

June 28, 1949.

A. W. CONLEY
HEATING APPARATUS

2,474,467

Filed March 3, 1945

2 Sheets-Sheet 1

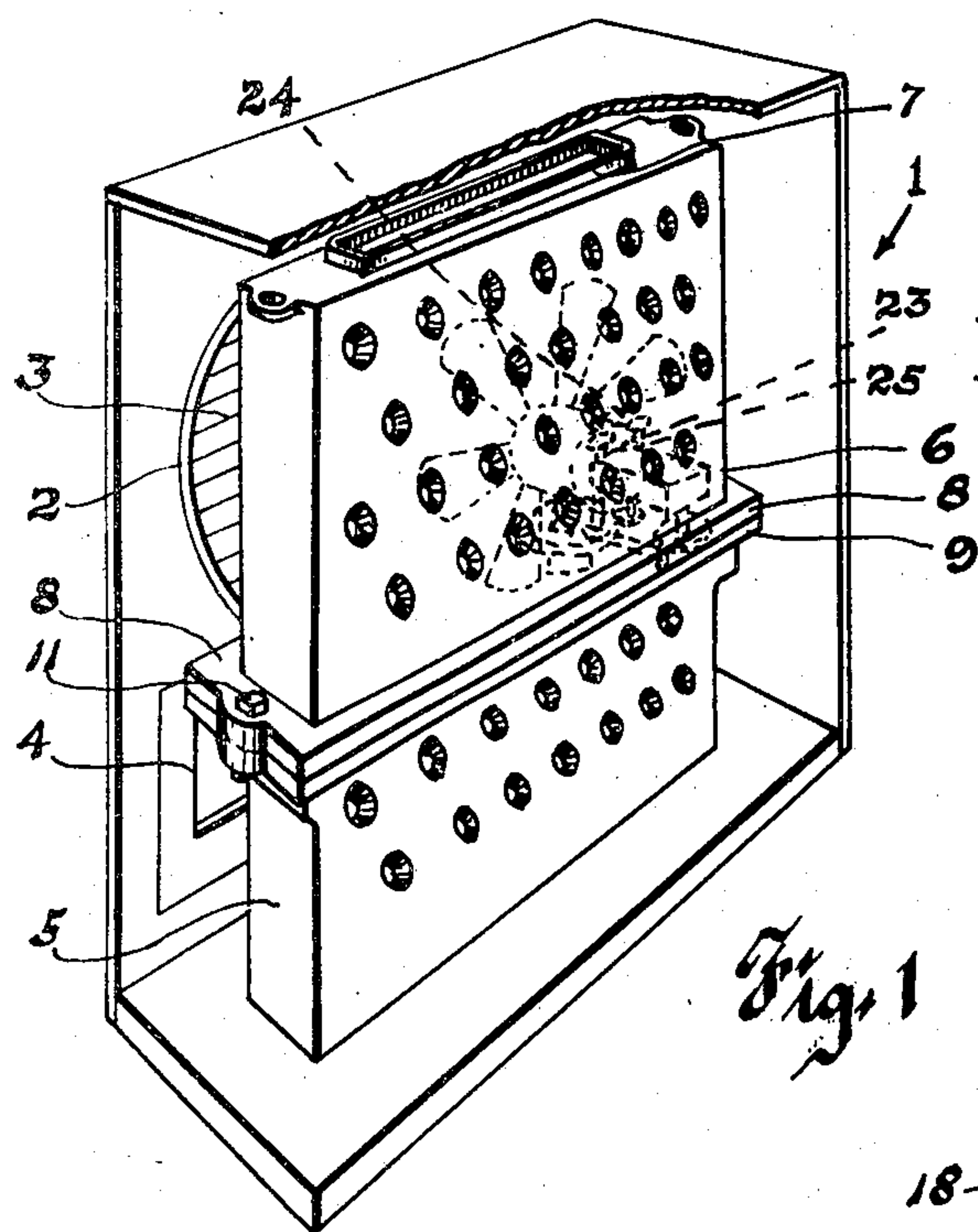


Fig. 1

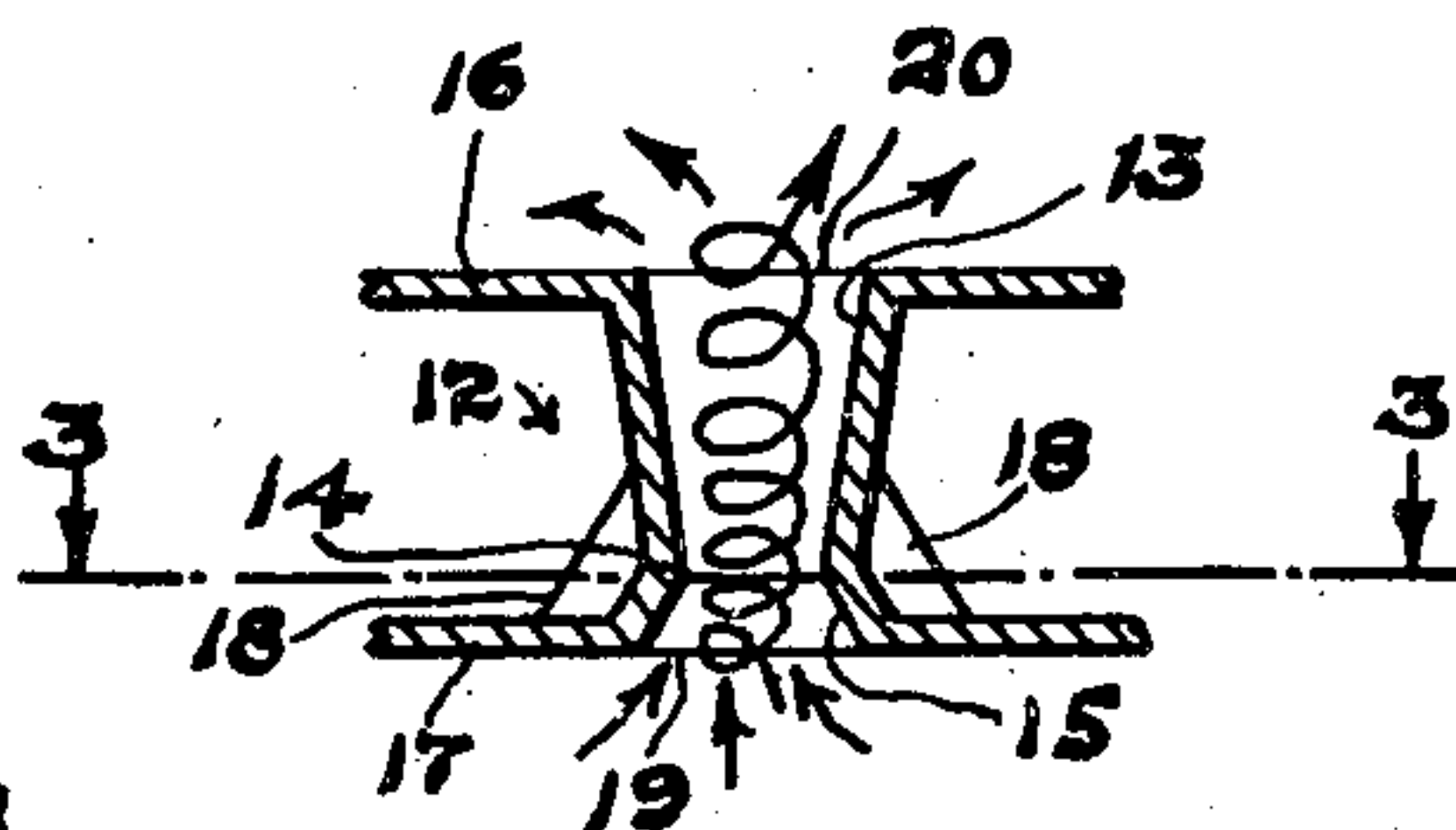


Fig. 2

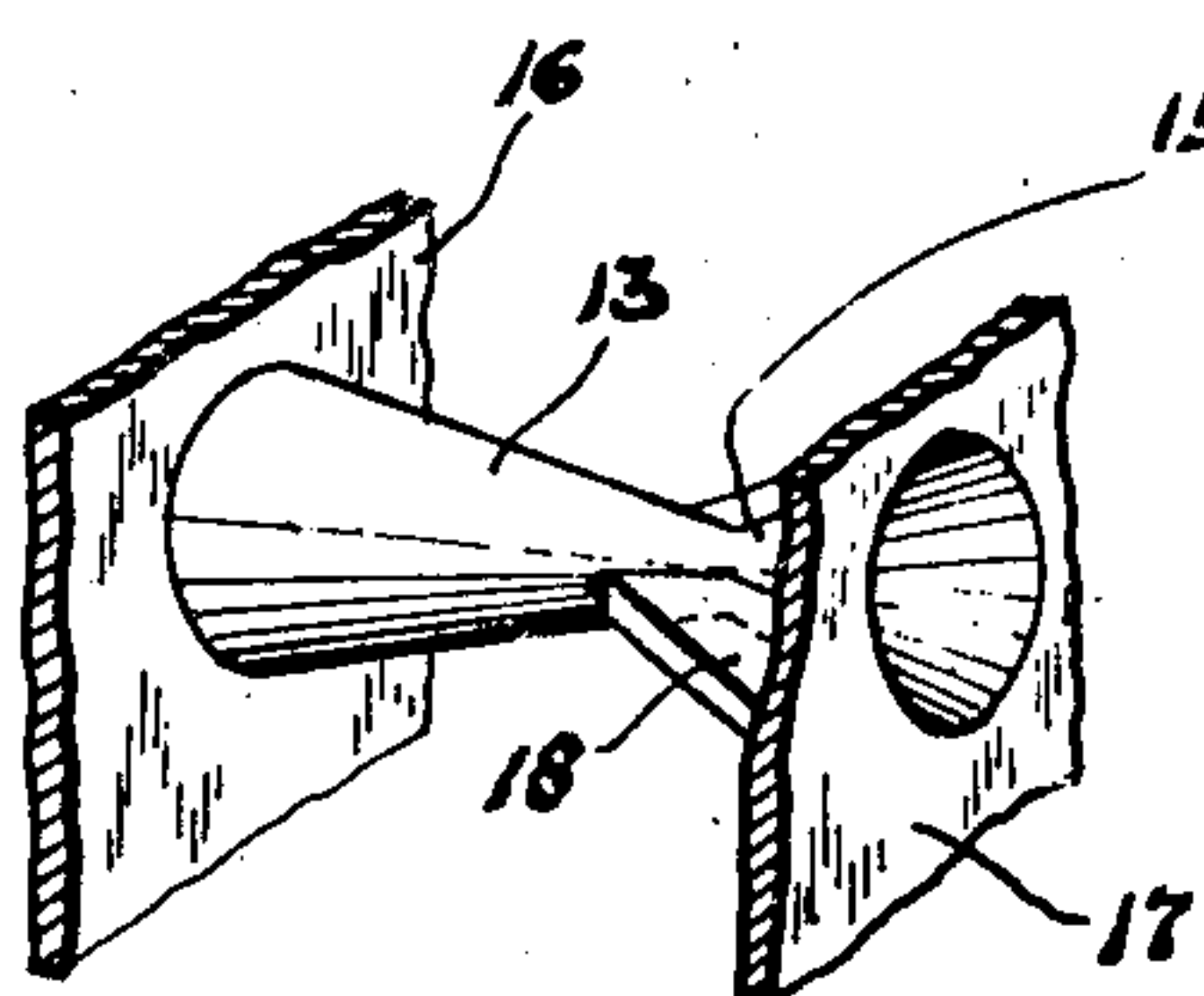


Fig. 4

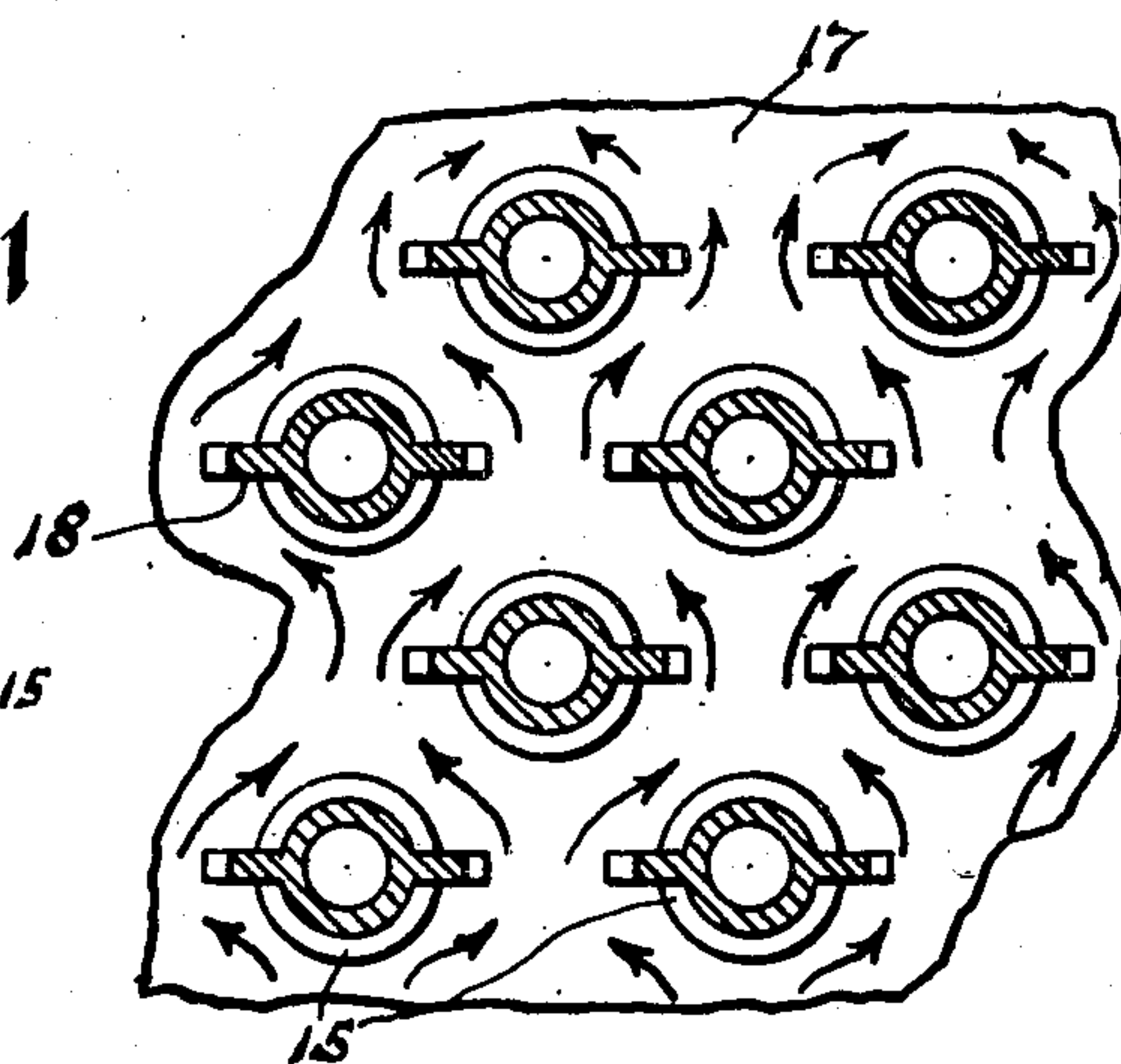


Fig. 3

