Cooler for gas leaving Roots blowers

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COOLER FOR GAS LEAVING ROOTS BLOWERS

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2 Claims. (Cl. 62—125)

This application is a continuation-in-part of
my application Serial No. 227,849 filed May 23,
1951, now abandoned.

This invention relates to Roots blowers.

It is an object of the invention to provide an
efficient cooler for gas leaving a blower.

It is a further object to improve the output
of a blower by means interposed in the path of
the effluent gas.

It is a further object to provide a Roots blower
which will have a high output of cold air.

A cooling system for a Roots blower according
to this invention, comprises an evaporator for a
volatile liquid located in the path of the gases
leaving the blower and connected to a condenser
external to the blower and outlet ducting. It is
preferred to provide a balance pipe between the
outlet duct of the blower and the cooling system
so that the pressure within the cooling system
varies in accordance with the pressure of gases
leaving the blower. In this way the boiling point
of the liquid in the evaporator is caused to vary
to some extent with the output of the blower and
hence the cooling system provides for regulation
of the temperature of the compressed gases over
a wider range of pressures.

In order to provide the minimum disturbance
of the gas flow of the gases leaving the blower
it is desirable that the evaporator shall be located
in the region where the gas flow conditions are
confused and it has been found preferable to
arrange the evaporator within the casing of the
blower. Both the evaporator and the condenser
may have the form of coiled, finned tubes or any
other convenient form of heat exchanger tubing.

As the volatile liquid, methyl alcohol may be used
for example.

The provision of an evaporator or any other
form of grid or perforated plate in the discharge
passage of a Roots blower near the outlet from
the blower chamber serves to improve the per-
formance of the blower as compared with the per-
formance when the grid or plate is omitted. I
believe that this is due to the damping of pulsa-
tions in the gas leaving the blower. This is an
important feature of this invention.

Commonly a Roots blower has a casing which
defines the blower chamber and has an outlet
port leading into an outlet duct which is attached
to the casing and forms the remainder of the dis-
charge passage. The grid of plate may be placed
across the duct provided that it is within a few
inches of the outlet from the chamber, but pref-
erably the grid or plate is set in the port in the
casing.

A grid for this purpose may be built up of strip
metal arranged edge-on to the flow along the
passage, or of other solid-sectioned members.

The accompanying drawings show preferred
embodiments of this invention. In these draw-
ings,

Figure 1 is a perspective view of one embodi-
ment;

Figure 2 is a section through the blower casing
on the line II—II in Figure 3;

Figure 3 is an elevation of the blower casing
seen in the direction of the arrow III in Figure 2.

Figure 4 is a perspective view of a second
embodiment; and

Figure 5 is an elevation similar to Figure 3.

The principal part of the first embodiment
shown in Figures 1 to 3, is a Roots blower com-
prising two four-lobed rotors 2 and 4, each turn-
ing in a chamber 6 within a casing 8. The rotors
are geared together by gear wheels in an exten-
sion 10 of the casing and are driven by a shaft
12. They serve to draw gas through an inlet port
14 and expel it through an outlet port 16. An
outlet duct 18 is bolted to the casing 8 over the
port 16 and has a section which changes gradu-
ally from the shape of the port 16 to circular.

A grid 20 is fitted into the port 16. This grid
is built up of intersecting thin brass strips 22
set in a frame 24. The whole grid is held in
place by two bolts 28 which enter tapped holes
in small blocks 26 brazed on to the frame 24.

The second embodiment shown in Figures 4
and 5 differs from the first in the replacement
of the grid 20 by an evaporator 30 comprising
tubes 32 extending between headers 34 and 35
and intersected by fins 36. The headers are con-
ected to a condenser 38 of similar type by flow
and return pipes 40 and 42. Thus, during the
running of the device, liquid evaporated in the
evaporator 30, is passed over through the flow
tube 40 as vapour to the upper part of the con-
denser 38, and liquid condensed in the condenser
38 will return to the bottom of the evaporator
30, through the return pipe 42.

To ensure that the liquid in the condenser
does boil throughout a wider varying range of
pressures in the outlet duct 18 than would be
the case if the cooling system were entirely iso-
lated from the outlet duct, the pipe 40 is con-
nected to the outlet duct 18 by a balance pipe 44
which is provided with a vapour trap 46 of any
convenient kind. In this way the pressure with-
in the cooling system is maintained at the same
value as the pressure in the outlet duct 18 so
that as the pressure in the outlet duct rises, the
pressure in the cooling system and hence the boiling point of the liquid in the evaporator also rises. The balance pipe 44 may be taken to any convenient point in the cooling system. The vapour trap 45 contains a movable piston or diaphragm which transmits pressure but prevents vapour from the cooling system passing into the outlet duct 15 and hence being lost.

I claim:

1. A Roots blower having a casing defining an outlet port, an outlet duct leading from said outlet port, a grid-like evaporator in said outlet port, a condenser external to said casing and outlet duct, and pipe connections between said evaporator and condenser whereby vapour produced by evaporation of a volatile liquid in the evaporator travels to the condenser where it is condensed and whence condensed liquid returns to the evaporator.

2. A gas compressor and cooler as claimed in claim 1 in which the cooling system is subjected to the pressure in the outlet duct through a pipe connection and vapour trap.

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