

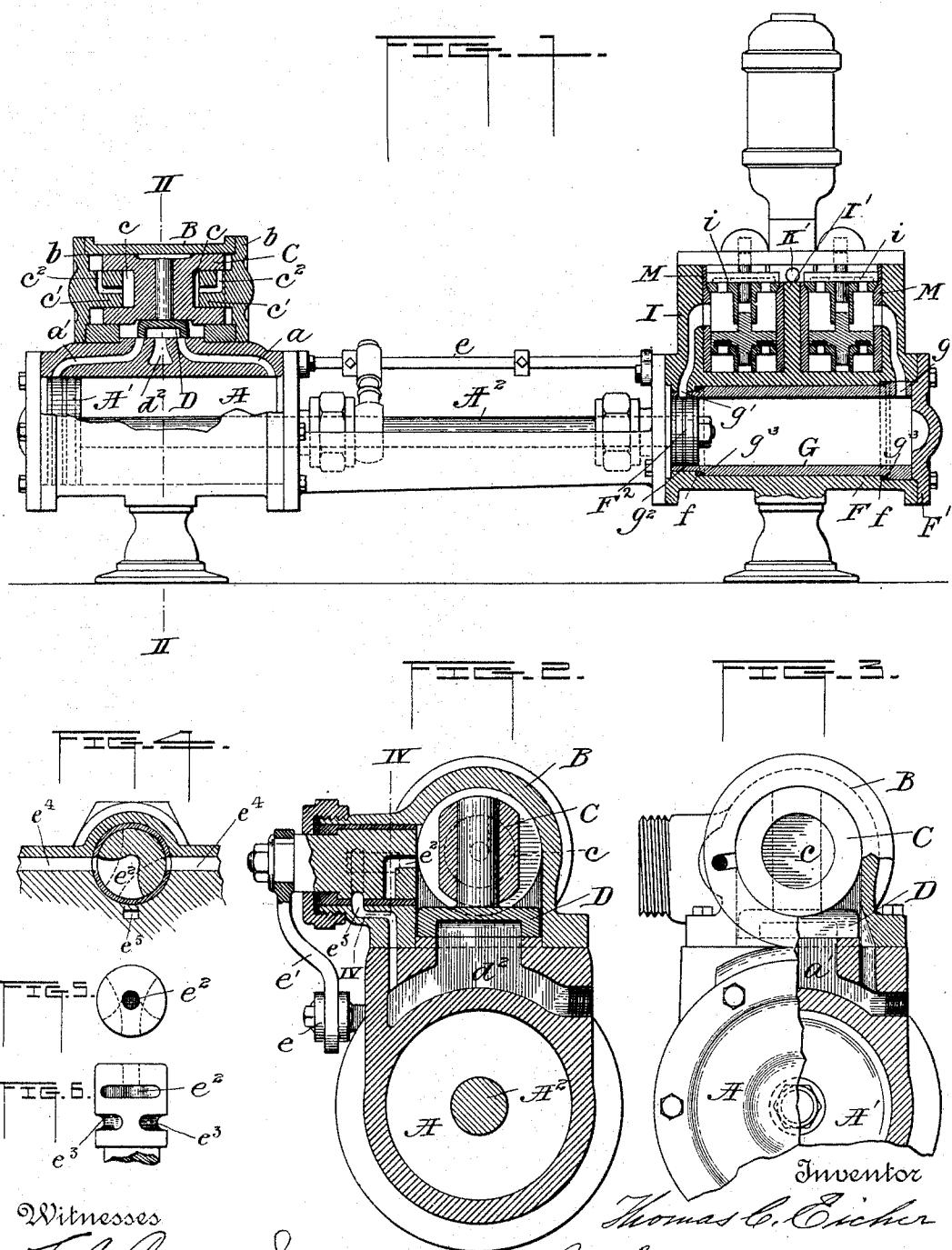
(No Model.)

2 Sheets—Sheet 1.

T. C. EICHER.  
VALVE FOR STEAM PUMPS.

No. 490,140.

Patented Jan. 17, 1893.



Witnesses

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Chas. E. Riordon.

