June 24, 1958 R. H. GEORGE 2,840,183

APPARATUS FOR COOLING AND CLEANING COMPRESSED AIR

Filed April 19, 1955

Fig. 1.

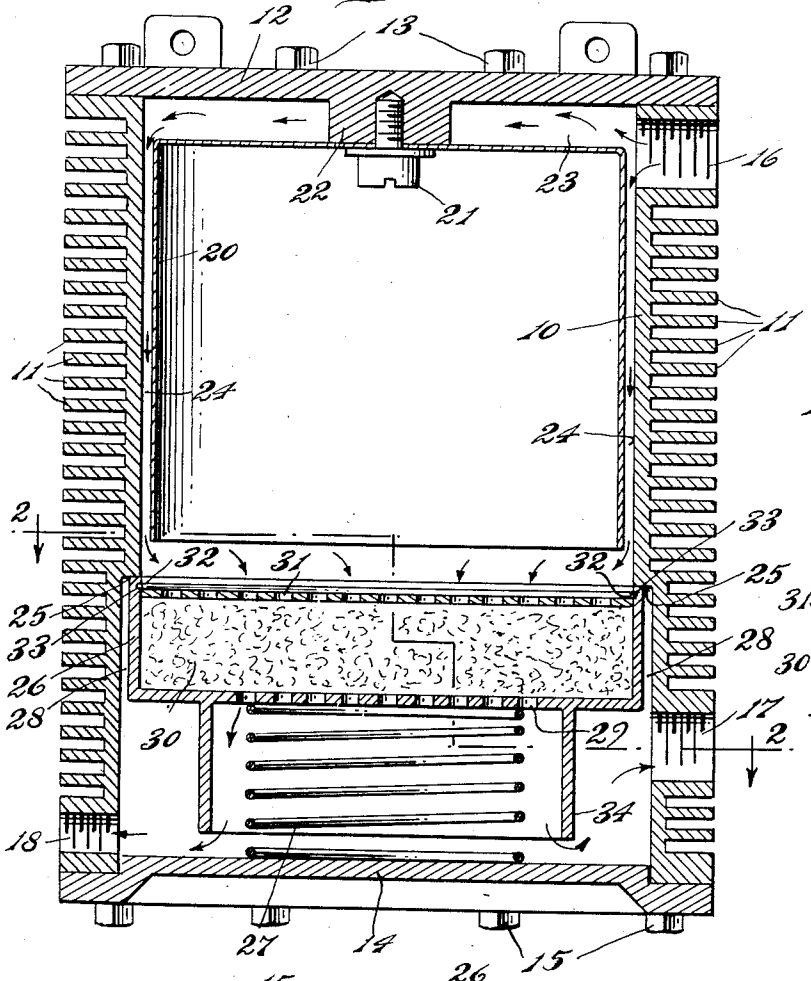


Fig. 3.

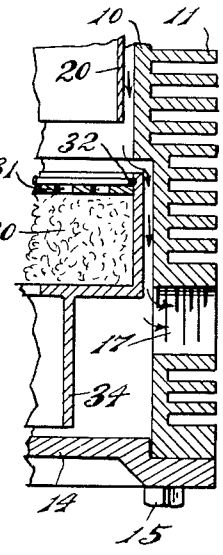
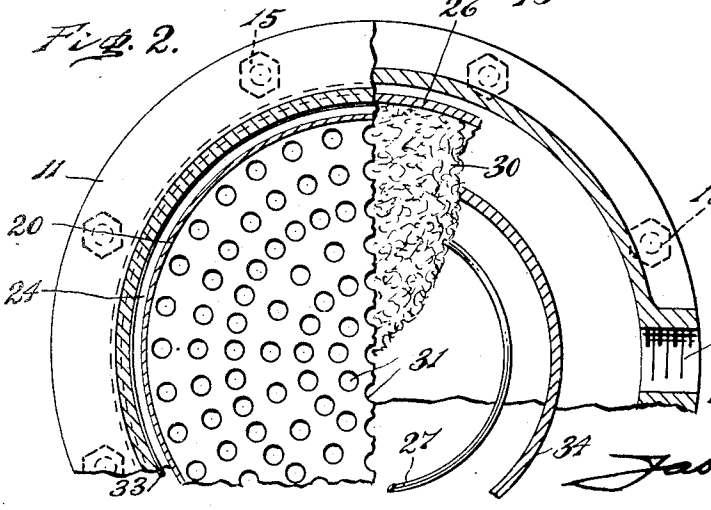


Fig. 2.



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APPARATUS FOR COOLING AND CLEANING COMPRESSED AIR

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2 Claims. (Cl. 183—32)

This invention relates to apparatus for cooling and cleaning compressed air, and it relates more particularly to such devices particularly adaptable for use as a part of the air brake systems of heavy motor vehicles, such as buses, trucks, and the like.

For many years past, it has been the custom to equip large sized air compressors with intercoolers, or aftercoolers, or sometimes both, to remove the heat caused by the compression of the air. The larger units of such devices were usually water cooled. More recently, attempts have been made to equip the smaller type compressor with both intercoolers and aftercoolers which usually were of the air cooled type.

