June 12, 1928.

1,673,072

G. T. HOUGHTBY

WARM AIR FURNACE

Filed Aug. 28, 1926

3 Sheets-Sheet 1

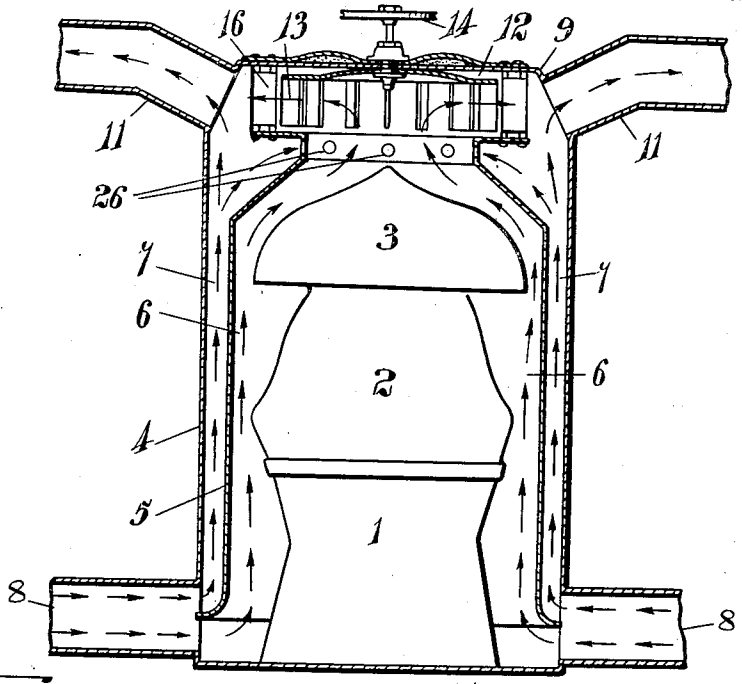

Fig. 1.

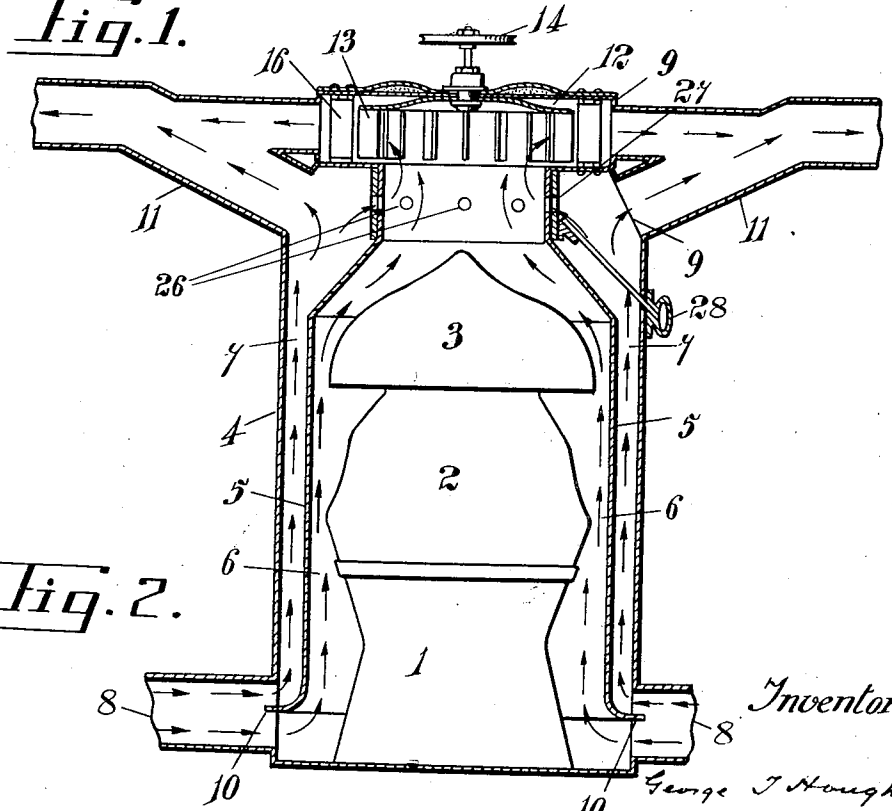

Fig. 2.

