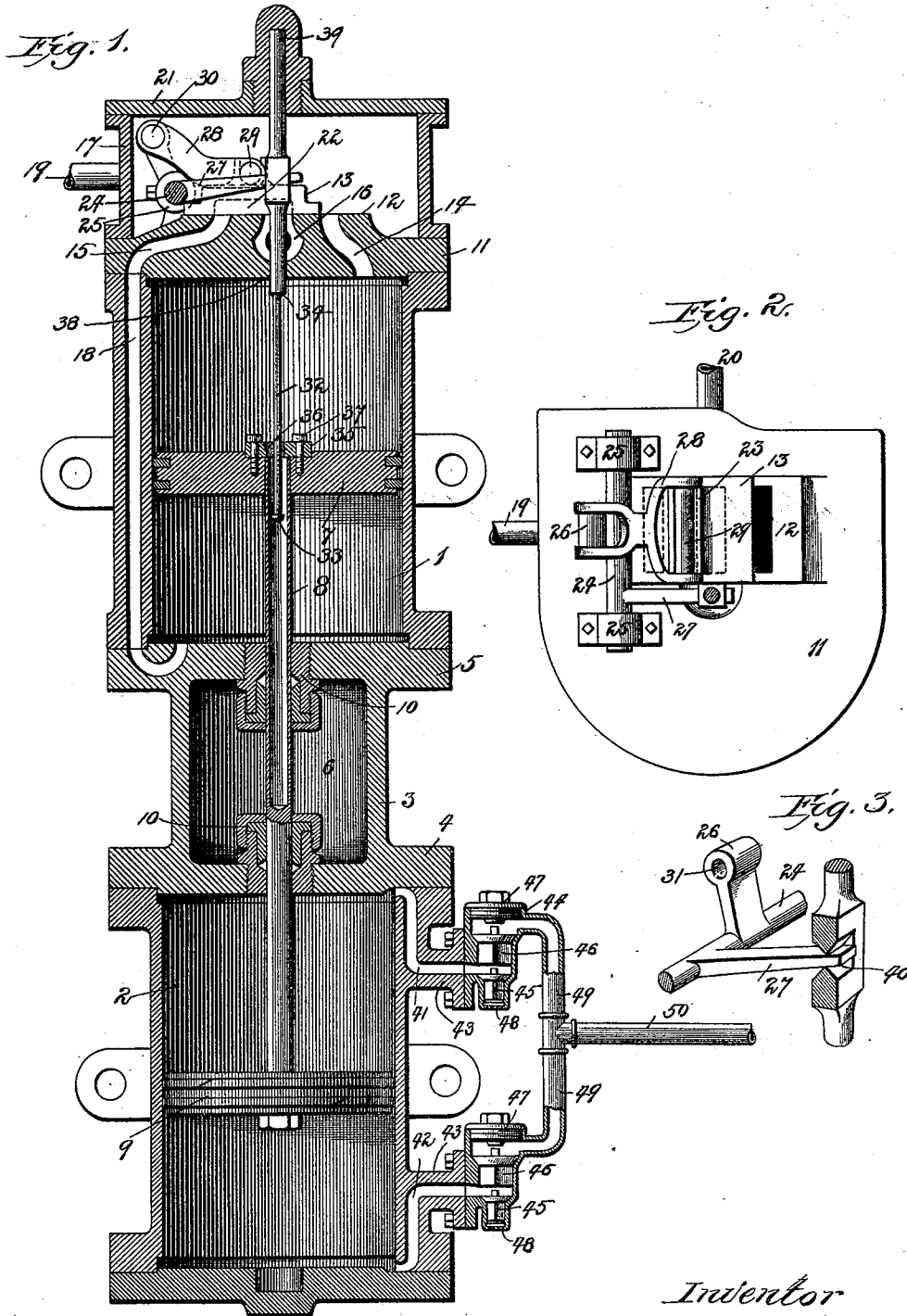


(No Model.)

H. KRENTZ.
STEAM ENGINE FOR AIR PUMPS.

No. 522,065.

Patented June 26, 1894.



Witnesses:
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UNITED STATES PATENT OFFICE.

HENRY KRENTZ, OF ST. LOUIS, MISSOURI.

STEAM-ENGINE FOR AIR-PUMPS.

SPECIFICATION forming part of Letters Patent No. 522,065, dated June 26, 1894.

Application filed May 29, 1893. Serial No. 475,829. (No model.)

To all whom it may concern:

Be it known that I, HENRY KRENTZ, of the city of St. Louis and State of Missouri, have invented certain new and useful Improvements in Steam-Engines for Air-Pumps for Fluid-Pressure Brake Systems, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to an improved steam-engine for air pumps for fluid-pressure brake-systems, and consists in the novel construction, combination and arrangement of parts hereinafter specified and designated in the claim.

The object of my invention is to simplify and cheapen the construction in this class of air pumps.

In the drawings: Figure 1 is a vertical section of my improved air-pump. Fig. 2 is a top plan view of the same, with the steam-chest cover removed. Fig. 3 is a detail view in perspective of a rock-shaft and connections used in moving the slide-valve of the steam-cylinder.