However, it has not become common practice to utilize devices of the character aforesaid in the air brake systems of heavy motor vehicles, such as trucks, buses and the like, as it was not thought practical to do so by reason of the relatively large amount of air sometimes passing rapidly through the system particularly when the brakes were frequently applied.

It has been the usual practice, in connection with devices of this character, to permit the air upon leaving the head of the compressor or pump to pass directly to the reservoirs at relatively high temperatures, much of the oil in the pump cylinders being vaporized and carried over into the reservoirs and, of course, the moisture, which is contained in the air, is taken in at the suction end of the pump, and is also carried over. When this highly heated compressed air, with the impurities carried over therein, is permitted to cool in the reservoirs, moisture and oil which is precipitated results in deposits in the reservoirs of a dirty emulsified character. The precipitated water and oil also contains a not inconsiderable amount of dust which is carried in with the air at the suction inlet, as well as the free carbon particles carried over by the highly heated air from the compressor.

In the air brake systems, such as are used in heavy motor vehicles, it is the usual practice to pipe the compressed air through a few feet of copper tubing directly into the first or No. 1 reservoir, and then into the second or No. 2 reservoir through similar tubing, and the only way in which the temperature could be reduced was through the surface radiation from the tubing and the tanks. However, these tanks are necessarily small and do not have sufficient radiation surface to cause a substantial reduction in the temperature of the air, particularly when the brakes are being frequently used.

As a result of the foregoing, not only was there a large loss in efficiency, but considerable damage to the moving parts of the brake system was caused, and many maintenance jobs were necessary which could have been avoided if the air was properly cooled and cleansed before it reached the tanks.

It has also been suggested to use filters of various kinds to remove contaminating solid materials such, for example, as the dust and carbon particles carried over from the pump, but when the filter pads become filled with such solids, resistance to the free flow of air will

be set up which may even prevent the passage of sufficient air to maintain proper working pressure of the air in the reservoir tanks, and if completely blocked will cause the brakes to fail by reason of no compressed air being permitted to pass to operate the same.

The principal object of the present invention is to provide a relatively simple and inexpensive form of device for reducing the temperature of the air, particularly that used in air brake systems of motor vehicles and for removing contaminating liquids and solids therefrom.

A further object of the invention is to provide a device of the character aforesaid, which will not only be efficient in its action, but which will offer no substantial resistance to the free flow of the compressed air therethrough.

A further object of the invention is to provide a device of the character aforesaid, employing a filter pad therein, which filter pad is so mounted in the apparatus whereby in the event of the filter pad becoming choked or blocked, the compressed air will, nevertheless, be permitted to pass from the compressor to the reservoir tanks.

The nature and characteristic features of the present invention will be more readily understood from the following description, taken in connection with the accompanying drawing forming part hereof, in which:

Figure 1 is a vertical central sectional view of a device embodying the main features of the present invention;

Fig. 2 is a fragmentary horizontal section taken approximately on the line 2—2 of Fig. 1; and

Fig. 3 is a fragmentary view of a portion of the device shown in Fig. 1 of the drawing with parts thereof in relative positions assumed under certain circumstances.

It should, of course, be understood that the description and drawing herein are illustrative merely, and that various modifications and changes may be made in the structure disclosed without departing from the spirit of the invention.

Referring to the drawing, in the particular embodiment of the invention therein shown, **10** is a cylindrical housing having heat radiating fins **11** on the outside of the walls thereof for disbursing the heat from within the housing.

The housing **10** is closed at the top by means of a header member **12**, detachably secured thereto by means of cap screws **13**, and likewise, the bottom of the housing **10** is closed by a header **14** which is secured to the housing proper by cap screws **15**.

The housing **10** is also provided, near its upper end, with a threaded inlet opening **16**, for the attachment of a pipe (not shown), for conveying the air from the pump or compressor to the housing. There is provided near, but some distance above the bottom, a similar threaded outlet opening **17** for the attachment thereto of a pipe (not shown), which extends to a reservoir tank of the air brake system.

The housing **10** is also provided with another outlet opening **18** as close to the bottom as possible, which opening **18** is also threaded for the attachment thereto of piping (not shown), for the removal of the condensate from the interior of the housing. The piping which is secured to the outlet opening **18** may extend to an automatic ejector valve which may be of the general type shown in my previous application for Letters Patent, filed June 9, 1954, Serial No. 435,405, which will periodically operate responsive to pressure differences caused by the operation of other parts of the apparatus from time to time in the normal actuation of the same.

There is provided internally an inverted cup like member **20** which is secured at a spaced distance from the inner surface of the top header **12** by means of a cap screw **21**, which is threaded into a boss **22** provided on the inner under face of the header **12**. This arrange-

ment provides a passageway 23 for the air entering through the inlet opening 16.

The external diameter of the inverted cup member 20 is slightly less than the internal diameter of the housing 10 thereby to provide, between the outer vertical surface of the cup member 20 and the inner wall of the housing 10, a narrow annular space 24. The compressed air which enters through the inlet opening 16 first passes over the top of the cup 20 and then downwardly through the said space 24. The cup member 20 is open at the bottom so that the air therein is always of the same pressure as that in the space 24.