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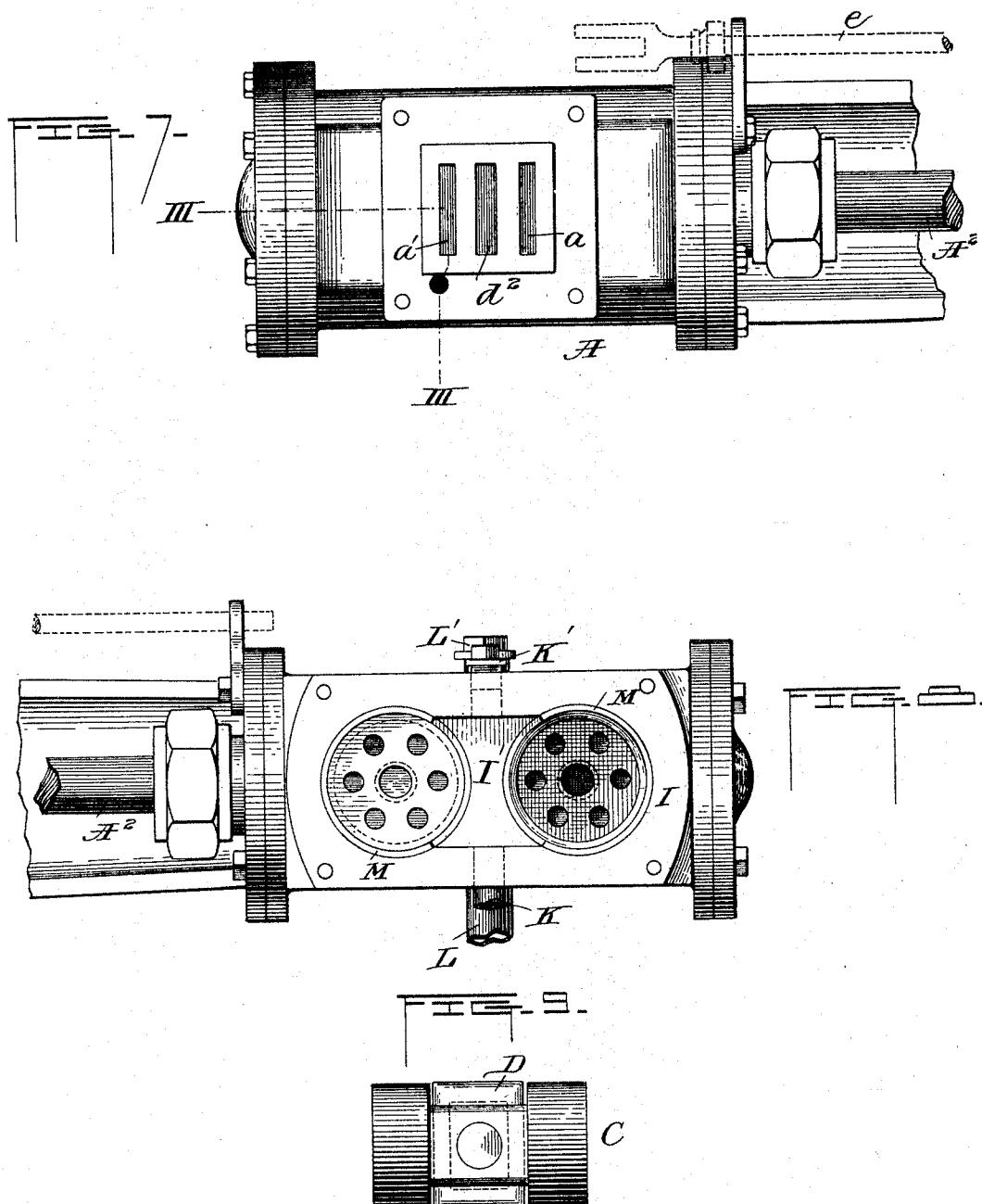
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# UNITED STATES PATENT OFFICE.

THOMAS C. EICHER, OF SCOTTDALE, PENNSYLVANIA.

## VALVE FOR STEAM-PUMPS.

SPECIFICATION forming part of Letters Patent No. 490,140, dated January 17, 1893.

Application filed February 23, 1892. Serial No. 422,490. (No model.)

To all whom it may concern:

Be it known that I, THOMAS C. EICHER, a citizen of the United States, residing at Scottsdale, in the county of Westmoreland and State 5 of Pennsylvania, have invented certain new and useful Improvements in Valves for Steam-Pumps; 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 10 the art to which it appertains to make and use the same.

My invention relates to improvements in valves for steam pumps, and has especial reference to the class of pumps used for pumping 15 water out of mines and other underground excavations, although of course it is adapted to be used for various purposes.

