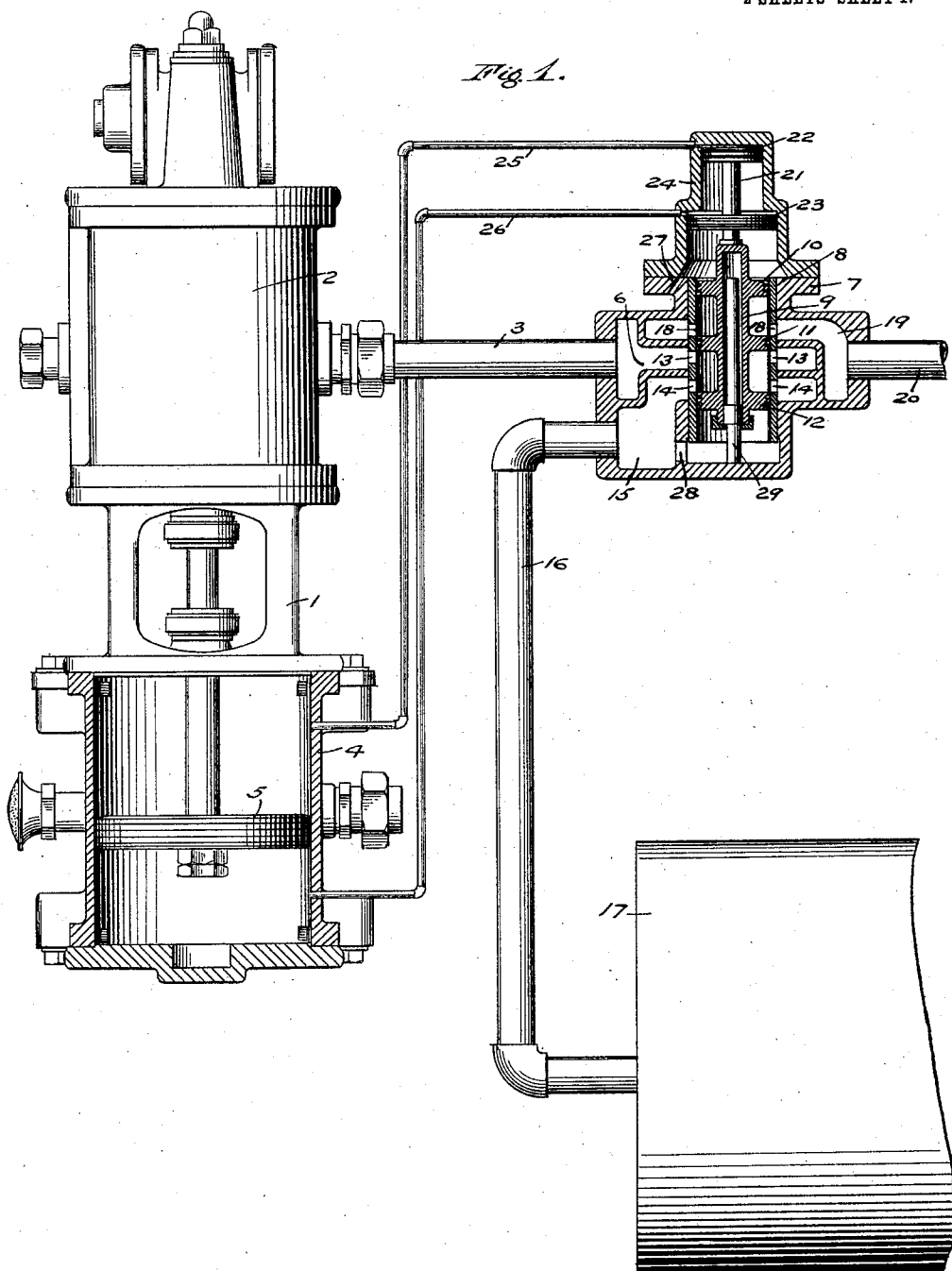


F. F. COGGIN.
EXHAUST STEAM CONTROLLING APPARATUS.
APPLICATION FILED SEPT. 13, 1909.

1,062,079.

