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1,483,044

L. F. HOFFMAN ET AL

WATER REGULATING SYSTEM FOR AIR COMPRESSORS

Filed Nov. 8, 1921

3 Sheets-Sheet 1

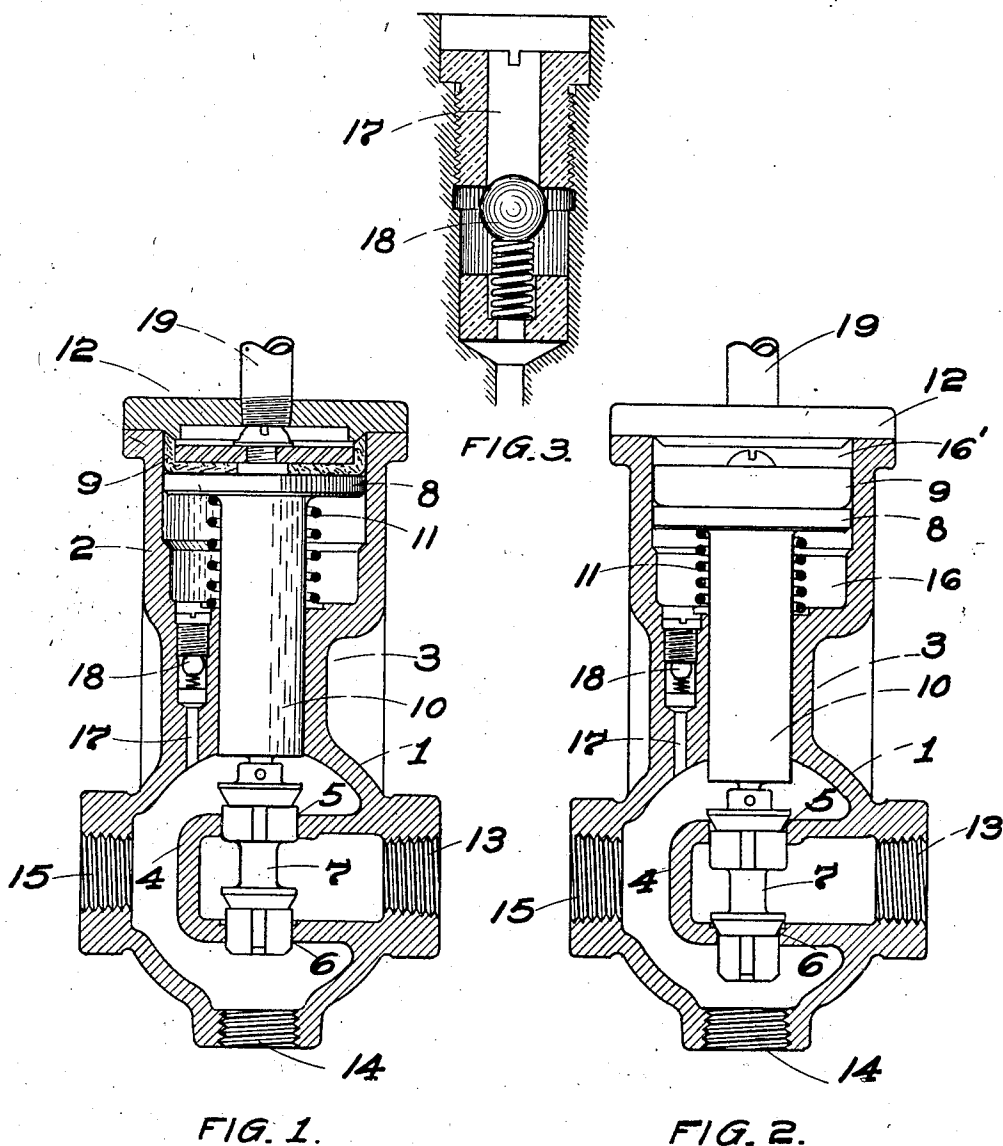


FIG. 3.

