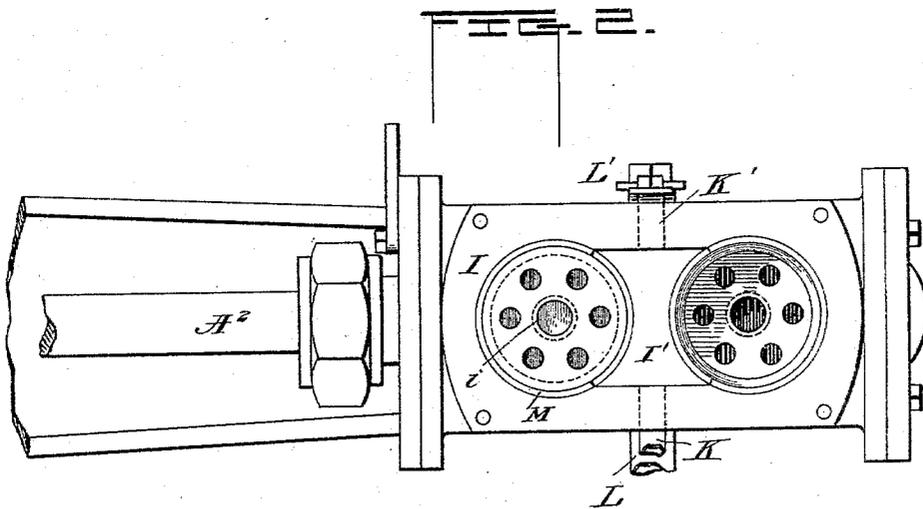
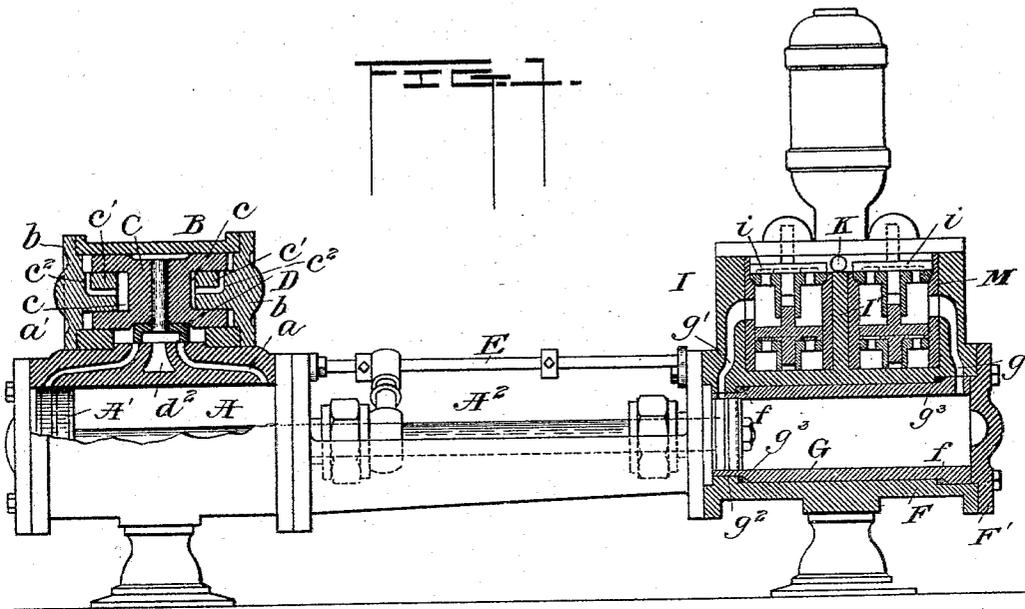


(No Model.)

T. C. EICHER.
STEAM PUMP.

No. 490,141.

Patented Jan. 17, 1893.



Witnesses
L. H. Conner Jr.
Chas. R. Jordan.

Inventor
Thomas C. Eicher
By Butcherworth & Dowell
his Attorneys

UNITED STATES PATENT OFFICE.

THOMAS C. EICHER, OF SCOTTTDALE, PENNSYLVANIA.

STEAM-PUMP.