Patented May 20, 1913.

2 SHEETS-SHEET 1.



WITNESSES

Wm. M. Gady
R. Custer

INVENTOR

Frank F. Coggin
by E. Wright

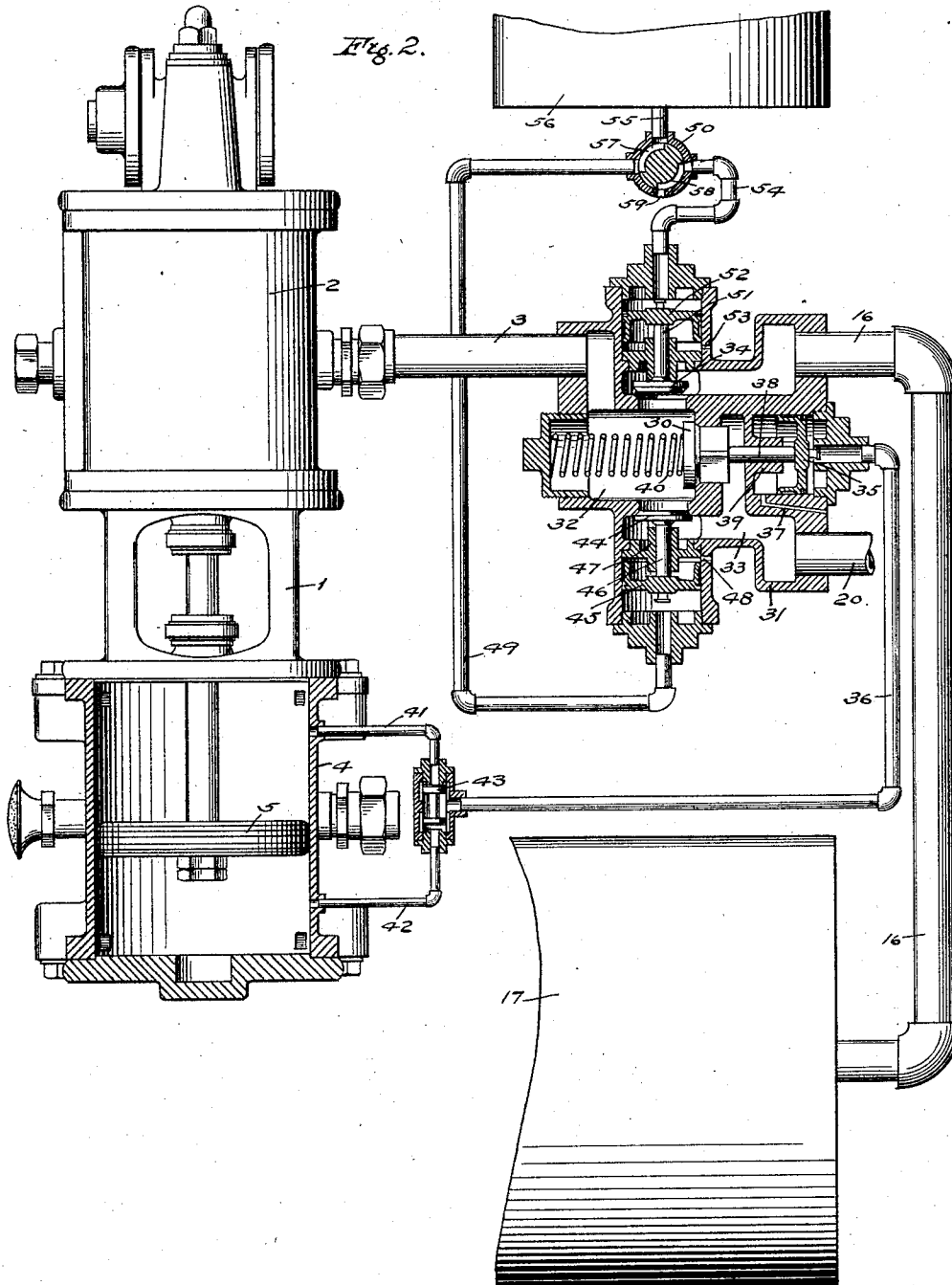
Att'y.