FIG. 1.

FIG. 2.

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BY

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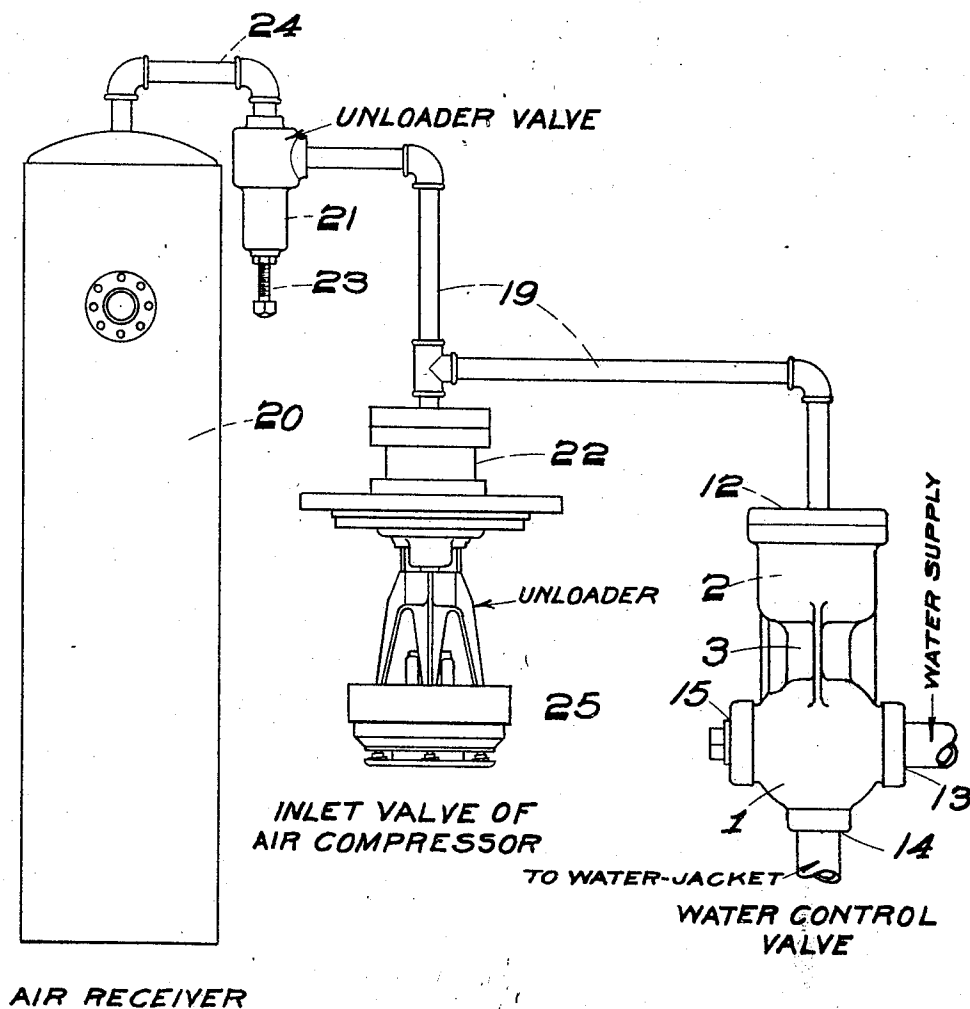
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SCHEMATIC VIEW
FIG. 4.

