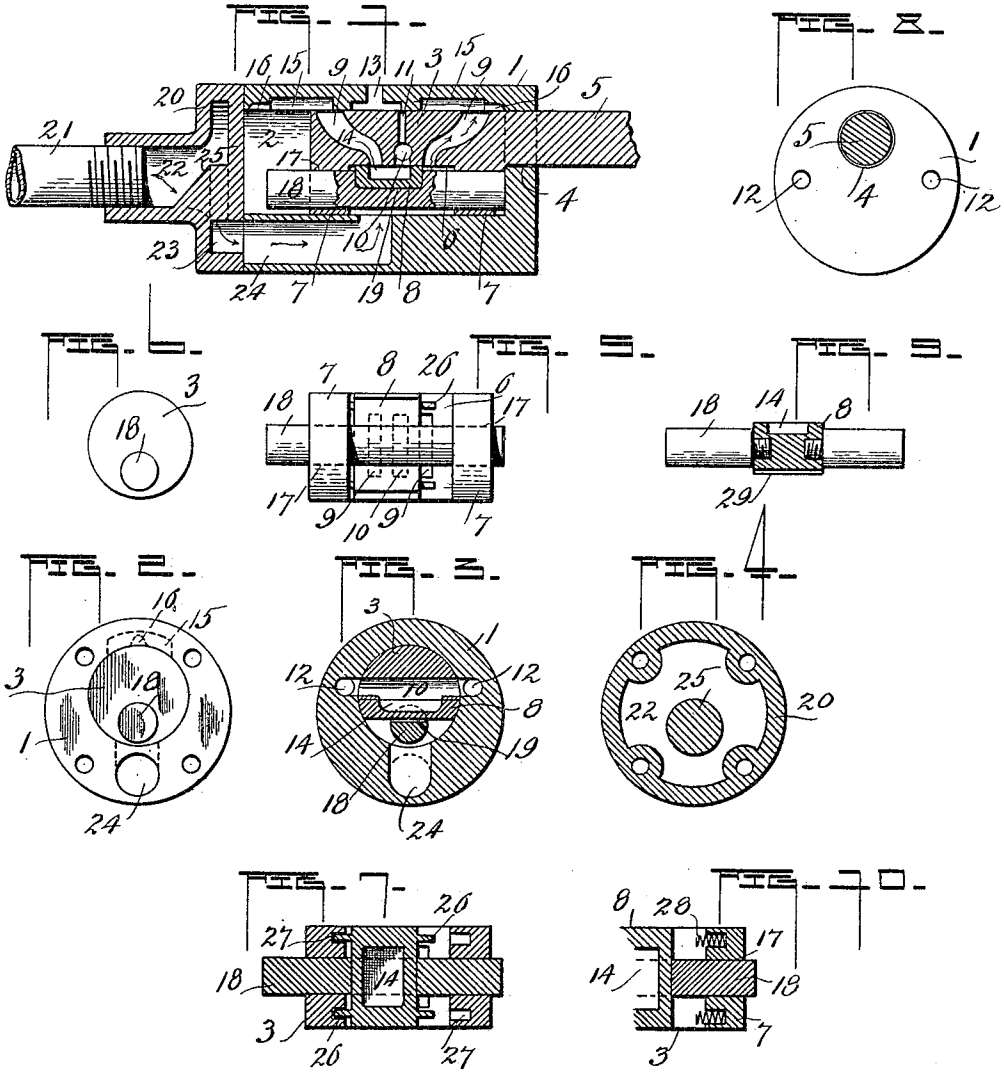
No. 819,727. PATENTED MAY 8, 1906.

C. L. CHARVAT.

STEAM TOOL.

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UNITED STATES PATENT OFFICE.

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STEAM-TOOL.

No. 819,727. Specification of Letters Patent. Patented May 8, 1906.

Application filed November 25, 1902. Serial No. 132,729.

To all whom it may concern:

Be it known that I, CHARLES L. CHARVAT, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Steam-Tools; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention has reference to a tool operated through the instrumentality of steam, compressed air, or like medium.

The object which I have in view is to provide a power device to which may be attached suitable means for tube-cleaning purposes or employed as a pneumatic tool in various ways.