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3 Sheets-Sheet 2

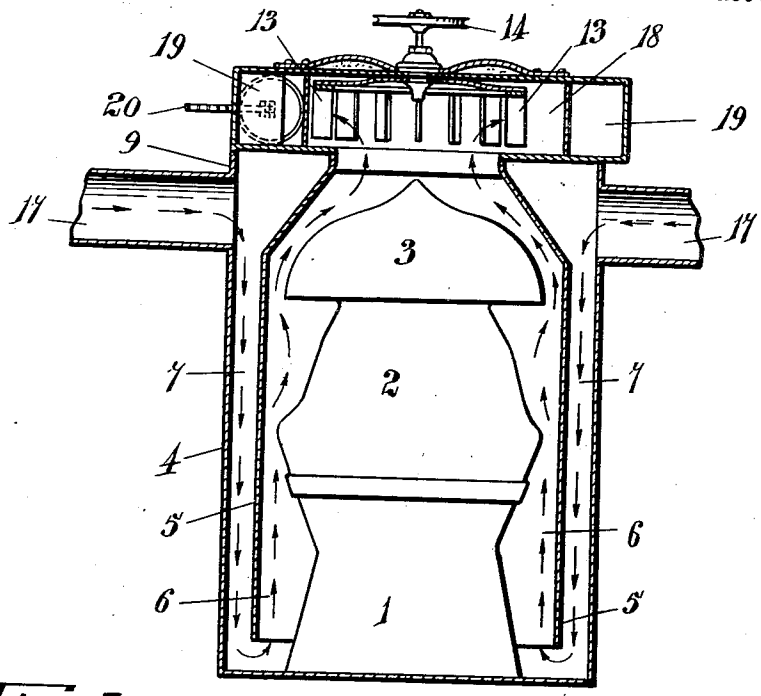

Fig. 3.

