

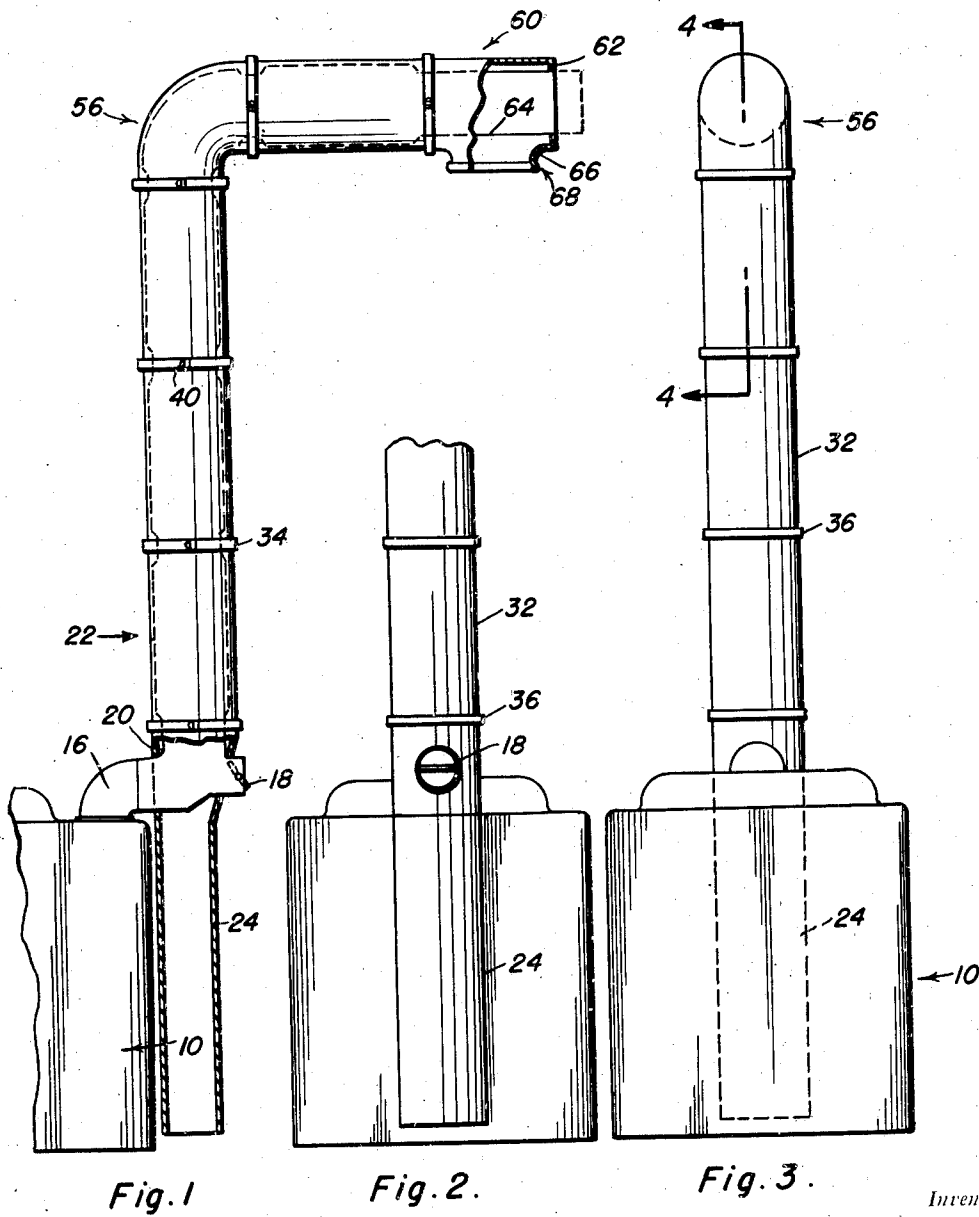
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W. E. RYAN
FLUE HEAT EXCHANGER