The invention and its uses are fully disclosed in the following specification, of which the accompanying drawings form a part, in which the separate parts of my improvement are designated by the same numerals of reference in each of the views, and in which—

Figure 1 is a longitudinal section of my device, showing its connection with means supplying steam, compressed air, or like medium to the same. Fig. 2 is an end view of the cylinder portion of the device. Fig. 3 is a cross-section of the same. Fig. 4 is a cross-section through the cylinder-head. Fig. 5 is a plan view of the piston and its component parts. Fig. 6 is a view of one end of the piston. Fig. 7 is a longitudinal cross-section through the piston and its valve parts. Fig. 8 is a front elevation of Fig. 1 with an extension of the piston in cross-section, and Figs. 9 and 10 illustrate detail views showing modifications.

The tool comprises a member 1, which serves the purpose of a steam-cylinder, having a cylindrical chamber portion 2, in which is operatively carried a piston 3, adapted to have a reciprocal movement imparted thereto. The chamber 2 and the piston 3 have their axial centers disposed to one side of the central bearing-line of the member 1, as shown, and in the forward end of the member 1 is provided an aperture 4, through which extends a reduced stem portion 5 of the piston 3, and it is to the end or some portion of the stem 5 that it is designed to attach operative devices to be actuated by the piston. The nature of the devices or their connections with the stem 5 are immaterial. As stated above, the tool itself is designed for various purposes, and I do not wish to be confined to the nature of the devices to be attached to the stem 5 nor to the uses of which the machine itself is adapted.

The piston 3 is provided with a transversely-arranged seat portion 6, leaving the extended portions 7, and 8 is a slide-valve operatively carried in the seat portion 6 and adapted to be shifted so that its opposite sides will alternately abut with the inner faces of the portions 7. The piston is further provided with ports 9, alternately employed as inlet and exhaust ports and communicate with the slide-valve 8 in the manner shown in Fig. 1, and 10 is an exhaust-port passing transversely through the piston, and communicating therewith is an exhaust-port 11, extending at right angles to the port 10. The exhaust-port 10 is arranged to intermittently and alternately receive exhaust-steam through the ports 9, and the exhaust-steam passing through the port 10 will enter oppositely-arranged exhaust-ports 12, extending longitudinally in the walls of the member 1 and open out of the end of the member and are so arranged that the port 10 will communicate with the ports 12 at all times, and a further means of exhaust is provided by the port 11, which communicates with an exhaust 13, opening out of the side of the member. (See Fig. 1.)

The slide-valve 8, which is operatively carried in the transverse seat portions 6, is designed to alternately open or close the ports 9 and is provided with a depressed body part 14, forming a chamber for steam passing through the ports 9 into the ports 10. The ports 9, which, as stated, serve the purpose of inlet and exhaust ports, open out of the side of the piston and, as shown, converge from a point adjacent to the exhaust-port 10 to a point near the opposite ends of the piston. Where the ports 9 open out of the piston they communicate with chambered portions 15, which are of suitable depth, width, and length, and both of said chambers are provided with reduced or contracted depressed or chambered portions 16, the function of which will hereinafter be more clearly described.

In the portions 7 of the piston I provide longitudinal apertures, (indicated as 17,) and operatively carried through these apertures and extending longitudinally of the piston and crossing the seat portion 6 thereof is a rod or stem 18, which, as shown, is longer

than the length of the piston, for a purpose to be set forth, and the said rod has a transversely-arranged cut-out or seat portion 19, in which is seated the slide-valve 8, whose movement is controlled and governed by the movement of the stem 18, as will become apparent.

20 indicates a head portion of the same diameter as the member 1 and abuts against the end of the member 1 for closing the open end of the chamber 2 and is bolted or otherwise suitably secured thereto. This head is designed to have attached to it an inlet-pipe 21 or similar device for supplying motive medium for actuating the piston, and the head 20 is provided with a chamber portion 22, communicating with a port 23 of the same, which in turn communicates with a port 24, extending longitudinally in the wall of the member 1, which at a suitable point opens out into the chamber 2 and does at all times admit motive medium into said chamber and into the seat portion 6 of the piston 3, (see Figs. 1 and 3,) and 25 indicates a reinforcing-block suitably disposed within the chamber 22 and serves to strengthen this portion of the inner face of the head, which is engaged by the end of the rod 18 in its movement, all of which will be more readily set out hereinafter.