F. F. COGGIN.
EXHAUST STEAM CONTROLLING APPARATUS.
APPLICATION FILED SEPT. 13, 1909.

1,062,079.

Patented May 20, 1913.

2 SHEETS—SHEET 2.



WITNESSES
Wm. M. Gady
J. Custer

INVENTOR
Frank F. Coggin
by E. Wright Att'y.

UNITED STATES PATENT OFFICE.

FRANK F. COGGIN, OF NEW YORK, N. Y., ASSIGNOR TO THE ECONOMY CAR HEATING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

EXHAUST-STEAM-CONTROLLING APPARATUS.

1,062,079.

Specification of Letters Patent.

Patented May 20, 1913.

Application filed September 13, 1909. Serial No. 517,416.

To all whom it may concern:

Be it known that I, FRANK F. COGGIN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Exhaust-Steam-Controlling Apparatus, of which the following is a specification.

This invention relates to apparatus for controlling exhaust steam, and more particularly to exhaust from steam driven pumps or compressors, such as a steam pump carried by locomotives for compressing air for the air brake system, whereby a portion of the exhaust steam may be diverted and stored for use in connection with a heating system or for other purposes.

It has heretofore been proposed to divert the exhaust steam from the air compressor to a storage reservoir from which the steam is supplied for heating the cars, and while considerable economy in the use of steam, and consequently fuel, is effected by this prior apparatus, the back pressure of exhaust steam acting on the steam piston of the pump is greater, according to the pressure carried in the steam heating reservoir, than is the case where the exhaust goes freely to the stack. This circumstance necessitates the employment of a somewhat higher live steam pressure on the opposite side of the piston in running the pump to overcome the additional back pressure of the exhaust steam.

It is well known that with the ordinary standard air compressor of the type used on locomotives, the back pressure of the exhaust steam even when exhausting to the stack in the usual manner is quite high for about three-quarters of the stroke owing to the high rate of speed of the steam piston during that portion of the stroke and the inability of the exhaust steam to escape through the exhaust ports fast enough, and then, as the pressure of air compressed becomes considerable, the piston slows up and thus permits the exhaust steam pressure to drop off rapidly, so that at the end of the stroke, the back pressure of the exhaust steam is but a few pounds in excess of atmospheric pressure.

I have found that by diverting the exhaust steam to the storage reservoir during the first portion of the stroke of the pump, in which the back pressure of the exhaust

steam would normally be high, even with a free exhaust, and then venting the remaining exhaust steam to the usual free exhaust during the latter part of the stroke, practically no greater amount of steam is required to compress a given quantity of air than where the exhaust is entirely free, while the exhaust steam diverted to the storage reservoir during the first part of the stroke may be saved for heating the cars or for other purposes. It is therefore the principal object of my invention to provide an apparatus for utilizing the exhaust steam from the pump and having means for diverting the exhaust steam during the first part of the stroke so that the same may be used for heating or other purposes and then permitting the remaining exhaust steam to escape to the atmosphere in the usual manner during the latter part of the stroke.

In the accompanying drawing; Figure 1 is a diagrammatic view, partly in sectional elevation, of an apparatus embodying my improvement for controlling the exhaust steam from a pump or compressor; and Figure 2 a similar view, illustrating a somewhat modified construction, also embodying my invention.