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3 Sheets-Sheet 3

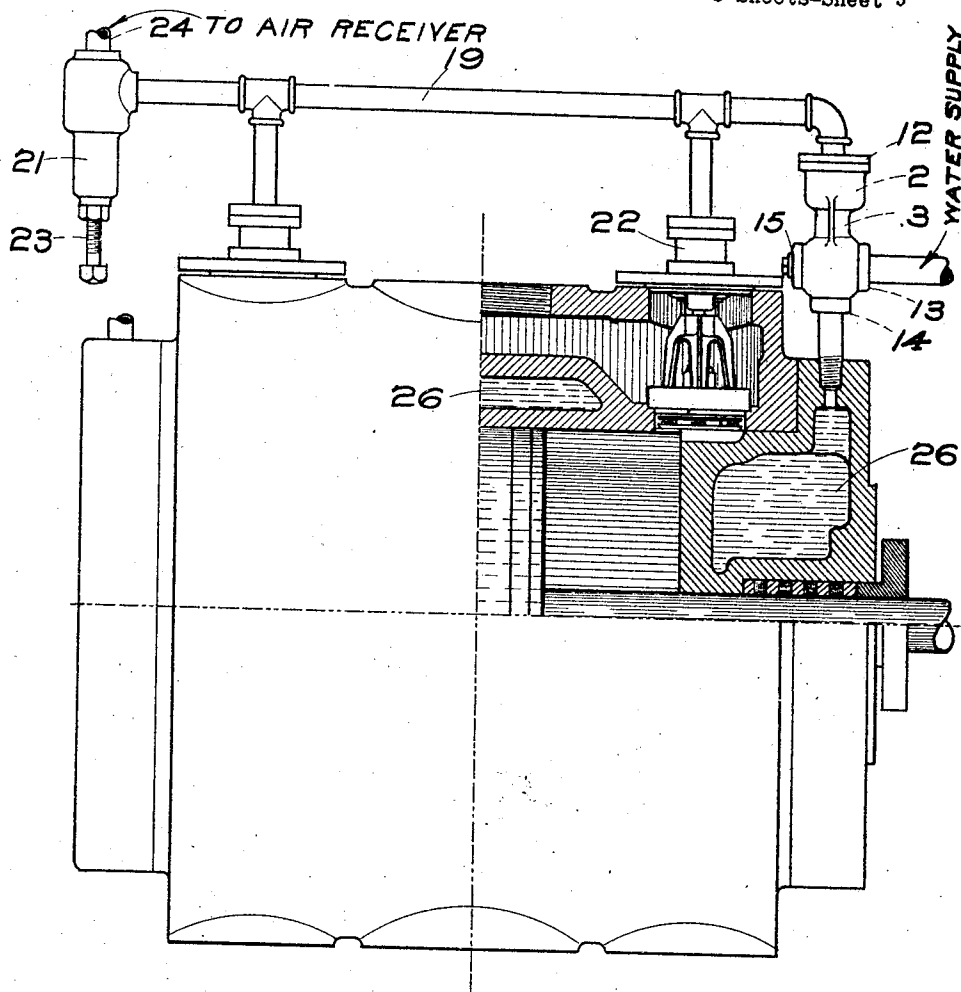


FIG. 5.

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UNITED STATES PATENT OFFICE.

LEON F. HOFFMAN AND HARRY C. WASSON, OF FRANKLIN, PENNSYLVANIA.

WATER-REGULATING SYSTEM FOR AIR COMPRESSORS.

Application filed November 8, 1921. Serial No. 513,714.

To all whom it may concern:

Be it known that we, LEON F. HOFFMAN and HARRY C. WASSON, citizens of the United States, residing at Franklin, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Water-Regulating Systems for Air Compressors, of which the following is a specification.

The object, construction, application and operation of our improved water control valve, are herein set forth with sufficient clearness to enable those skilled in the arts to which its construction and use respectively relate, to make and use the same.

The cylinders of air compressors of most types, are provided with a water-jacket for cooling purposes, and heretofore, when the compressor was in operation, whether working at full load or no load, the water has been permitted to flow in a constant volume through the water jacket of the compressor. In as much as water is not needed when the compressor is operating at no load,—or “unloaded”, as it is usually termed,—the water which is used at this time is not necessary, and is virtually wasted; but since no way has heretofore been provided for automatically regulating the volume of water according to actual service conditions and requirements, a considerable wastage of water has resulted. In many places where air compressors are used, water is taken and paid for by meter rates, hence economy in its use is necessary; in many other places the condition of the water supply makes its economical use equally necessary. It is therefore the object of this invention to secure an economical consumption of cooling water in the water-jacket of an air compressor by reducing or shutting off the supply of water to said water-jacket when the compressor is unloaded.

