Sept. 22, 1931. W. E. DEAN 1,824,037

AIR PURIFIER

Filed Dec. 6, 1928 2 Sheets-Sheet 1

Fig. 1.

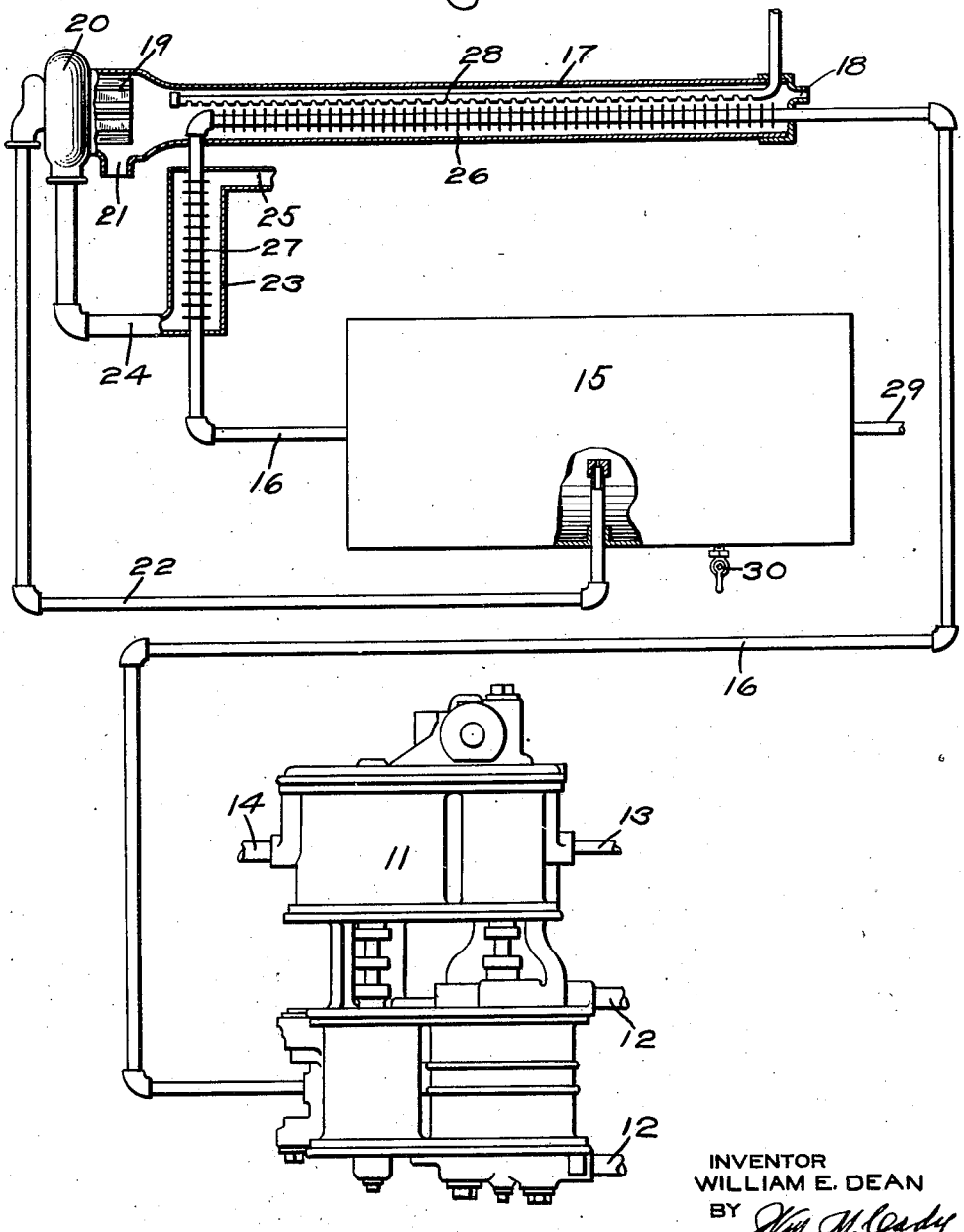

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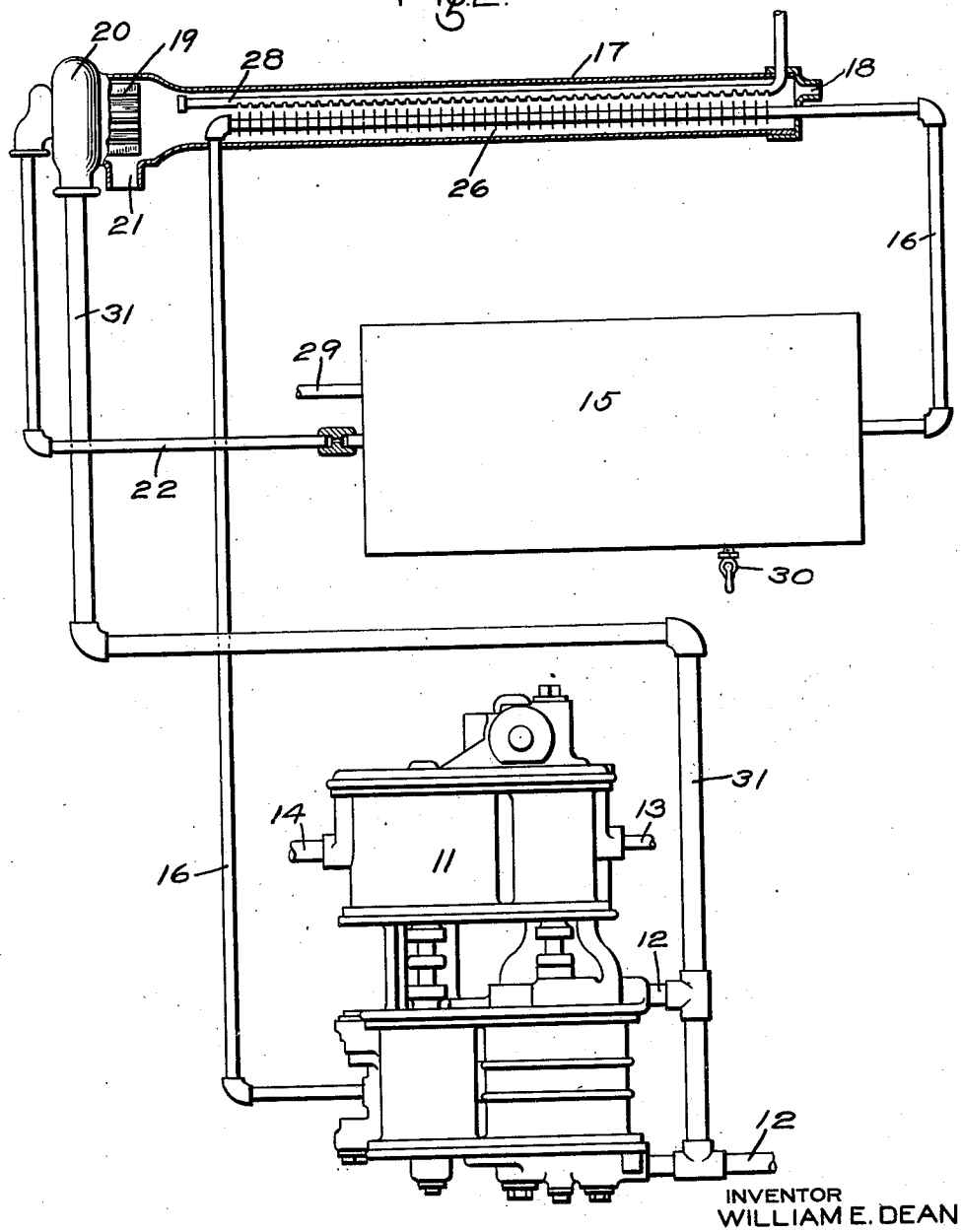
Fig. 2.



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UNITED STATES PATENT OFFICE

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AIR PURIFIER

Application filed December 6, 1928. Serial No. 324,291.

This invention relates to fluid pressure apparatus and more particularly to means for purifying the air used in fluid pressure brake systems.

An object of the invention is to provide means for removing surplus moisture from the air which is compressed for use in fluid pressure brake systems.

Another object of the invention is to provide improved air purifying means of the character mentioned which is relatively simple in construction, and reliable and exact in function under all conditions of service.

The invention also comprises certain new and useful improvements in the construction, arrangement and combination of the several parts of which it is composed, as will be hereinafter more fully described and claimed.

In the accompanying drawings; Figure 1 is a diagrammatic view, partly in section, of one form of air purifying apparatus constructed according to the invention; and Fig. 2 is a similar view of a modified form of apparatus.

When air containing water vapor is compressed to a higher pressure and allowed to cool to its original temperature, it becomes more highly saturated with water vapor than in its original state, because of the less volume it occupies. In compressing air for the locomotive air supply, the pressure is sufficient to exceed the dew point of the air so that moisture is precipitated. Part of the moisture remains suspended in the air in the form of a mist and is carried over into the brake system through the feed valve, or through the full release port of the automatic brake valve. The moisture collects in the hose couplings, dirt collectors, auxiliary reservoirs, and other parts of the brake system and sometimes causes brake failures, due to ice forming and stopping air passages and due to corrosion caused by the water in the various air brake devices. Another factor that adds to this difficulty is the fact that the air supply in the main reservoirs is at a temperature several degrees above the atmospheric temperature. When the air is admitted to the brake pipe and becomes cooled to atmospheric temperature, additional moisture is deposited. An offsetting factor is the lower pressure of the air in the brake pipe as compared with the main reservoir pressure. Air at lower pressure can carry more moisture and will, therefore, become drier as the pressure is reduced. This effect, however, is not sufficient to off-set the first two above mentioned factors.