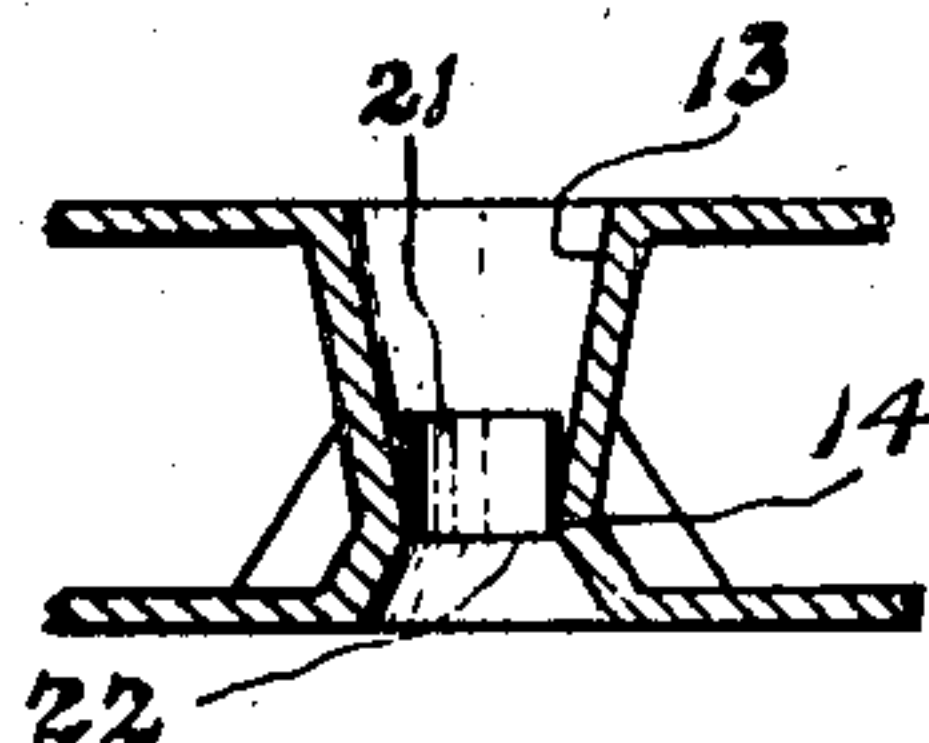


Fig. 5

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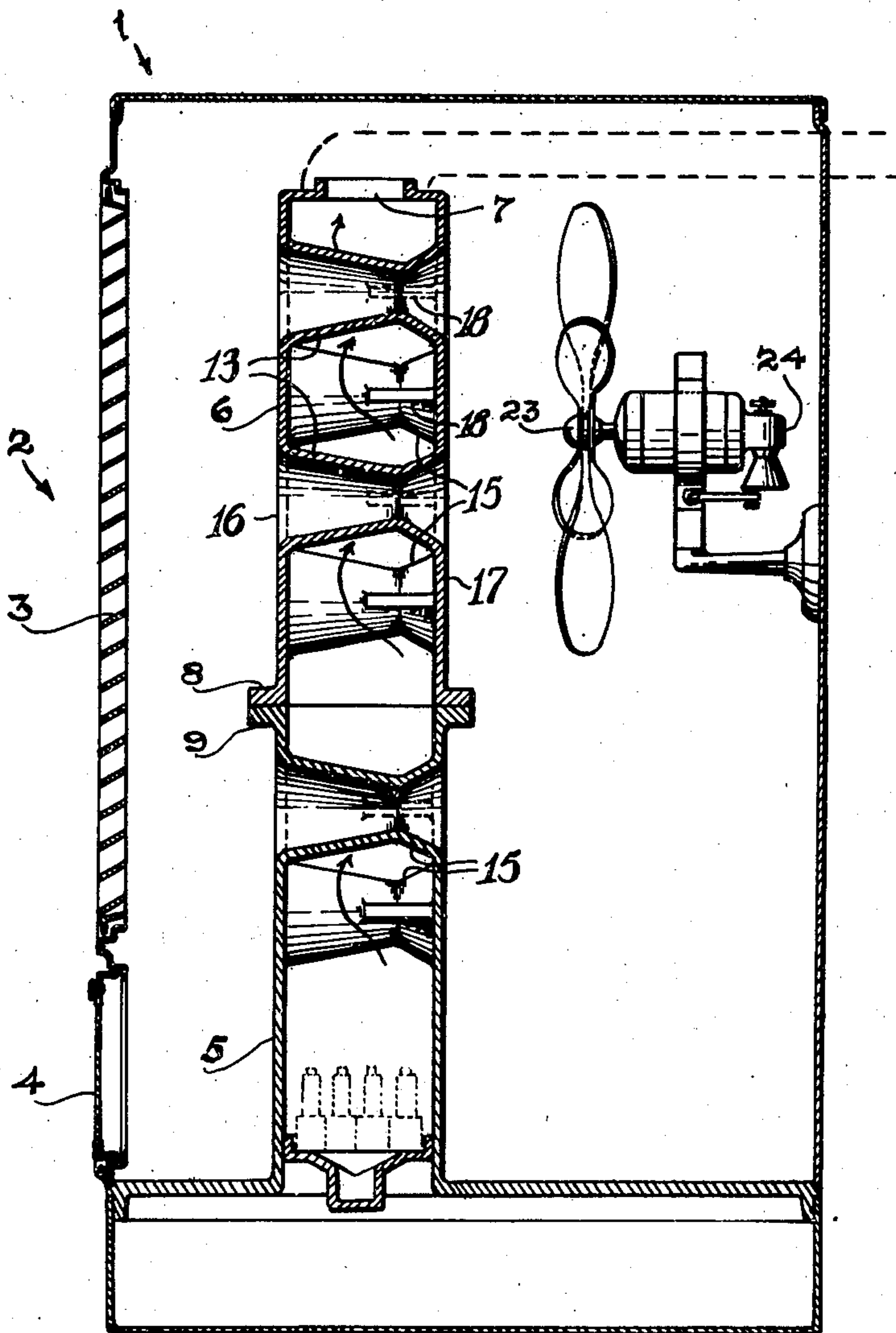


Fig. 6

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UNITED STATES PATENT OFFICE

2,474,467

HEATING APPARATUS

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Application March 3, 1945, Serial No. 580,898

8 Claims. (Cl. 257—137)

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This invention relates to a heating apparatus. More particularly, it comprises a heating apparatus wherein a source of heat is placed at the bottom of the unit and the air immediately above the same is heated within an enlarged heat transfer chamber, and wherein transverse passageways are provided whereby heat is transferred to air currents circulated throughout the room or other area which the apparatus is intended to heat. The invention also includes providing such passageways in the form of Venturi ducts with lateral wing areas which not only cause the heated gases from the source of heat, which may be a gas burner or the like, to follow a tortuous passageway to the flue or chimney into which such gases are discharged, but also causes a spiral jet action on the air within the chamber or other area which is to be heated.