2,479,413

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2 Sheets-Sheet 1



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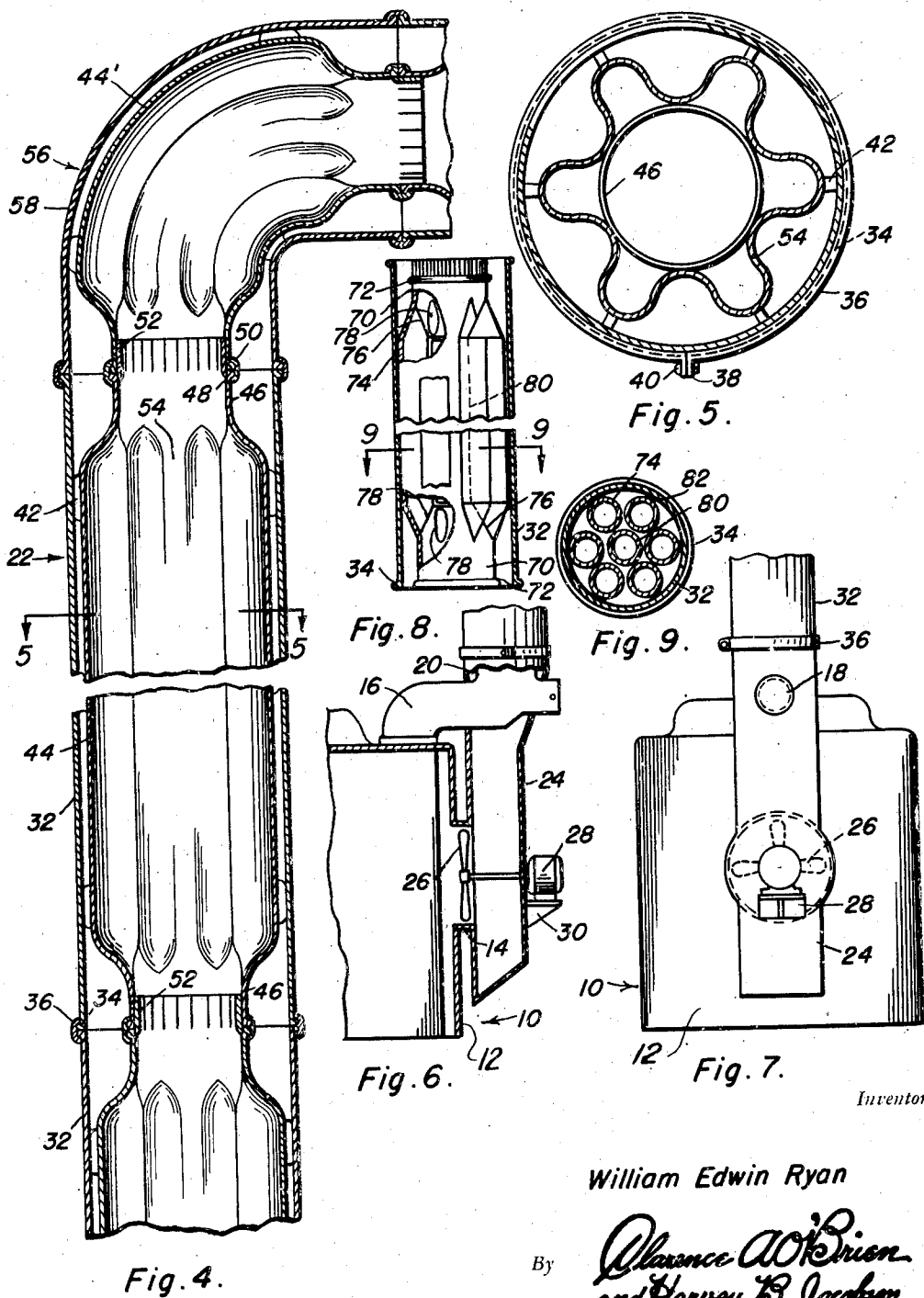
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UNITED STATES PATENT OFFICE

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FLUE HEAT EXCHANGER

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2 Claims. (Cl. 257—166)

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This invention relates generally to heat exchangers and more particularly to a heat exchanger combined with a flue of a stove.

A primary object of this invention is to provide a combined flue and heat exchanger which will utilize otherwise wasted heat escaping from the said flue, transferring this heat to the air in a room of a building.

Another salient object of this invention is to provide a combined flue and heat exchanger which is constructed in sections in which the flue sections and the sheath portions of the heat exchanger are coextensive in length and secured together, the combined sections being secured together in a novel manner.

Another object of this invention is to provide a device of this character in which the flue is constructed in a novel manner to more effectively operate in transferring the heat from the hot combustion gases to the air circulating within the sheath portions of the heat exchanger.