1 indicates the steam-cylinder and 2 the cylinder of the air pump, which are both vertical with their bores in alignment and joined together by a center casting 3 which forms the upper head 4 of the said air cylinder and the lower head 5 of the steam-cylinder. This center-casting is provided with an internal recess of any common shape which I designate by the numeral 6.

7 indicates the piston of the steam-cylinder, which is provided with suitable common packing-rings and located therein and firmly secured upon the upper end of the piston-rod 8.

9 indicates the piston of the air-cylinder, which is also provided with common packing-rings and secured upon the lower portion of the piston-rod 8.

10 indicates suitable stuffing-boxes which encircle the piston-rod 8, and one is secured to the lower head 5 of the steam-cylinder and another is secured to the upper head 4 of the air cylinder and both project into the recess 6 of the casting 3, for an obvious purpose.

11 indicates the upper head of the steam-cylinder which is in the form of a horizontal-plate having upper and lower parallel sur-

faces which are located at a right angle to the bore of the steam-cylinder. The upper surface of the head 11 is constructed in the form of a seat 12 for a common slide valve 13. Formed in this head are steam ports 14 and 15 and an exhaust port 16, which are relatively arranged therein in the usual manner, with the exception that the upper end of the port 14 communicates with the interior of the steam-chest 17, while its lower end communicates with the upper end of the cylinder 1, and the upper end of the port 15 communicates also with the interior of said steam-chest, while its lower end communicates with the upper end of a steam-port 18 formed in the wall of the cylinder 1 and extending vertically therein and communicating with the lower end of the said cylinder.

A suitable steam pipe, or a pipe-connection 19 is provided for supplying steam to the steam-chest, and a suitable exhaust pipe or exhaust connection 20 communicates with the exhaust port 16 to carry off the exhaust-steam and discharge same at the usual point. The interior of the steam-chest 17 is of sufficient size to contain and permit operation of the slide-valve 13 and its connections, and said chest is provided with a cover 21.

I desire to state that the steam-chest cover, the steam-chest, and the heads of the steam and air-cylinders are to be secured in position by common bolts or screws. The valve-seat 12 is elevated so as to project upward within the steam chest a distance, and the same is rectangular in plan view as shown in Fig. 2.

The shape of the slide-valve 13 in plan view corresponds to the shape of its seat, and said valve is constructed with the common exhaust-cavity 22, so as to admit steam alternately above and below the steam piston 7 and alternately exhaust steam from above and below said piston, as said valve is moved upon its seat in a horizontal line transversely of the steam-cylinder, by the means presently described. The back of the slide-valve 13 is provided with a bearing 23 which extends transversely of said valve and has its upper side open.

24 indicates a rock-shaft mounted in suitable bearings 25 which project from the upper surface of the upper head 11 of the steam

cylinder, one at either side of the valve-seat within the steam-chest, and this shaft extends transversely of said valve adjacent one end thereof.

5 26 indicates an arm having its lower end fixed upon the shaft 24 intermediate of the bearings 25 so that said arm projects upward.

27 indicates a lever or arm having one end fixed to the shaft 24 and extending substantially at a right angle to said shaft and set substantially at a right angle to the arm 26 with its opposite end free, and so that its opposite end may vibrate and pass above and below the plane of the valve-seat, parallel to one side of said seat.

15 28 indicates a connecting-link or stirrup having a fork at each end. The fork at the inner end of said link 28 is provided with a pin or journal 29 which engages and has a bearing in the bearing 23 on the back of the slide-valve, while the fork at the opposite end of said link is provided with a pin 30 which engages a bearing 31 formed in the arm 26 adjacent the outer end of said arm, so that said link connects said arm 26 to the slide-valve. The piston-rod 8 is hollow or tubular and has an open upper end.

32 indicates the valve operating-rod, the lower end of which is loosely mounted in the bore of the piston-rod 8 and is provided with a head or projection 33. The rod 33 is provided with a shoulder or projection 34 just below the under side of the upper head 11.

35 35 indicates a plate having an aperture 36, and secured upon the upper side of the steam piston 7 by means of suitable bolts or screws 37, with its aperture engaging said rod, so that the plate 35 alternately strikes the head 33 and the shoulder 34 on said rod as said piston approaches the top or bottom of the steam-cylinder. The rod 32 extends upward in a vertical line through an aperture or passage 38 formed centrally of the bore of the cylinder in the upper head 11, and said rod projects upward above the slide-valve seat 12 and its upper end slides in a socket or bearing 39 formed in or attached to the steam-chest cover 21.

40 40 indicates a transverse slot formed in the rod 32 intermediate of its length, and this slot is loosely engaged by the lever 27, which is located therein loosely, so that said lever may oscillate and still be connected to said rod.