The invention also includes the provision of a cylindrical member of reduced diameter within the Venturi duct to enhance the jet effect on the air currents passing within the same to insure wider distribution of the heated air throughout the area to be heated.

The invention also includes the forming of the apparatus with a minimum of parts and of a shape to be readily fabricated and assembled and inspected and repaired at any time it should become necessary.

The principal object of the present invention is to provide an improvement in heating apparatus wherein increased heating effect will be obtained through the consuming of a given amount of fuel.

Another object of the invention is to provide an improved heating apparatus adapted for general use wherein the parts of the unit are of simple construction, but of highly efficient operation by reason of the special relationship of the structural elements thereof.

Another object of the invention is to provide an improved heating apparatus particularly adapted for the heating of dwellings through the use of oil or gaseous fuel and wherein a maximum heating effect is obtained with the use of a minimum amount of fuel through the exceptional heat transfer characteristics of the apparatus herein provided.

Another object of the invention is to provide an improved heating apparatus wherein air is circulated at a relatively high rate of speed through a heating unit under conditions wherein heat transfer is carried out under most favorable conditions.

Another object of the invention is to provide an improved heating apparatus wherein the gases of

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combustion travel a winding pathway through the apparatus and contact the wall surfaces thereof over extended areas.

Another object of the invention is to provide an improved heating apparatus wherein the transfer of heat takes place through the walls of a transverse passageway of special conformation, wherein the air currents of the area to be heated are passed through such apparatus at a high rate of speed, but under conditions permitting rapid transfer of heat thereto and the distribution of such heat throughout the area to be heated.

Other and further objects of the invention will appear in the course of the following description.

To the accomplishment of the foregoing and related ends, said invention consists of the means hereinafter fully described and particularly pointed out in the claims, the annexed drawing and the following description setting forth in detail certain structures embodying the invention, such disclosed means constituting, however, but several of various forms in which the principle of the invention may be used.

In said annexed drawings:

Figure 1 is a perspective view, broken away in part, showing one form of apparatus embodying the principles of the invention;

Fig. 2 is an enlarged central horizontal sectional view of one of the ducts shown in Figure 1;

Fig. 3 is a fragmentary vertical sectional view of a plurality of ducts with associated wing members, as seen in the plane of the line 3—3 indicated in Fig. 2;

Fig. 4 is a fragmentary perspective view showing an improved single Venturi duct as it appears within the heat transfer chamber;

Fig. 5 is a central horizontal sectional view similar to Figure 2 showing a modified form of duct structure, having a jet nozzle area; and

Fig. 6 is a central vertical sectional view of the structure shown in Fig. 1.

As is clearly shown in Figure 1 of the drawing, the heating apparatus comprises a housing 1 with a large central discharge aperture 2 for heated air, preferably provided with adjustable louvres 3 for controlling the rate and direction of the heated air passing therethrough, and provided adjacent its lower front portion with an air intake passageway 4. The heating unit follows conventional forms with reference to having a heating chamber 5 adjacent its base and a heat transfer chamber 6 immediately above the same, said heat transfer chamber communicating with a flue 7 or other discharge passageway for the gases of combustion. The heating unit 5 is pref-

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erably provided with gas burners, but other types of heating units may be used without departing from the spirit of the invention. The air taken in through the passageway 4 will be circulated toward the rear of the housing 1 and will be carried with special force toward the front of the apparatus by reason of the peculiar shape of the Venturi ducts disposed transversely of both the burner chamber 5 and the heat transfer chamber 6.

The heat transfer chamber 6 is provided with flanges 8 which engage flanges 9 at the top edge of the heating chamber 5 and the two chambers are secured together by means of bolts 11 engaged through suitable apertures in said flanges, preferably at each end of the assembled chambers. In order to secure a maximum rate of transfer of the heat to the air circulated through the apparatus, the transverse passageways must preferably be of a cross section tending to cause the air passing through such apparatus to closely adhere to the heated wall surface thereof.

In the preferred form of construction, the transverse Venturi ducts are of the character shown in Figures 2, 3, and 4, wherein said transverse ducts 12 have an outer portion 13 formed as a hollow frustrum of a cone merging at a narrow neck portion 14 with a short intake portion likewise formed as a hollow frustrum of a cone 15, but one having a greater degree of angularity, and reversely positioned.