The construction whereby we are enabled to attain said object is clearly shown in the accompanying drawings in which,

Fig. 1 is a central longitudinal section through our improved regulating valve, showing the valve in the open position.

Fig. 2 is a central longitudinal section through our improved regulating valve, showing the same in the closed position.

Fig. 3 is a detail.

Fig. 4 is a schematic, elucidated view, illustrating the application of our improved regulating valve and the way in which it is

co-ordinately connected to and its operation synchronized with, the operation of the unloading mechanism of an air compressor.

Fig. 5 is an elevation, partly in vertical section, of an air compressor cylinder, showing the same equipped with our improved water regulating system.

As illustrated in Figs. 1 and 2, our improved water control valve, which constitutes an important part of this system, consists of a housing structure which comprises a throttle-body 1, a cylinder 2 and a plunger-guide 3. Said throttle 1 is provided with the double-seated inlet-chamber 4, having the ports 5 and 6, with which the double-disc valve 7 cooperates. Said throttle and valve may be substantially like any of the well-known structures of the type illustrated, with the required modifications.

Within said cylinder 2 is a piston 8 having a packing cup 9, thus adapting said piston to be air-actuated. Said piston is provided upon its lower face, with a plunger 10 which is adapted to have longitudinal movement through said guide 3; the end of said plunger is operably connected to said valve structure 7. For the purpose of normally retaining said piston 8 in the upper portion of said cylinder 9, and said valve 7 in the related open position, as shown in Fig. 1, a compression spring 11 is provided which surrounds said plunger 10 and bears at one end upon the piston 8, and at its other end upon the bottom wall of chamber 16 of said cylinder 2. Said cylinder is provided with a cover 12 which closes its open end and adapts the same for the employment of compressed air as an actuating medium, in opposition to the action of said spring 11, and to actuate the valve 7 into its closed position, as shown in Fig. 2.

Port 13 of the throttle is the water-inlet port, and either of the ports 14, 15 may be employed as an inlet to the water-jacket of the air compressor cylinder, the other port being plugged accordingly.

Inasmuch as the plunger 10 enters the water-chamber of the throttle 1, and is longitudinally operable in the guide 3, water may find its way around said plunger into chamber 16 of the cylinder 2.

Means is provided for expelling such water and driving same back into the throttle so that it will not interfere with the downward valve-closing movement of said piston 8. Said means consists of a duct 17

leading from said chamber 16 to the throttle chamber, and in which is inserted a check-valve 18 of any suitable construction, which is disposed and operative to let the water pass out of said chamber 16, but will not permit the passage of water there-through into said chamber 16.

Air to actuate the piston 8 together with its plunger 10 and the thereto attached valve 7 is supplied through the pipe 19.

The operation of our water regulating system will now be set forth, and for the purpose of this explanation, Fig. 4 of the drawing has been supplied, and the reference ordinals employed in Figs. 1 and 2 are applied to like parts of said regulating valve in this view.

As previously stated, our improved water-regulating system is designed to operate co-ordinately and synchronously with the unloader of the air compressor, hence in said Fig. 4 we have shown an air receiver 20, an unloader valve 21, and unloader 22, all connected,—(simply in an illustrative way) to piping 19 through which actuated compressed air is conducted from said receiver to each of said elements 21, 22 and our water-regulating valve.

The unloading valve 21 here illustrated is fully shown and described in Letters Patent of the United States No. 1,224,272, dated May 1, 1917, but we do not confine ourselves to the employment of this particular unloading valve. The unloader 22 here shown, is also shown in said Letters Patent, but any other suitable unloader may be employed, and either an inlet or a discharge valve of an air compressor may be actuated thereby to produce an unloading function.