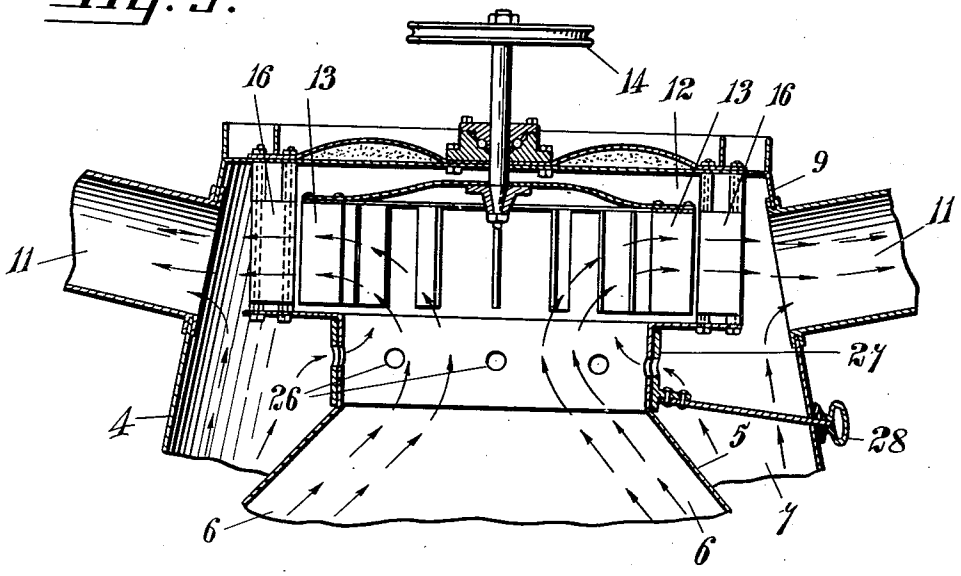

Fig. 4

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3 Sheets-Sheet 3

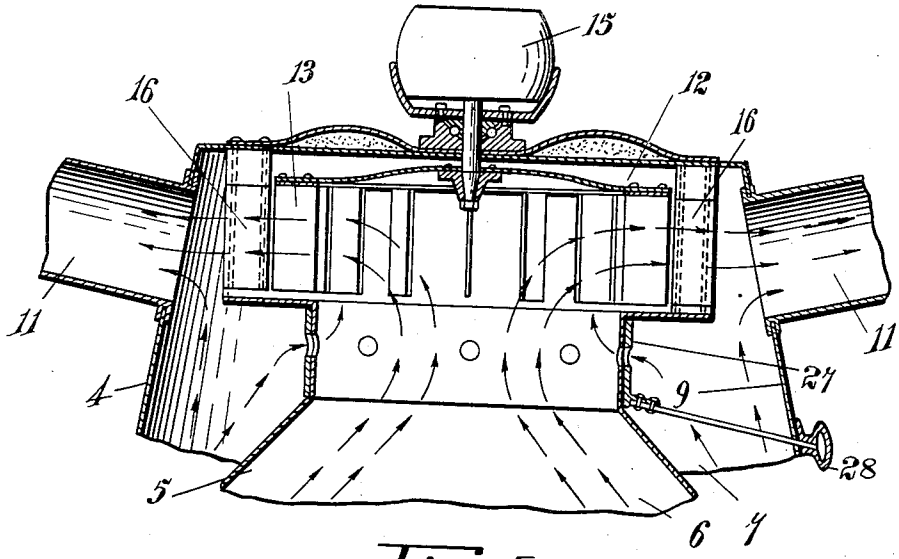

Fig. 5.

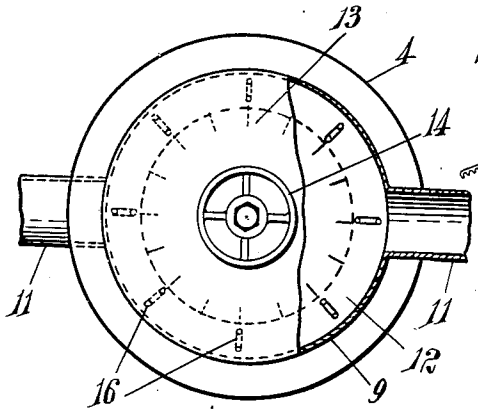

Fig. 6.

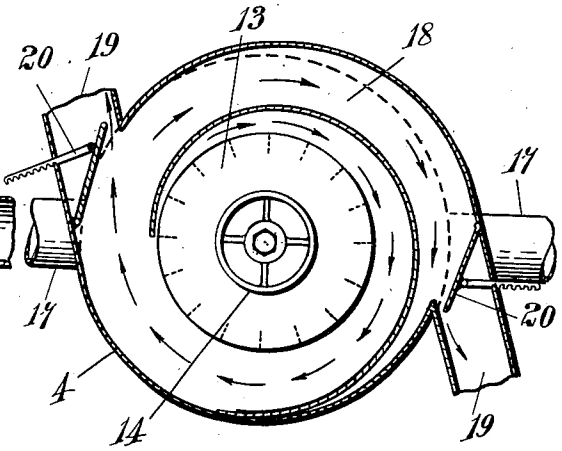

Fig. 7.

Inventor

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Patented June 12, 1928. 1,673,072

UNITED STATES PATENT OFFICE.

GEORGE TITUS HOUGHTBY, OF LONDON, ONTARIO, CANADA.

WARM-AIR FURNACE.

Application filed August 28, 1926. Serial No. 132,241.

The object of my invention is to so construct a warm air furnace that its heating efficiency will be materially increased, and this object is attained:—

(*a*) By the distribution of the warm air equally to all the leaders; and

(*b*) By the control of the air currents through the free air space.

In carrying out the invention the furnace is provided with a metal partition for dividing the free air space into two vertical channels. One of these channels is between the partition and the fire box, combustion chamber, and radiator, and the other is between the partition and casing. Both of the chanenls may be connected, independently of each other, with the air intake and leaders, or one may be connected through the other with the air intake and leaders.

The partition is heated by radiation from the fire box, combustion chamber and radiator, and the air passing through the outer channel, i. e. the channel between the partition and casing, takes up the heat from the partition and serves to insulate the casing from the fire box, combustion chamber and radiator, the degree of insulation being more or less dependent on the velocity of the air current passing through this channel. The air passing through the other or inner channel takes up the heat from the partition, fire box, combustion chamber, and radiator.

The furnace is also provided with a fan chamber, which communicates with the free air space and with the leaders, and a fan within the fan chamber for accelerating the velocity of the air currents passing through the free air space and distributing the air equally to all the leaders. The fan chamber is constructed with deflectors for preventing the rotation of the air in the fan chamber and causing the air pressure to build up as the fan revolves, so that this pressure will force the air through the leaders to the registers.