Close to the bottom edge of the cup member 20, the housing 10 is enlarged in its internal diameter to provide an annular shoulder 25 which forms a bearing seat for the rim of a filter unit 26, which is normally held on said seat by a coil spring 27 interposed between a portion of the filter unit 26 and the inner face of the lower header member 14. The filter unit 26 is also of a slightly smaller external diameter than the internal diameter of the portion of the housing 10 in which it is located, thereby again to provide a narrow annular space 28 around the outside of the filter unit 26 for the passage of the air therethrough under certain conditions as will hereinafter be more fully set forth.

The filter unit 26 comprises a cylindrical container having a perforated or foraminous base portion 29 and normally containing a quantity of fibrous filter material 30 which is retained in place in the container by means of a perforated or foraminous top plate 31. The top plate is secured in position by means of a spring ring 32 seated partly within an annular groove 33 located near the top inner edge of the side wall of the container.

The filter unit 26 may also be provided with a downwardly extending cylindrical baffle 34, the arrangement being such that normally, after the air passes through the narrow annular passage 24 around the cup member 20, it then passes through the openings in the top plate 31 of the filter unit 26, thence through the filter material 30 and downwardly through the space within the cylindrical baffle 34, underneath the same, and thence through the outlet opening 17 to the pipe connected thereto for conveying the cooled and cleaned air to the reservoir.

Normally, a relatively small volume of dust and carbon particles will be retained in the filter material, which may be removed and cleaned from time to time. Also, the liquids consisting of the moisture precipitated by the cooling action of the apparatus, as well also any vaporized oil which may be carried over from the compressor, will be collected in the bottom of the apparatus to be removed from time to time through the outlet 18, under the control of an automatic ejector or drain valve of the type hereinbefore referred to.

However, if the filter material should become so choked that the air may no longer pass freely therethrough, or should be so filled with filtrate to such an extent as to completely stop the passage of air therethrough, the pressure of the air on the filter unit will force the same downwardly as indicated in Fig. 3 of the drawing, and permit air to pass through the annular space 28 around the filter unit 26 and thence to the air outlet 17.

It will be seen that by the foregoing arrangement there is provided a simple and relatively inexpensive device for cooling and cleaning compressed air, which has been found to be particularly adaptable for use in connection with braking systems of heavy motor vehicles, which will not only serve effectively to cool the air prior to its entrance into the reservoir tanks, but will also remove therefrom the deleterious material, such as moisture and oil, and the solid particles of dust and carbon which have an injurious effect on the working parts of the brake system.

The arrangement is such that no failure of the brakes can occur by reason of the choking of the filter unit. The filter unit may be easily and readily removed for cleaning or renewal, and the condensate may be automatically removed from time to time.

I claim:

1. Apparatus for cooling and cleaning compressed air comprising a housing having heat dispersal means on the outside of the side wall thereof and having an inlet opening at the top, and inverted cup shaped member secured within the housing, but below the top thereof thereby to provide a space at the top for the passage of the air, said cup shaped member being of an external diameter slightly less than that of the internal diameter of the portion of the housing in which it is positioned thereby to provide a narrow annular space for the downward passage of the air immediately adjacent the side wall of the housing, a filter unit positioned below the cup shaped member in the lower portion of said housing and normally seated on a shoulder in the side wall of the housing, said filter unit having foraminous top and bottom plates, and filter material disposed between said plates, the arrangement being such that the air normally passes downwardly through the filter material, a spring supporting said filter unit whereby it may be forced downwardly in the event of choking or clogging of the filter material, the filter unit being of an external diameter slightly less than that of the internal diameter of the portion of the housing in which it is positioned thereby to provide an annular passageway through which the air may pass when the filter unit is forced downwardly, and the housing having an air outlet opening located near but above the bottom thereof, and a drainage outlet opening at the bottom thereof.

2. Apparatus for cooling and cleaning compressed air comprising a housing having heat dispersal means on the outside of the side wall thereof and having an inlet opening at the top, an inverted cup shaped member secured within the housing, but below the top thereof thereby to provide a space at the top for the passage of the air, said cup shaped member being of an external diameter slightly less than that of the internal diameter of the portion of the housing in which it is positioned thereby to provide a narrow annular space for the downward passage of the air immediately adjacent the side wall of the housing, a filter unit positioned below the cup shaped member in the lower portion of said housing and normally seated on a shoulder in the side wall of the housing, said filter unit having foraminous top and bottom plates, and filter material disposed between said plates, the arrangement being such that the air normally passes downwardly through the filter material, a spring supporting said filter unit whereby it may be forced downwardly in the event of choking or clogging of the filter material, the filter unit being of an external diameter slightly less than that of the internal diameter of the portion of the housing in which it is positioned thereby to provide an annular passageway through which the air may pass when the filter unit is forced downwardly, an annular baffle extending downwardly from the under side of the filter unit through the interior of which the air normally passes, and the housing having an air outlet opening located near but above the bottom thereof, and a drainage outlet opening at the bottom thereof.

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