In Fig. 1 of the drawings is shown a standard steam driven air compressor or pump 1 of the usual construction as applied to locomotives for compressing the air used in the fluid pressure brake system, and having a steam cylinder 2, to which is connected a steam exhaust pipe 3, and an air cylinder 4 containing piston 5 adapted to be operated by the steam piston in the usual manner. The exhaust steam pipe 3 communicates with a chamber 6 of a casing 7 of a valve mechanism for controlling the exhaust steam from the pump.

A cylindrical bushing 8 is fitted into a chamber within the casing 7 and contains a piston device 9 provided with a series of piston heads 10, 11, and 12 adapted to reciprocate in the bushing 8. Through the bushing 8 extend ports 13 opening into the chamber 6, ports 14 leading to a chamber 15 connected by pipe 16 with a reservoir 17, and ports 18 opening into a chamber 19 connected with the usual atmospheric steam exhaust pipe 20. In one position, the piston device 9 is adapted to connect the ports 13 with the ports 14 and in another position, the ports 13 with the ports 18.

Opposite one end of the piston device 9 is a differential piston device 21 having heads 22 and 23 and contained in a cap 24 adapted to be secured to the casing 7. The space adjacent one face of the piston head 22 is in communication, through a pipe 25, with one end of the air cylinder 4 and the space adjacent one face of the piston head 23 is open through a pipe 26 to the opposite end of the air cylinder 4.

The chamber intermediate the piston heads 10 and 23 is constantly open to the atmosphere through a port 27, while the chamber at the outer face of piston head 12 is open through a port 28 to chamber 15 and is therefore constantly subject to the pressure in the reservoir 17.

In operation, it will be noted that the pressure in the reservoir acting on the outer face of piston head 12 tends to maintain the piston device in the position shown in Fig. 1, with ports 13 connected to ports 14, so that exhaust steam from the pump may flow through the exhaust pipe 3 to chamber 15 and thence through pipe 16 to the reservoir 17. When the air compressor is in action, assuming the air piston 5 to have just started on its down stroke, the space below the piston 5 is substantially at atmospheric pressure so that as both the pipes 25 and 26 are open at this time to said space the heads 22 and 23 are subject to atmospheric pressure. The fluid confined in the chamber below the piston 5 is now compressed by the downward movement of the piston until the pressure has increased to such a degree, that, having access through the pipe 26 to the piston head 23, the pressure on the differential area of piston head 23 exceeds the reservoir pressure on the head 12 and forces the piston device 9 downwardly, thereby causing the piston head 11 to cut off communication from the ports 13 to the ports 14 and to connect ports 13 with ports 18. The exhaust steam from the air compressor will then be diverted into chamber 19 and thence out through the usual atmospheric or stack exhaust pipe 20.

It will be evident that the parts may be proportioned so that the air pressure accumulated in the air cylinder 4 at any desired point in the stroke will be capable of operating the valve piston device 9 so as to cause the remaining exhaust steam to be vented to the atmosphere, but preferably the apparatus is designed to operate when the pump has made about three-quarters of its stroke, as at this point, the exhaust steam pressure would normally drop rapidly where the exhaust is free.

The port opening of pipe 26 and likewise pipe 25 into the air cylinder 4 is located a little more than the thickness of the piston 5 from the end of the cylinder so that when the piston 5 reaches the end of its stroke

both pipes 25 and 26 are open to the side of the piston at atmospheric pressure. Thus both heads 22 and 23 are subject only to atmospheric pressure at the beginning of a stroke and consequently the reservoir pressure on the head 12 promptly returns the piston device to its position connecting the pump exhaust with the reservoir.

As the piston 5 moves upwardly the pressure on the head 22 admitted from the air cylinder 4 through pipe 25 reaches a degree sufficient to overcome the steam pressure on the head 12 and the valve piston device 9 is then shifted as before to cut off communication from the exhaust steam pipe to the reservoir and to open the usual atmospheric exhaust to the exhaust steam. For limiting the downward movement of the valve piston 9 a stop rod 29 may be loosely mounted within a suitable cavity in the valve piston, so that the rod 29 will engage a portion of the valve piston 9 at a predetermined point in its traverse and prevent further downward movement.