41 41 indicates the upper port of the air-cylinder 2 and 42 the lower port thereof. The inner end of the upper port 41 communicates with the air-cylinder above the piston thereof, and the lower port 42 communicates with said cylinder below said piston. The outer ends of these ports are formed in separate necks 43, which are cast integral one upon or adjacent each end of the air-chamber and have vertical aligned faces at their outer ends. Separate valve casings 44 each carrying a suction-valve 45, a delivery-valve 46 and a detachable-plug 47, are connected to the ver-

tical faces of the necks 43. The suction and delivery-valves of each casing are mounted in vertical alignment and are removable from their seats in said casing by detaching the 70 plugs 47.

The operation is as follows: Steam from the boiler being admitted to the steam chest 17 through steam pipes 19, with the parts in the position here shown, enters the steam 75 cylinder above the piston thereof by way of port 14, and drives said piston downward while the steam used on the previous up-stroke of said piston is discharged from beneath the same through the port 18 in the 80 cylinder, the port 15 in the upper head thereof, the exhaust recess 22 in the slide-valve, the exhaust-port 16 in said head, and the exhaust-pipe 20. As the steam piston nears the end of its downward stroke, the plate 35 85 carried thereby comes in contact with the head 33 carried by the rod 32 and draws said rod downward until the slide-valve cuts off the supply of steam through said port 14 on this downward stroke. The lever 27 has its free 90 end thus carried downward, which rocks the shaft 24 and moves the free end of the arm 26 inward, and said arm carrying with it the link 28, moves the slide-valve 13 toward the right hand and first cuts off the supply of 95 steam through the port 14, then the exhaust cavity 22 of the slide valve is brought over said port 14 and the steam used on this downward stroke is exhausted through said port 14, said exhaust cavity, the exhaust port 100 16 and the exhaust pipe 20. Meanwhile, at about the same time that the port 14 is placed in communication with the exhaust pipe, the slide valve uncovers the port 15 and again admits steam beneath said piston, and so on. 105 During the upward stroke of the steam-piston, as the same nears the limit of said stroke, the plate 35 strikes the shoulder 34 of the rod 32 and throws the free end of the lever 27 upward, with a result the reverse of that just 110 stated when said rod is moved downward. The upward movement of the air-piston 9 causes the lower suction-valve 45 to lift from its seat, and causes air to be drawn through the series of straining apertures or holes 48 in 115 the lower valve-casing beneath said suction valve, thence past the valve and through the port 42 into said cylinder. The downward movement of the air-piston closes the suction valve 45 just mentioned and drives the air 120 contained in the cylinder below the piston out through the port 42 past the delivery valve 46 in the lower valve casing, by way of pipe connections 49 to the delivery pipe 50. In a similar manner, downward movement of the 125 air piston draws air into the upper end of the cylinder through the upper port 41, past the upper suction valve 45, lifting the same. The air on the upper side of the air-piston is being forced outward through the upper port 41 dur- 130 ing the upward stroke, and closes the upper suction valve 45 and opens the upper discharge

valve 46 and passes by way of pipe connection 51 to the same discharge pipe 50 to which the pipe connection 49 is connected.

5 The above described construction and rela-
 5 tive arrangement of the separably detachable
 upper and lower valve casings, form a very
 desirable and convenient arrangement, as
 either of same may be detached without dis-
 10 turbing the other for purposes of repair, clean-
 ing and the like. The valves in each casing
 are detachable by upward movement by re-
 moving the plug 47 which is located in align-
 ment with the valves contained therein and
 above same.

15 What I claim is—

In a steam-pump, the combination of two
 separate cylinders arranged vertically with
 their bores in alignment, one of the same be-
 ing a steam cylinder, pistons located in said
 20 cylinders, a hollow piston rod connecting said
 pistons, a slide-valve seat, having steam and
 exhaust ports and located upon the upper
 head of said steam cylinder with its face hori-
 zontal, a steam chest inclosing said valve seat,
 25 a slide-valve mounted in said steam-chest
 upon said valve-seat, said valve having a
 bearing for a pin or journal upon its back, a
 rock shaft 24 mounted in bearings within said

steam-chest adjacent one end thereof, an arm
 26 having its lower end fixed upon the shaft 30
 24, a lever 27 having one end fixed to the
 shaft and extending at an angle thereto, a
 connecting-link connecting said arm 26 to the
 bearing on the back of the valve, a valve-op-
 erating rod 32, the lower end of which is 35
 loosely mounted in the hollow piston rod and
 provided with a head or projection 33 there-
 in, a plate 35 having an aperture 36 and se-
 cured upon the upper side of the steam-pis-
 ton with its aperture engaging said rod, a 40
 shoulder or projection 34 formed upon said
 rod just below the upper head of the steam-
 cylinder in the path of said plate, said rod ex-
 tending upward through an aperture or pas-
 sage formed in the upper head of the steam- 45
 cylinder and projecting upward in the said
 steam chest and provided thereat with a
 transverse slot 40, said lever 27 engaging said
 slot in said rod, and operative connections,
 substantially as herein specified. 50

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

HENRY KRENTZ.

Witnesses:

EDWARD E. LONGAN,
 JNO. C. HIGDON.