By the present invention, means are provided for cooling the compressed air as it passes from the compressor to the main reservoir of a fluid pressure brake system. The apparatus is designed to reduce the temperature of the compressed air to a degree less than the atmospheric temperature so as to reduce the water vapor carrying capacity of the compressed air and cause sufficient moisture to be dropped in the main reservoir that air supplied to the brake pipe of a train will be only partially saturated and will tend to pick up any moisture that may be in the brake pipe.

Referring first to Figure 1 of the drawings, the apparatus may comprise a steam driven air compressor 11 of the usual type to which there is connected one or more air intake ports 12, a steam supply pipe 13, and a steam exhaust port 14.

A main reservoir 15 is connected to the air compressor 11 by means of a pipe 16.

A section of the pipe 16 is enclosed by a casing 17, having at one end a restricted opening 18, and at its opposite end a fan 19 which is operated by a turbine 20.

At a point contiguous to the fan 19, the casing 17 is formed with an opening 21 of greater size than the opening 18.

The turbine 20 may be driven by air from the main reservoir 15 which is delivered to the turbine through a pipe 22.

At a point nearer to the reservoir 15 than is the casing 17, a section of the pipe 16 is enclosed by a second casing 23. One end of the casing 23 is connected to the exhaust of the turbine 20 by means of a pipe 24, while the opposite end of the casing 23 is formed with an outlet opening 25.

The portion of the pipe 16 within the cas-

ing 17 is provided with a series of fins 26, while the portion of the pipe 16 within the casing 23 is also provided with a series of fins 27.

Within the casing 17 there is a perforated pipe 28, one end of which is connected to a suitable source of water supply (not shown).

The reservoir 15 may be connected to the fluid pressure brake apparatus (not shown) by means of a pipe or conduit 29.

For the purpose of permitting draining of the water from the reservoir 15, a pet cock or drain valve 30 is provided.

In operation, as the temperature of the air from the compressor 11 will be considerably higher than the temperature of the atmosphere, when this hot compressed air passes through the portion of the pipe 16 within the casing 17, the heat thereof will be absorbed by the rarefied air which is drawn through the restricted opening 18 by the fan 19 and by the vaporization of the water which drips on to the pipe 16 from the pipe 28. As the rarefied air circulating around the radiating section of the pipe 16 within the casing 17 exhausts through the opening 21 it will carry off the surplus heat and therefore the compressed air in the pipe 16 will be cooled to a point which will cause condensation of the moisture in the pipe 16.

The compressed air in the pipe 16 which is cooled in the first section of radiating pipe to atmospheric temperature or below atmospheric temperature, is again cooled by the air which is discharged from the turbine 20 into the second radiating section provided in the casing 23.

As the air utilized in operating the turbine 20 is taken from the reservoir 15, when it is cold, and as such air discharges considerably more heat in the external work done actuating the turbine 20, its temperature will be much below atmospheric temperature when it is conducted to the section of the pipe 16 within the casing 23. Therefore, the compressed air will be further cooled to a point considerably below atmospheric temperature, so that when it enters the main reservoir 15 it will be cooled to a point where it drops sufficient water vapor in the main reservoir to cause the air in the reservoir to be only partially saturated when released to a lower pressure by the feed valve (not shown) and becomes atmospheric temperature again in the train line.

In the form of the invention shown by Fig. 2, the air intake ports 12 of the compressor 11, are connected by a pipe 31 to the exhaust port of the turbine 20, in such a manner that the cold air from the main reservoir 15 which is utilized in actuating the turbine 20, is mixed with other intake air so as to lower the temperature of the air drawn into the compressor 11 to a degree that the air delivered from the compressor 11 is somewhat cooler than it would otherwise be before passing through the radiating section of pipe within the casing 17. Accordingly, in this form of the invention, the apparatus is provided with only a single cooling section, which is sufficient to reduce the temperature of the compressed air to a point below atmospheric temperature for the purpose hereinbefore explained.

While one illustrative embodiment of the invention has been described in detail, it is not my intention to limit its scope to that embodiment or otherwise than by the terms of the appended claims.

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

1. An apparatus of the character described comprising a reservoir, an air compressor, a pipe connecting the reservoir and compressor, a casing enclosing a section of the pipe, and a fan actuated by air supplied from the reservoir for circulating a cooling fluid through the casing.

2. An apparatus of the character described comprising a reservoir, an air compressor, a pipe connecting the reservoir and compressor, a casing enclosing a section of the pipe, means within the casing for precipitating a liquid on the portion of the pipe enclosed by the casing, a fan for circulating air through the casing, and means for actuating the fan by compressed air supplied from the reservoir.

3. In an apparatus of the character described, an air compressor, a reservoir, means for conducting the compressed air to the reservoir, said means having a radiating section, a casing enclosing the radiating section, and a fan for circulating air through the casing.

4. In an apparatus of the character described, an air compressor, a reservoir, means for conducting the compressed air to the reservoir, said means having a radiating section, means for wetting the exterior of the radiating section, a casing enclosing the radiating section, a fan for circulation air through the casing, and means for operating the fan by compressed air supplied from the reservoir.

In testimony whereof I have hereunto set my hand, this 3rd day of December, 1928.

WILLIAM E. DEAN.