According to the construction shown in Fig. 2 of the drawings, a puppet-valve 30 is employed for controlling the flow of exhaust steam from the pump, the casing 31 having a chamber 32 at one side of the valve 30 into which the exhaust steam pipe 3 opens. The chamber 33 at the opposite side of valve 30 communicates with the atmospheric exhaust pipe 20. Chamber 32 communicates through a non-return check valve 34 with pipe 16 leading to the reservoir 17. For operating the puppet valve 30 a piston 35 is provided, having a pipe 36 opening to the space at one side and having an atmospheric port 37 opening to the space at the opposite side of the piston. A stem 38 connected to said piston and passing through a suitable stuffing box 39 is adapted to engage the valve 30 and open same when operated by the piston 35. A spring 40 acts on the valve 30 and is adapted to oppose the action of fluid pressure on the piston 35. Branch pipes 41 and 42 open respectively to the opposite ends of cylinder 4, and a double check valve 43 is provided for controlling communication from said branch pipes to the pipe 36. Assuming the air piston 5 to be moving downwardly, as the air is compressed below the piston, the double check valve 43 is shifted by the compressed fluid flowing through pipe 42 so that communication is opened from pipe 42 to pipe 36 and air thereupon flows through pipe 36 to the piston 35. The pressure of the spring 40 and of the exhaust steam on the valve 30 opposes the pressure of the compressed air acting on piston 35 and by properly proportioning the spring 40 and valve 30, the valve 30 may be made to open at any desired point in the stroke of the pump, though preferably the parts are designed

so that the valve opens at the air pressure attained at about three-quarters of the stroke. The opening of valve 30 permits the remaining exhaust steam in the steam cylinder to vent to the chamber 33 and thence to the usual exhaust pipe 20. In the reverse stroke of the air piston 5, the double check valve 43 is shifted by the higher pressure above the piston, so that the compressed air from above the piston flows through the pipe 36 to piston 35 and upon the piston 5 reaching a predetermined point in its stroke the piston 35 is operated to open the valve 30 and permit the exhaust steam from the pump to vent to the stack or atmosphere.

It is sometimes desirable to be able to operate the air compressor in the usual manner with a free exhaust and I may therefore employ manually operated means such as shown in Fig. 2 for cutting out the exhaust steam controlling mechanism. For this purpose a valve 44 is provided for controlling a by-pass passage from the chamber 32 to chamber 33, and a piston 45 having a stem 46 passing through a stuffing box 47 and connected to the valve 44. The chamber at one side of the piston 45 is open to the atmosphere through a port 48 and the chamber at the opposite side of the piston is connected by a pipe 49 with a cock 50. The check valve 34 is similarly connected by a stem 51 with a piston 52 open on one side to the atmosphere through a port 53 and having its opposite side in communication with a pipe 54 leading to the cock 50. The cock 50 is also provided with a pipe 55 opening into the main reservoir 56 of the air compressor 1. When it is desired to take the exhaust steam from the pump for heating, the cock 50 is turned to the position shown in Fig. 2, in which a cavity 57 in the cock connects pipe 55 with pipe 49, and a cavity 58 connects pipe 54 with an exhaust port 59. Fluid under pressure from the main reservoir 56 is thus admitted through the pipe 49 to the piston 45 and said piston is thereupon operated to close the valve 44, thus preventing the escape of exhaust steam. The piston 52 being open to the atmosphere on its outer face, exhaust steam is free to flow to the pipe 16 and the heating reservoir by lifting the check valve 34. In order to cut out the exhaust controlling apparatus, the cock 50 is turned so that cavity 58 connects pipes 54 and 55 and cavity 57 connects pipe 49 with exhaust port 59. The valve 34 is then closed by the air pressure admitted to piston 52 and valve 44 is free to open, and permit the exhaust steam to flow directly to the chamber 33 and the usual exhaust pipe 20.