The discharge hollow cone area 13 merges with the outer walls 16 of the respective chambers wherein such ducts are located and the intake cone 15 merges with the inner walls 17 of said respective chambers.

In forming the transverse ducts in unbalanced Venturi shape the advantage gained through the passage of air through the interior of such ducts has a disadvantageous effect upon the passage of gases of combustion through the combustion chamber and heat transfer chamber, and in order to counteract this tendency of the heated gases to move toward the narrow neck portion of the Venturi duct, small wings or vanes 18 are provided having inclined outer edges extending substantially parallel to the outer surfaces of the shallow intake hollow cone areas. The vanes 18 preferably are positioned in a horizontal plane and project outwardly from the ducts, preferably at a slightly greater angle than the surface of the discharge hollow cone areas, and thus cause a slightly greater volume of heated gases to contact the conical discharge portions of the ducts and the front wall of the apparatus, and thus form a more highly heated area at the discharge orifice of each of said ducts. The advantages of this construction, it is believed, will be apparent from an inspection of Figures 2, 3, 4, and 6, wherein the arrows show the entrance of air through the inlet port 19, and the spiraling of the air into contact with the increasing diameter of wall area toward the discharge port 20, as indicated. As stated, the wall area of the hollow conical discharge portion 13 is somewhat more highly heated than the inner portion of the Venturi ducts.

In the form of construction shown in Figure 5, used with the fan, shown in Figures 1 and 6, adjusted for oscillation, the structure is of a character to produce vortex rings when the parts are made of the proper relative proportion and wall contour. This not only has the advantage of the spiral jet action of the structure shown in Figures 2 and 4, but has the further advantage of having the vortex ring rotate against the heated walls of

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the discharge passageway 13. This vortex ring formation is brought about through the provision of a narrow tube 21 firmly engaged at its tapered inner portion 22 with the walls of the narrow neck portion 14. The tube 21 may be of various lengths and must bear a predetermined ratio of width to the rim of the passageway and to the volume of air stream entering such passageway.

The circulation of the air is preferably maintained through the use of a motor driven fan 23 preferably positioned centrally of the heat transfer chamber 6 in spaced relation to the rearward face thereof. The fan may be of the fixed position character or, as shown in Figures 1 and 6, may be a fan having an oscillating attachment 24 of conventional design, whereby it may be adjusted to oscillate if desired.

The intermittent action of the fan against the air passing through the transverse passageways, when adjusted for oscillating movement, serves to allow a certain quantity of air within a passageway to reach a relatively high temperature before the impact of the air stream from the fan projects such quantity of air outwardly through the passageway into the space to be heated. Thus, the successive projection of preheated air bodies in the respective passageways permits a time interval during which increased heating effect is obtained upon such individual air bodies in the passageways and a more rapid heating of the area to be served by such heating unit is brought about.

The length of the fan blades is preferably adequate to distribute air over the entire rearward face of the heat exchange chamber 6, and, as stated, the air will pass through the transverse Venturi ducts with a spiral action in the manner shown in Figures 2 and 4, or with the vortex or modified vortex action in the form shown in Figure 5. In the latter instance, if the length of the tubes 21 is increased somewhat, the jet action of the structure will be enhanced and a counterflow of air along the walls of the discharge portion of the duct will be induced with improved heating of the air within such passage, as well as a wider distribution of the heated air streams in the chamber or other area to be heated.

Other modes of applying the principle of my invention may be employed instead of those explained, change being made as regards the structure herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. An apparatus of the character described having in combination a housing having a front wall with a central discharge area therein, a combined heating and heat exchange chamber mounted in spaced relation to said front wall of said housing, a plurality of transverse passageways extending through said heating and heat exchange chamber, a fan mounted rearwardly of said passageways, the discharge opening in the front wall of said housing being positioned opposite of said fan, an intake area adjacent the base of said housing, means to cause enhanced heating effect in each of said transverse passageways, comprising horizontal wing elements of substantially triangular formation connected with each of said transverse passageways and with the rear wall of the chamber adjacent the rearward portions thereof and serving to direct

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gases of combustion toward the front wall of said chamber.