For an understanding of the invention reference is to be had to the following description and to the accompanying drawings, in which:

Fig. 1 is a vertical section of a warm air furnace constructed according to my invention, showing the partition for dividing the free air space into two channels, and the fan chamber and fan set within the casing hood,

Fig. 2 is a vertical section showing the fan chamber and fan located above the hood, and the air intakes at the bottom of the furnace,

Fig. 3 is a vertical section showing the air intakes at the top of the furnace,

Fig. 4 is an enlarged sectional detail view showing the fan chamber and a pulley driven fan,

Fig. 5 is a similar view to Fig. 4 showing a motor driven fan,

Fig. 6 is a horizontal section through the fan chamber shown in Figs. 1 and 2, and

Fig. 7 is a horizontal section through the fan chamber shown in Fig. 3.

Like characters of reference refer to like parts throughout the specification and drawings.

The fire box 1, combustion chamber 2, radiator 3, and the casing 4, enclosing these parts and provided with air intakes and leaders, may be similar to corresponding parts of any of the usual types of warm air furnaces, and these constitute no part of my present invention.

Between the casing and the fire box, combustion chamber and radiator is the free air space and within the furnace is a partition 5 between, and spaced from, the casing and the fire box, combustion chamber and radiator, which divides the free air space into two vertical channels 6 and 7. In the furnace shown in Figs. 1 and 2 the air intakes 8 are at the bottom of the casing, the partition 5 encloses the fire box, combustion chamber and radiator and extends to approximately the middle of the air intakes 8, and the baffles 10 extend from the bottom of the partition into the air intakes to separate the air into two currents one of which flows through the outer channel 7 and the other of which flows through the inner channel 6. The hood 9 is constructed with the usual leaders 11 and the air flowing through the outer channel 7 has a direct passage from the air intakes 8 to the leaders, while the air flowing through the inner channel 6 has a passage through the fan chamber 12 to the leaders. The partition 5 is of conductive metal and is heated by direct radiation from the fire box, combustion chamber and radiator. The air passing through the outer channel 7 takes up some of the heat from the partition 5, and the air passing through the inner channel 6 also takes up some of the heat from the partition 5 and from the fire box 1, combustion chamber 2 and radiator 3.

The furnace shown in Fig. 1 is construct-

ed with the fan chamber 12 within the hood 9 and with a fan 13 within the fan chamber 12, and this fan may be driven by a pulley 14 as shown in Figs. 1 to 4, to which motion is imparted by a belt or other power transmission device or it may be driven by an electric or other motor 15, as shown in Fig. 5.

The furnace shown in Fig. 2 is constructed with the fan chamber 12 above the hood and a fan within the fan chamber. The fan chamber shown in Figs. 1 and 2 communicates with the air channel 6 and the rotation of the fan 13 creates a suction in the fan chamber which accelerates the velocity of the air currents passing through this channel.

The fan chamber, as shown in Fig. 6, is provided with a plurality of deflector blades 16 radially arranged and evenly spaced around the fan chamber. These blades extend from the rotational path of the fan part way to the wall of the fan chamber for retarding the rotary circulation of the air in the fan chamber, during the revolution of the fan, and causing the pressure in the fan chamber to build up as the fan revolves and this pressure equally distributes the air to all the leaders 11 and forces it to the warm air registers.

In Fig. 3 the air intakes 17 are shown to be in the vicinity of the hood 9 and the air entering these intakes passes downwardly through the outer channel 7 around the bottom of the partition wall 5 and upwardly through the inner channel 6 to the fan chamber 18. The fan chamber 18 in the construction shown in Fig. 7, is provided with leaders 19 tangential to its circumference and each of these leaders has an adjustable damper 20 which can be opened and closed at will to control the circulation of the air from the fan chamber to the leader.

The heated air from the channel 6 is drawn or sucked into the fan chamber shown in Figs. 1, 2, 3 and 4 and forced under pressure into the leaders 19 through which it rapidly flows to the warm air registers, and in the constructions shown in Figs. 1 and 2, the air from the channels 7 combines with the air from the channels 6 as it enters the leaders and is carried under pressure to the registers.