It will thus be seen that with my invention, the exhaust steam from the air compressor may be stored and utilized for heating the cars or for other purposes without

using substantially any more live steam to run the compressor than is necessary where all the exhaust steam is vented to the stack in the usual manner. The heating of the cars is thus very economically effected.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In exhaust steam controlling apparatus for steam driven pumps, the combination with the exhaust steam supply conduit, a storage chamber, and a free exhaust outlet, of means operated by the pressure from the pump cylinder to open communication from the exhaust conduit through the free exhaust outlet during the latter part of the stroke of the pump.

2. In exhaust steam controlling apparatus for steam driven pumps, the combination with the exhaust steam supply conduit, a storage chamber, and a free exhaust outlet, of a valve mechanism subject to pressure from the pump cylinder, and operating to close communication from the exhaust conduit through the free exhaust outlet and to establish communication from the exhaust conduit to the storage chamber during the first part of the stroke of the pump and to open communication from the exhaust conduit through the free exhaust outlet during the latter part of the stroke.

3. In exhaust steam controlling apparatus for steam driven pumps, the combination with the exhaust steam supply conduit, a storage chamber, and a free exhaust outlet, the exhaust conduit being connected to the storage chamber and to the free exhaust outlet, of means governed by the pressure in the pump cylinder for controlling the communication from the exhaust conduit through the free exhaust outlet.

4. In exhaust steam controlling apparatus for steam driven pumps, the combination with the exhaust steam supply conduit, a storage chamber, and a free exhaust outlet, the exhaust conduit being connected to the storage chamber and to the free exhaust outlet, of valve mechanism operated by the pressure in the pump cylinder for controlling the communication from the exhaust conduit through the free exhaust outlet.

5. In exhaust steam controlling apparatus for steam driven pumps, the combination with the exhaust steam supply conduit, a storage chamber, and a free exhaust outlet, of valve mechanism adapted to normally close communication from the exhaust conduit through the free exhaust outlet and establish communication from the exhaust conduit to the storage chamber, and operated by a predetermined degree of pressure in the pump cylinder to open communication from the exhaust conduit through the free exhaust outlet.

6. In exhaust steam controlling apparatus

for steam driven pumps, the combination with the exhaust steam supply conduit, a storage chamber, and a free exhaust outlet, the exhaust conduit being connected to the storage chamber and to the free exhaust outlet, of a valve for controlling the communication from the exhaust conduit through the free exhaust outlet, and a movable abutment subject to the pressure in the pump cylinder for operating said valve.

7. In exhaust steam controlling apparatus for steam driven pumps, the combination with the exhaust steam supply conduit, a storage chamber, and a free exhaust outlet, the exhaust conduit being connected to the storage chamber and to the free exhaust outlet, of a valve mechanism operated by the opposing pressures of the pump cylinder and the storage chamber for controlling communication from the exhaust conduit through the free exhaust outlet.

8. In exhaust steam controlling apparatus for steam driven pumps, the combination with the exhaust steam supply conduit, a

storage chamber, and a free exhaust outlet, of a valve mechanism operated by the opposing pressures of the pump cylinder and the storage chamber for controlling communication from the exhaust conduit through the free exhaust outlet and communication from the exhaust conduit to said chamber.

9. The combination with a steam driven pump having an exhaust conduit, a free exhaust outlet, and a storage chamber, of a fluid pressure valve mechanism for controlling communication from the exhaust conduit through the free exhaust outlet, and a fluid pressure conduit connecting said valve mechanism to the pump cylinder at such a point as to be passed by the pump piston in moving to the end of its stroke.

In testimony whereof I have hereunto set my hand.

FRANK F. COGGIN.

Witnesses:

WM. M. CODY,
A. M. CLEMENTS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."