SPECIFICATION forming part of Letters Patent No. 490,141, dated January 17, 1893.

Original application filed February 23, 1892, Serial No. 422,490. Divided and this application filed July 23, 1892. Serial No. 441,038. (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 of Pennsylvania, have invented certain new and useful Improvements in 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 the art to which it appertains to make and use the same.

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

It has been proposed heretofore to use a bushing or lining for pump cylinders having polished surfaces adapted to fit the bore of the cylinder into which it is forced by hydraulic pressure, and the difficulty has been that when such bushings become worn and need refitting or boring, they cannot easily be removed on account of the tightness of the fit, and as a result the linings are injured to such an extent in removing them as to render them practically useless after removal. To overcome this objection, I propose to provide a removable bronze bushing or lining for the pump cylinder which may be seated and firmly secured within the bore of the cylinder in connection with packing rings arranged so as to form a water-tight joint at each end of the bushing between the inlet and outlet ports; the parts being so arranged that the bushings may be easily removed when worn, and bored and refitted for further use without the loss of time and trouble which is occasioned by removing bushings of the kind now in common use.

The invention will first be described in connection with the accompanying drawings, 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 steam-pump embodying my invention; and Fig. 2,

is a plan of the pump cylinder and attachments, the valve chest and air chamber being removed.

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

a, a', are the steam passages and d² 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. These plugs are provided with steam ports or ducts c², 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.

An oscillating valve, which may be of the usual or any preferred construction 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 A², and with a vibrating arm of the oscillating valve. The latter valve communicates by means of suitable ports and ducts with the spaces between the heads b, and the ends of the piston valve C, and the exhaust d², 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.

The steam actuated valve shown herein forms the subject-matter of a separate application filed in the United States Patent Office on February 23, 1892, Serial No. 422,490, and further description of said valve and connected parts is not deemed necessary herein.

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 near the ends thereof communicating with the water passages g, g', lead-

ing to the valve chambers mounted upon the pump cylinder, and is formed with a reduced end portion g^2 , and exterior circumferential shoulders g^3 , 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 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 any suitable means as for example 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 the bushing and the cylinder. When the bushing becomes worn, it may be readily removed for the purpose of boring and refitting and then re-placed for further use, whereby I secure all the advantages of the usual bushing without the expenditure of time and labor and waste of material incident to present methods of securing and removing such bushings.

I denotes the valve chest mounted upon 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 water passages to the exit port K or K' in the usual manner.

It has heretofore been the usual practice in pumping sulphur water from mines to use valve chambers formed entirely of bronze, but such constructions are very costly, and in order to dispense with bronze chambers I propose to provide removable bronze bushings or linings M, fitting within the usual iron chambers. These bushings as shown are cut away for a portion of their circumference near their upper ends so as to communicate with the water passage at the top of the valve chest connecting the two chambers across the division wall I'. 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 is protected from the injurious effects of the sulphur water when the pump is used for pumping out mines and when the bushings become worn so as to require refitting or substitution, they may be readily removed and others placed in their stead.

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,

and thus avoid the necessity for reversing or shifting the position of the pumping cylinder and valve chest.

The operation of the pump 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 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 confined between the cylinder head and the piston which also assists in imparting the initial return stroke. 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 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 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^2 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 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.

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 valves and working piston of the engine.

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 pump cylinder having the interior circumferential shoulders near the ends thereof, the removable bronze bushing provided with correspondingly arranged exterior circumferential shoulders adapted to abut against the shoulders of the cylinder, and the interposed packing rings and means for detachably securing the bushing within the cylinder, substantially as described.

2. In combination with the pump cylinder provided with ports near its ends communi-

cating with water passages leading therefrom
and interior circumferential shoulders adja-
cent to said ports and between the same, the
removable bronze bushing extending the
5 length of the cylinder and provided with
ports near its ends adapted to register with
the cylinder ports, and with exterior circum-
ferential shoulders arranged to abut against
the shoulders of the cylinder, together with
10 elastic packing rings fitted between said

shoulders and means for detachably securing
the bushing within the cylinder, substantially
as described.

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

THOMAS C. EICHER.

Witnesses:

JOHN RUTHERFORD,
FRED FARLY.