The partition 5 is provided with apertures 26 below the fan chamber and the suction created by the fan draws part of the air current from the channel 7 into the channel 6 as the air flows upwardly through the latter channel to the fan chamber. These apertures are controlled by an adjustable damper 27 and a handle 28 is connected with the damper 27 to adjust it for controlling the apertures.

When the furnace is to operate on the gravity system the partition will be used to divide the free air space into two channels as above described but the fan will be omitted and when it is desired to use the fan for distributing the air equally to all the leaders in a suction and pressure system, the entire free air space may be heated by direct contact of the air with the fire box, combustion chamber and radiator, and the partition may be omitted.

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

1. In a furnace comprising a fire box, combustion chamber, and radiator, and a casing enclosing them, provided with air intakes and leaders, the combination of a partition between the casing and the fire box, combustion chamber and radiator for dividing the free air space of the furnace into two air channels, the outer air channel being between the partition and the casing and communicating directly with the leaders, and the inner air channel being between the partition and the fire box, combustion chamber and radiator, a fan chamber above the free air space of the furnace, communicating with the inner air channel and the leaders, a fan within the fan chamber for sucking the air through the inner air channel and forcing it through the fan chamber to the leaders and accelerating the velocity of the air passing through both channels of the free air space and effecting its equal distribution to all of the leaders, and means for causing the air pressure to build up within the fan chamber as the fan rotates.

2. In a furnace comprising a fire box, combustion chamber, and radiator, and a casing enclosing them provided with air intakes and leaders, the combination of a fan chamber communicating with the free air space of the furnace and the leaders, a fan with in the fan chamber for accelerating the velocity of the air passing through the free air space and distributing it equally to all the leaders, and deflectors within the fan chamber for preventing the rotation of the air with the fan and causing the pressure to build up as the fan rotates.

3. In a furnace comprising a fire box, combustion chamber, and radiator, and a casing enclosing them, provided with air intakes and leaders, the combination of a partition between the casing and the fire box, combustion chamber and radiator for dividing the free air space of the furnace into two air channels, the outer air channel being between the partition and the casing and communicating directly with the leaders, and the inner air channel being between the partition and the fire box, combustion chamber and radiator, a fan chamber above the free air space of the furnace, communicating with the inner air channel and the leaders, a fan within the fan cham-

ber for sucking the air through the inner air channel and forcing it through the fan chamber to the leaders and accelerating the velocity of the air passing through both channels of the free air space and effecting its equal distribution to all of the leaders, apertures through the partition in the vicinity of the fan chamber for establishing communication between the inner and outer air channels near the upper end of the free air space, and means for causing the air pressure to build up within the fan chamber as the fan rotates.

4. In a furnace comprising a fire box, combustion chamber, and radiator, and a casing, enclosing them and provided with air intakes and leaders, the combination of a partition between the casing and the fire box, combustion chamber, and radiator, for dividing the free air space into two air channels communicating with the air intakes and leaders, a fan chamber communicating with the air channels and with the leaders, a fan within the fan chamber for accelerating the velocity of the air currents through the channels and distributing it equally to all the leaders, and means for causing the air pressure to build up within the fan chamber as the fan rotates.

5. In a furnace comprising a fire box, combustion chamber, and radiator and a casing, enclosing them and provided with air intakes and leaders, the combination of a partition between the casing and the fire box, combustion chamber, and radiator, for dividing the free air space into two air channels communicating with the air intakes and leaders, a fan chamber communicating with the free air space of the furnace and with the leaders, a fan within the fan chamber for accelerating the velocity of the air currents through the channels and distributing it equally to all the leaders, and deflectors within the fan chamber for preventing the rotation of the air with the fan and causing the pressure to build up as the fan rotates.

6. A furnace comprising means for heating a current of air, a fan and fan chamber above the heating means for accelerating its velocity through the free air space of the furnace, and means for retarding the rotation of the air within the fan chamber and causing the pressure to build up as the fan rotates for increasing the velocity head of the air through the outlets.

7. A furnace as claimed in claim 6 in which the free air space is divided into two air channels by a partition surrounding the heating means one of which is in circulation with the outlets through the fan chamber and the other of which is in direct circulation with the outlets and in direct circulation with the fan chamber through the other channel.

Dated at the city of Toronto, in the county of York, and Province of Ontario, Dominion of Canada, this 15th day of June, 1926.

GEORGE T. HOUGHTBY.