To relieve the jar upon the rod 18 and the valve, I have provided upon opposite sides of the valve 8 the short stems 26, which as the valve reaches the end of its stroke in either direction will enter chambers 27, formed within the portions 7 of the piston. This feature in the device may be used or not, as desired, as the machine will operate without it, or instead of the pins 26 I may employ compression-springs 28 in the openings 27 to be engaged by the side walls of the valves. (See Fig. 10.) It will also be noticed that the stem 18 is of one piece throughout and has a seat portion for the reception of the valve. This may be modified to the extent of providing two short stems 18, suitably attached to the valve in manner shown in Fig. 9, and employ a valve whose outer face will be flush with the surface of the piston and be provided with a groove 29 in its outer face for the passage of steam around the valve that it may enter the ports 9.

In the operation of the device it will be understood without further description the manner in which motive power is admitted through the ports 9 for shifting the piston 3. The piston through its peculiar construction, the purposes for which it is used, and the mode of applying motive medium thereto is designed to move with almost uniform speed from the beginning to the completion of its stroke. Then, again, the movement of the piston is instantaneously stopped when the device which connects with its stem 5 delivers its blow. The stop is so violent that the piston rebounds instantly. The valve has by this time been shifted to a position which will cause the motive medium to force the piston in an opposite direction. The rebound just referred to is so violent that were it not for the pin or stem which controls the position of the valve and retains it in its correct position by the motive medium which is permitted to act thereon the piston would bound away from the valve, and thereby change the position of the ports relative to the position of the valve, and such a transposition of the ports would seriously interfere and altogether destroy the machine for successful operation.

Attention is now directed to the ports 9 in the piston, which, it will be observed, pass from what may be termed the "steam-chest" to the opposite side of the piston and not to the ends. Were the ports to open at the ends of the piston-head instead of the side the uses for which this machine is intended would be destroyed. It will be observed that where the ports open out of the piston-head they each open into or communicate with the chambers or pockets 15 in the cylinder or member 1, which have a varying depth at one end of the contracted portions 16, as described. This arrangement permits the device connected with the stem 5 of the piston to give the varying stroke. For instance, if the device which is attached to the stem 5 is to be operated within a boiler-tube and if the tube has a piece welded to it when the means employed engages the wall of the tube where the weld occurs the length of the stroke by reason of such welding will be materially shorter than a stroke where there is no weld, and in water-tube boilers where the scale may vary from a sixteenth of an inch thick at one point to a half-inch at others the necessity for a varying stroke will become apparent. Now then were the ports 9 to open out of the ends of the piston-head the varying stroke, which is absolutely necessary, as explained, and is found necessary in tools in this character, it could not be accomplished, as the motive medium emerging from the ports would act under full pressure against the piston-heads as soon as the valve was shifted; but by placing the ports as shown in the drawings and by the arrangement of the contracted or reduced chamber portions 16 of the chambers 15 the full force of the motive medium can only be applied against the piston-head when the ends of the piston have moved away from the contracted portions 16 and is coincident with the deeper portions 15, and by applying the motive medium in this manner, so as not to permit the same to act on the piston-head its entire stroke, the varying stroke of the piston desired may be obtained. The valve 8 after once shifted is not reshifted for a return stroke of the piston until the face of the piston-head has passed

the deeper part of chambers 15 or member 1 and is coincident with the shallow or contracted portions 16 thereof. When this point is reached in the movement of the piston, it will be observed that the port for admission of the motive medium to act on the piston-head is wide open; but the piston-head together with the shallow portion 16 of the chamber 15 form what might be termed an "auxiliary" valve and almost prevents the motive medium from entering behind or in front of the piston, where it is next to act thereon. From this point on to the cylinder-head the piston will have a varying stroke, if necessary, as just enough motive medium will be admitted through the shallow portions 16 to assist the rebound of the piston and to act slightly on the stem or rod carrying the slide-valve. In the rebound the piston is carried over until one end of the said piston is coincident with the deeper part of the chamber in the member 1, or that chamber designated as 15, when it will be acted on by a full force of the motive medium.

The above explanation of the operation and usefulness of the device is to bring out the differences of the machines usually employed in engine construction and the construction herein, and it is not thought necessary to go into detail and explain the stroke which is ordinarily obtained in a piston in the usual engine construction.