In the use of compressed air, the maximum or desired limit of receiver pressure is determined, and the regulating screw 23 of the unloader valve 21 is set so that air will be released by said valve 21 from the receiver 20 into pipe 19 when the pressure in said receiver reaches said determined maximum limit. The air thus released into pipe 19 will pass to the unloader 22, which, in this case, will act upon the inlet valve 25 of the air compressor and hold it open, whereupon delivery of compressed air from the compressor will cease and the compressor is said to be unloaded. The air released by the unloader valve 21, as stated, will also pass into chamber 16' of our regulating valve, and will actuate piston 8 therein, so as to close valve 7: Thus co-ordinately and synchronously with the unloading of the compressor, water will cease to be supplied to the water jacket of said compressor. When the air pressure in the air receiver 20 falls below said maximum pressure, the unloader valve 21 will close communication between said receiver 20 and said pipe 19: The actuating air in said pipe 19, the un-

loader 22 and chamber 16', will escape then through escape-ports in the unloader valve 21. The unloader 22 will then cease to function and the air-inlet valve 25 of the air compressor will resume its normal operation. The piston 8 of our regulating valve will be raised by spring 11, thus opening valve 7, and the supply of water to the water-jacket of the air-compressor will be resumed, co-ordinately with the resumption of work by the compressor.

We claim the following:

1. In a water-regulating system for the cooling water of air compressors, in combination, an air compressor having a water-jacketed cylinder, a conduit through which water is supplied to said water-jacket, a valve in said conduit, means normally and yieldably retaining said valve in the open position, means adapting said valve to be actuated to its closed position by the use of compressed air, a compressed air actuated unloading device for said air compressor, and means whereby compressed air is simultaneously applied to both said valve and to said unloading device, and simultaneously released therefrom.

2. In a water-regulating system for the cooling water of an air compressor, in combination, an air compressor, the cylinder of which is supplied with a water-jacket, a conduit through which water is supplied to said water-jacket, a normally-open valve in said conduit, means adapting said valve to be actuated into its closed position by the application of compressed air thereto, a normally inactive unloading device for said air compressor, means adapting said unloading device to be actuated into its unloading position by the application of compressed air thereto, and means causing the simultaneous application of compressed air to both said unloader and to said valve, and the simultaneous release of said compressed air therefrom.

3. In a water-regulating system for the cooling water supplied to the water jacket of an air compressor, in combination, an air compressor, the cylinder of which is supplied with a water-jacket, a conduit through which water is supplied to said water-jacket, a normally open valve in said conduit adapted to be actuated to its closed position by the application of compressed air thereto, and to resume said normally open position upon the release of said compressed air therefrom, a normally inactive unloading device for said air compressor, adapted to be actuated into its unloading position by the application of compressed air thereto, and to resume said normally inactive state upon the release of said compressed air therefrom, means causing the simultaneous application of compressed air to said valve and to said unloader, to actuate the same,

also the simultaneous release of such compressed air, so as to permit said valve and said unloader to resume respectively said normal states.

- 5 4. A water regulating system for air compressors comprising in combination, a compressor cylinder provided with a water-jacket, an air-actuated unloader arranged to effect a cessation of the compressing function of said compressor cylinder when the
10 air delivered by said cylinder has reached a pre-determined stage of compression, a normally open valve through which water is supplied to said water-jacket arranged to
15 be actuated into its closed position by means of air at said pre-determined pressure so as to arrest the flow of water therethrough to said water-jacket co-ordinately with said

cessation of said air delivery caused by said unloader, and an adjustable valve whereby
20 said pre-determined pressure is determined and fixed for the passage of actuating air from the receiver therethrough simultaneously to said unloader and to said water
25 valve and to simultaneously release said actuating air from said water valve and said unloader when the air pressure developed by said cylinder falls below said pre-determined pressure.

In testimony whereof we affix our signatures in presence of two witnesses.

LEON F. HOFFMAN.
HARRY C. WASSON.

Witnesses:

J. H. SPEER,
JEANNETTE LONG.