It has heretofore been proposed to actuate the valves of steam pumps by admitting steam 20 alternately at opposite ends of a piston valve controlling the main valve of the engine, and at the same time cushioning the piston valve near the completion of its stroke by admitting live steam at the end of the chest toward 25 which the valve is moving; but it has been found in practice that the action of the valve is irregular and that when the main valve is suddenly shifted and thrown wide open, the live steam is admitted to the working piston 30 so freely as to immediately exert its full force in effecting the reverse movement of the piston thereby thrusting or forcing the piston forward or back with a sudden start or jerk which endangers the working parts of the machinery and produces an irregular and thumping 35 action of the pump.

The principal object of my invention is to overcome such objections, and to provide mechanism for effecting an easy and smooth 40 action of the valves and piston, which I accomplish by admitting steam to the working cylinder in such manner as to exert a gradually increasing force in effecting a reversal of the engine and at the same time cushioning 45 the valves and piston so as to avoid thumping and produce a noiseless, easy running steam pump.

The invention will first be described in connection with the accompanying drawings, 50 which form a part of this specification, and then particularly pointed out in the claims at the end of this description.

Referring to the drawings, in which similar letters of reference are used to denote corresponding parts of the machine, Figure 1, is a longitudinal sectional elevation of a machine embodying my invention; Fig. 2, is a transverse section of the same taken on line II—II of Fig. 1; Fig. 3, is an end view partly in section looking in the direction of the arrow at the left of Fig. 1; the section being taken on the line III—III of Fig. 7; Fig. 4 is a detail sectional view on the line IV—IV of Fig. 2; Fig. 5 is an end view, and Fig. 6 a plan of the oscillating valve; the valve stem being 65 broken away in Fig. 6; Fig. 7 is a plan of the engine cylinder and attachments, the valve chest being removed; Fig. 8 is a similar view of the pump cylinder and attachments, the valve chest and air chamber being removed; 70 and Fig. 9, is a plan of the steam-actuated piston-valve with slide valve attached.

A, denotes the engine cylinder with piston A' working therein.

a, a', are the steam passages and d<sup>2</sup> the exhaust passage of the usual construction.

B, denotes the valve chest within which works the steam-actuated piston-valve C, to which may be secured in any suitable manner the main slide valve D, of the usual construction. The ends of the piston-valve C, are recessed or socketed as at c, to receive the piston plugs c', which may be secured to the cylinder heads b, but are preferably formed integral with said heads of the valve chest. 85 These plugs are provided with steam ports or ducts c<sup>2</sup>, which connect the valve recesses or sockets c, with the space within the valve chest intermediate the ends of the plugs, as shown in Fig. 1.

E, is an oscillating valve, which may be of the usual or any preferred construction, and which is adapted to be automatically actuated by the movements of the working piston A', by means of the valve actuating rod e, connecting in the usual manner with the piston rod A<sup>2</sup>, and with the vibrating arm e' of the oscillating valve. The valve E, communicates by means of suitable ports e<sup>2</sup>, e<sup>3</sup>, and ducts e<sup>4</sup>, e<sup>5</sup>, with the spaces between the heads b, and the ends of the piston valve C, and the exhaust d<sup>2</sup>, respectively, for the purpose of alternately admitting and exhausting the steam for actuating the piston valve so

as to shift the slide valve which controls the steam passages leading from the interior of the valve chest to the main cylinder in the usual manner.

5 F, denotes a pump cylinder within which is fitted a removable bushing G, of bronze, which is designed to be used as a protection to the iron of the cylinder when pumping sulphur-water in mines. The bushing G is provided with ports g, g' at the ends thereof communicating with the water passages leading to the valve chambers mounted upon the pump cylinder, and is formed with a reduced end portion g<sup>2</sup>, and exterior circumferential shoulders g<sup>3</sup>, which are adapted to abut against corresponding interior shoulders of the pump cylinder, and between these shoulders are fitted annular packing rings f, of any suitable material. By this means, when 10 the bushing G is inserted within the bore of the cylinder F, with the packing rings interposed between the abutting shoulders of these parts, the bushing may be forced to its seat by the usual screw bolts for securing the detachable cylinder head F' in place, and the packing rings will be compressed and expanded so as to form a water-tight joint at the inner side of the ports g, g', and seal the joints against the admission of water between 15 the bushing and the cylinder. When the bushing becomes worn, it may be readily removed for the purpose of boring and refitting and then replaced for further use.

