprising spaced heads located upon opposite sides of the inlet ends of the steam ports.

6. In a steam actuated valve mechanism, the combination of a cylinder; a steam actuated valve; steam ports connecting the cylinder with the chest of the valve; and steam
70 channels communicating with the valve chest, said ports and channels being arranged in different planes and out of communication; a slide valve operatively connected to the steam actuated valve and controlling said
75 ports; and an auxiliary valve operatively connected to the piston and intercepting the channels, said auxiliary valve being located below the plane of the slide-valve seat and in a casing formed in the wall of the cylinder.

7. In a steam actuated valve mechanism, the combination, with a cylinder; a valve
85 chest; ports connecting said cylinder and chest; an auxiliary valve carrying a slide valve to control said ports; and main inlet and exhaust ports; of channels connecting
90 the main inlet port with the valve chest; a tubular auxiliary valve intercepting those channels which communicate with the extremities of said chest, and having its bore in communication with the main exhaust, the
95 casing of said auxiliary valve being formed in the wall of the cylinder and provided with a removable cap equal in diameter to the auxiliary valve; and means for operating said auxiliary valve, whereby the intercepted
100 channels are opened to apply the full head of steam to the piston valve when the exhaust from the cylinder is cut off by the piston head.

8. In a steam actuated valve mechanism, the combination of a cylinder; steam ports
105 communicating therewith and terminating in an intermediate valve seat; the main inlet port communicating with a valve chest located above said seat; steam channels com-
110 municating with the main inlet port, extending transversely beyond the vertical plane of said steam ports, longitudinally toward the ends of the cylinder, and vertically to the extremities of the valve chest; an auxiliary
115 valve intercepting the vertical portions of said channels and operatively connected to the piston; and an auxiliary valve arranged in said valve chest and carrying a slide valve to control the steam ports.

9. In a steam actuated valve mechanism, the combination of a cylinder; a valve chest
120 surmounting the cylinder; ports communicating with the cylinder at its extremities and converging and inclining upwardly toward their inner ends to an intermediate
125 valve seat; a main inlet port communicating with the center of the valve chest; steam channels communicating with the main inlet port below the plane of the inner ends of the
130 steam ports, extending horizontally under said inner ends, longitudinally toward the ex-

tremities of the cylinder, and vertically to communicate with the extremities of the valve chest; an auxiliary valve intercepting the vertical portions of the steam channels and
5 operatively connected to the piston; and an auxiliary valve carrying a slide valve to control the steam ports.

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

THOMAS J. PIERS.

Witnesses:

LAWRENCE O. MALLERY,
ALLEN W. MALLERY.