I am aware that an attempt has been made and a patent issued where the operation of a valve is to some extent controlled by loosely-carried rods which engage the cylinder-heads of the engine, and it is hardly necessary for me to state that with such a construction my device would be entirely inoperative, as no regularity of movement such as I aim at and obtain could be acquired by loosely-carried pins, as they would never be in position to engage the valve and to shift it at its proper time and would more or less leave the valve to move freely on the rebound of the piston, all of which, it is believed, will be understood.

I am aware that various changes may be made in the construction and combination of features as herein employed and that details may be resorted to, and I do not wish to be confined to the details herein nor to the employment of my device in its operative connection with means actuated directly or indirectly connected with the piston.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a device of the character described, the combination of a member having a cylinder portion and an inlet-port leading into the body of the cylinder and oppositely-disposed exhaust-ports leading from the cylinder and longitudinally disposed in the walls of said member, a piston operatively carried in the member having inlet-ports adapted to alternately communicate with the inlet of the member and a transverse exhaust-port having communication with the exhaust-ports of the member, a slide-valve controlling the inlets of the piston and means for controlling the movements of said valve, substantially as specified.

2. In a device of the character described, the combination of a member having a cylinder portion and an inlet-port leading into the body of the cylinder and exhaust-ports leading from the cylinder and longitudinally disposed in the walls of said member, a piston operatively carried in the cylinder having steam-ports opening out of its side, chambers in the walls of the cylinder disposed at its ends and communicating with the ports of the piston, a valve, and a stem carrying the valve movable independent of the movement of the piston, substantially as specified.

3. In a device of the character described, the combination of a steam-cylinder having reduced chambers formed in the opposite ends thereof, a piston operating in said cylinder having ports communicating with the chambers of the cylinder, a slide-valve movable in said piston and means carried by the piston operatively connected with the valve adapted to actuate the same in advance of the return movement of the piston, substantially as described.

4. A tool for the purposes herein, comprising a member having a cylinder portion, a piston operatively carried in the member having inlet and exhaust ports communicating with chambered or recessed portions of the member, and each chamber having reduced or contracted portions, a stem reciprocally arranged in the piston and a slide-valve having a positive connection with the stem which controls the movements thereof for opening or closing the ports of the piston.

5. A tool for the purposes herein, comprising a member having a cylinder portion, a piston operatively carried in said cylinder having a stem disposed to one side of its axial center to which is designed to be attached a suitable tool, also having inlet and exhaust ports opening out of its side, recessed portions of the wall of the cylinder communicating with the inlet-ports of the piston, a stem operatively carried in the piston having protruding ends arranged for engagement with the end walls of the cylinder in advance of the piston and a slide-valve having a positive connection with the stem and controlling the ports of the piston, substantially as described.

6. In a tool for the purposes described, the combination of a cylindered member having operatively carried therein a piston having inlet and exhaust ports opening out of its sides and provided with an extension disposed to one side of its axial center designed

to have attached thereto a suitable tool, chambers 15 suitably disposed in the walls of the cylinder having contracted portions 16 designed to retard the motive medium as it acts on the piston during a portion of its stroke, a reciprocal stem passing through the piston carrying a slide-valve adapted to alternately open and close the ports of the piston, substantially as described.

7. The mechanism for controlling the movements of a tool of the character described, comprising a piston operatively carried in a suitable member having steam-ports opening out of its side, chambers in the walls of the member disposed at opposite ends thereof and communicating with the ports of the piston, a slide-valve, a stem, operating longitudinally in the piston having a portion overlying the valve, the ends of the stem arranged to engage the walls of the member in advance of the piston for shifting the valve for closing one inlet-port and partially opening the other whereby the piston may be returned immediately upon its reaching the end of its stroke, substantially as and for the purposes described.

8. In a device of the character described, the combination of a steam-cylinder having oppositely-disposed chambers in its wall and contracted portions of said chambers, a piston operating in said cylinder having suitable steam-ports, a valve, and a stem carrying the valve movable independent of the movement of the piston, substantially for the purposes set forth.

9. In a device of the character described, the combination of a steam-cylinder having chambers disposed in its walls at opposite ends thereof, a piston operating in said cylinder having ports communicating with the chambers of the cylinder, a slide-valve, and means for relieving the blow of the valve as it abuts with portions of the piston, and a stem carrying the valve and controlling the movements thereof, substantially as described.

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

CHARLES L. CHARVAT.

Witnesses:

CHAS. W. LA PORTE,

ADA B. LA PORTE.