I, denotes the valve chest mounted upon 20 the pump cylinder F, and provided with the usual puppet valves i, or any preferred form of valve by which the water may be alternately drawn in and forced out of the respective valves through the ports g, g' and usual 25 water passages to the exit port K or K' in the usual manner.

M M, denote removable bronze bushings or linings, which as seen in Figs. 1 and 8, are cut away for a portion of their circumference 30 near their upper ends so as to communicate with the water passage at the top of the valve chest connecting the two chambers. Within the bushings M, M, are seated the puppet valves i, i, in the usual or any preferred manner. By this construction the valve chambers and particularly the division wall I' connecting these chambers are protected from the injurious effects of the sulphur water when the pump is used for pumping out mines and 35 when the bushings become worn so as to require refitting or substitution, they may be readily removed and others placed in their stead.

The operation of my invention is as follows:—In the position illustrated in Fig. 1, the piston valve has been thrown to the right and is receiving the full force of the live steam at the left while being cushioned at the opposite end by the dead steam confined 40 in the recess or socket by the piston plug c; the live steam being permitted to exert its force upon the entire surface or area of the

valve so as to force the valve wide open against the back pressure of the dead steam exerted against the walls of the recess opposite the piston plug only. The main slide valve is also shown as being only partly open so as to admit steam gradually behind the main piston A' which is cushioned near the completion of its stroke by the dead steam 45 confined between the cylinder head and the piston which also assists in imparting the initial return stroke. The object of admitting the steam gradually to the piston cylinder is to prevent thumping, which is occasioned by admitting the full force of the steam on the initial stroke of the piston; it being found in practice that the pump cylinder is not entirely filled with water at each stroke, and until the piston has made a partial stroke, the 50 water is not compact, so that if the full force of the steam is exerted upon the piston in the first instance it will be thrown backward with a sudden jerk or start, thus endangering the working parts of the machine and causing an irregular and thumping action of the pump. When the piston valve shall have thrown the slide valve wide open the working piston will then be in position to exert its full force against a compact column of water in the pumping 55 cylinder. When the piston A' reaches the opposite end of the cylinder the oscillating valve E, will be automatically actuated, through the described connections, so as to permit live steam to enter between the head b, of the 60 valve chest, and the cylindrical end of the piston valve, and start the valve toward the opposite end of the chest and as the duct C<sup>2</sup> begins to be uncovered at one end of the valve the corresponding duct at the opposite end will be immediately covered, thereby admitting the live steam upon the entire area of the valve to oppose the pressure of the dead steam at the opposite end confined within the recess between the piston plug and the 65 inner wall of the recess c. In this manner the piston valve is gradually shifted and poised between the opposing pressures so as to move the main slide valve slowly, and gradually admit steam to the main piston. 70 The pump is double acting, forcing the water at each stroke of the piston F' in the usual manner, and the action of the machine is noiseless, easy and smooth owing to the method of actuating and cushioning the 75 working piston of the engine.

In pumping out mines it is sometimes desirable to reverse the positions of the inlet and outlet pipes, and to this end I preferably provide outlet and inlet pipes K, K', and L, L', at each side of the cylinder F, one pair of which may be plugged, as at K', L', when the opposite side is in action, for the purpose of permitting the inlet and exhaust to be arranged at either side of the pump cylinder, 80 and thus avoid the necessity for reversing or shifting the position of the pumping cylinder and valve chest.

I make no claim in this application to the

pump attachments which form the subject-matter of a divisional application filed July 23, 1892, Serial No. 441,038.

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

1. In combination with the working cylinder and piston the steam actuated valve comprising a piston valve having a recess or socket at each end, the piston plugs fitting said sockets and provided with ducts intermediate their ends communicating with the interior of said sockets, and suitable valves and passages controlling the admission of fluid to the piston valve and working cylinder whereby steam is gradually admitted behind the piston valve at the moment of the reversal of the inlet valve and confined in the recess at the opposite end of the piston valve near the completion of its stroke, for the purpose of cushioning the valve and grad-

ually admitting steam to the working cylinder, substantially as described.

2. In combination with the main cylinder and piston, and suitable valve mechanism for alternately admitting and exhausting the steam therefrom, the slide valve, the piston valve attached thereto having the socket or recess at each end, the piston plugs fitting within said sockets, and provided with ducts intermediate their ends leading from said sockets to the interior of the valve chest and the automatically actuated oscillating valve, all constructed and adapted to operate substantially as described. 35

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

THOS. C. EICHER.

Witnesses:

CHAS. E. RIORDON,  
N. E. McCABE.