2. An apparatus of the character described having in combination a housing, having a heating chamber disposed centrally of its lower portion and a heat exchange chamber associated with said heating unit immediately above the same and provided with a discharge outlet on its upper area, a plurality of transverse ducts at spaced intervals throughout at least one of said chambers, an oscillating fan positioned adjacent the rear wall of said housing adapted to move air intermittently forwardly through said transverse ducts, an air intake opening adjacent the base of the front wall of said housing, and an air discharge opening centrally of the front wall of said housing above such air intake opening, and means to cause enhanced heating effect in each of said transverse ducts, comprising horizontal wing elements of substantially triangular formation connected with each of said transverse ducts adjacent the rearward portions thereof and serving to direct gases of combustion toward the front walls of said chambers.

3. An apparatus of the character described having in combination a housing provided with a front wall formed with a central discharge area therein, a combined heating and heat exchange chamber mounted in spaced relation to said front wall of said housing, a plurality of transverse passageways extending through said heating and heat exchange chamber, a fan mounted rearwardly of said passageways, the discharge area in said front wall of said housing being positioned opposite said fan, an intake area adjacent the base of said housing, and horizontal wing elements connected with said transverse passageways on the rear wall of said chamber to produce transverse flow of heated gases and cause enhanced heating effect in each of said transverse passageways.

4. An apparatus of the character described having in combination a housing provided with a front wall formed with a central discharge area therein, a combined heating and heat exchange chamber mounted in spaced relation to said front wall of said housing, an intake area adjacent the base of said housing, a plurality of transverse passageways extending through said heating and heat exchange chamber, means disposed rearwardly of said passageways for producing an intermittent discharge of air therethrough, each of said passageways consisting of frusto-conical areas of relatively different size to produce an ejector effect on the air passing therethrough, and horizontal wing elements connected with the transverse passageways on the rear wall of said chamber to produce a transverse flow of the heated gases and cause enhanced heating effect in each of said passageways.

5. An apparatus of the character described having in combination a housing provided with a front wall formed with a central discharge area therein, a combined heating and heat exchange chamber mounted in spaced relation to said front wall of said housing, a plurality of transverse passageways extending through said heating and heat exchange chamber, a fan mounted rearwardly of said passageways, said discharge area in the front wall of said housing being positioned opposite said fan, an intake area adjacent the base of said housing, and means to cause enhanced heating effect in each of said transverse passageways, said means comprising horizontal vanes connected with the external

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surfaces of each of said transverse passageways and the rear wall of said chamber to direct the heated gases toward the front wall of said chamber.

6. An apparatus of the character described having in combination a housing having a heating chamber disposed centrally of its lower portion and a heat exchange chamber associated with said heating chamber above the latter and formed with a discharge outlet in its upper area, a plurality of transverse ducts at spaced intervals throughout at least one of said chambers, each duct consisting of long and short frusto-conical areas provided with a constricting tube, a fan positioned rearwardly of said ducts and operating to move air intermittently forwardly through said ducts, an air intake opening adjacent the base of one wall of said housing, an air discharge opening formed centrally of the front wall of said housing in a plane above said air intake opening, and horizontal wing elements connected with said transverse ducts and the rear wall of the adjacent chamber to cause transverse flow of the gases and enhance heating effect in each of said transverse ducts.

7. An apparatus of the character described having in combination a housing having a heating chamber disposed centrally of its lower portion and a heat exchange chamber associated with said heating chamber above the latter, said housing being formed with a discharge outlet in its upper area, a plurality of transverse ducts at spaced intervals throughout at least one of said chambers, each duct consisting of frusto-conical areas of relatively different size to produce an ejector effect on the air passing therethrough, a fan positioned rearwardly of said ducts operating to move air intermittently forwardly therethrough, an air intake opening adjacent the base of one wall of said housing, an air discharge opening formed centrally of the front wall of said housing in a plane above said air intake opening, and horizontal wing elements connected with said transverse ducts and the rear wall of the adjacent chamber to cause transverse flow of the gases and enhance heating effect in each of said transverse ducts.

8. An apparatus of the character described having in combination a housing having a discharge outlet in its upper area, a heating chamber in the lower portion of said housing, a heat exchange chamber in said housing immediately above said heating chamber, said chambers having front and rear walls, a plurality of ducts at spaced intervals throughout at least one of said chambers and extending through the front and rear walls thereof, each of said ducts consisting of a short frusto-conical area at the intake end of said duct and a long frusto-conical area at the discharge end of said duct, a fan operating to move air intermittently through said ducts, an air intake opening formed in the front wall of said housing adjacent the base thereof, an air discharge opening formed in the front wall of said housing in a plane above the intake opening, and means to cause enhanced heating effect in each of said transverse ducts, said means comprising horizontal wings provided on the external surfaces of each of said ducts and arranged to direct the gases of combustion toward the front wall of the adjacent chamber.

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