Still another object of this invention is to combine with a device of this character means to force the circulation of air through the heat exchanger in an improved manner, the air being drawn from the top of a room wherein the device is situated, or from any other desired area and expelled through the air heating chamber of a circulatory stove, when one form of this invention is employed.

And a last object to be specifically mentioned is to provide a device of this character which is relatively inexpensive and practicable to manufacture, extremely simple and convenient to install and to use, and which will give generally efficient and durable service.

With these objects definitely in view, this invention resides in certain novel features of construction, combination and arrangement of parts and portions as will be hereinafter described in detail in this specification, and particularly pointed out in the accompanying drawings which form a material part of this application, and in which:

Figure 1 is a side elevational view of a portion of a heater with this invention operatively applied thereto, portions of the figure being broken away and the underlying portions shown in vertical cross section;

Figure 2 is a fragmentary and elevational view of the lower portion of the structure illustrated in Figure 1;

Figure 3 is a front elevational view of the structure shown in Figure 1, the view being taken as from the left side of Figure 1;

Figure 4 is a vertical sectional view of an upper portion of the invention, the view being on a slightly enlarged scale to better disclose the internal construction thereof;

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Figure 5 is a horizontal sectional view, taken on the line 5—5 in Figure 4;

Figure 6 is a diagrammatic view of a portion of a circulatory heater and the lower portion of this heat exchanger operatively applied thereto, portions of the heat exchanger being shown in vertical section;

Figure 7 is an elevational view of the structure shown in Figure 6, the view being taken as from the right hand side of Figure 6;

Figure 8 is a vertical sectional view of a preferred modified form of this invention in which the flue portions are comprised of a plurality of tubes connected to headers adjacent each end of the sections of the heat exchanger; and,

Figure 9 is a horizontal sectional view of this modified form, the view being taken on the line 9—9 in Figure 8.

Similar characters of reference designate similar or identical parts and portions throughout the specification and throughout the several views of the drawings.

Referring now to the drawings in detail, it will be noted that the environment wherewith this invention is adapted to be used includes preferably a circulatory heater generally indicated by the numeral 10 and having an exterior jacket 12 which is provided with the duct 14 on one side thereof and the flue for the combustion gases designated at 16. This flue 16 will ordinarily be provided with a draft control damper 18 and a vertical neck portion 20, it being understood that in one modified form of this invention, the duct 14 is not used.

This heat exchanger includes a plurality of sections generally indicated by the numeral 22 which are arranged in series and in abutting relation, as hereinafter described more fully. The lowermost of these sections is connected to the neck portion 20 and a depending tubular portion 24 is connected to said lowermost section. This depending pipe portion 24 may be opened at the bottom as indicated in Figure 1 or closed as in the preferred embodiment of this invention and indicated in Figure 6, depending upon whether or not a fan 26 is used with the heat exchanger. When the fan 26 is used, an electric motor 28 to drive the fan is suitably mounted upon the heater 10 or upon the portion 24 by a bracket 30 and the fan is positioned to force air through the duct 14 into the air circulation chamber of the circulatory heater.

Each of the sections 22 is comprised of an external sheath, ordinarily of cylindrical tubular form, with annular bead portions 34 at each end of the section. When these sections are arranged in abutting relation an annular split strap clamp 36 having outwardly turned terminal flanges 38 is used to secure the adjacent ends of the sections together. The flanges 38 are apertured to receive

clamping bolts 40, and these clamps are concave to fit over the beads 34 and to tightly engage the same when the bolt 40 is tightened. A plurality of spacer members 42 are secured by any suitable means within the sheath 32 and arranged to space the flue members 44 from the sheath 32. These flue members are each constructed, in the modification which will be first described, of arcuately corrugated sections of tubular material, substantially coextensive with the sheath 32 and having reduced end portions 46 which are cylindrical in form.

These cylindrical end portions 46 are similarly provided with beads 48 which are clamped together by split annular straps 50 of similar construction to the construction of the clamps 36 already described. One end of one of the cylindrical portions on each section 44 is further reduced in diameter, as indicated at 52, to fit within the end of the adjacent cylindrical member 46. The corrugated form of the flue sections 44 is best illustrated at 54 in Figures 4 and 5.

An elbow, generally indicated at 56 is constructed according to the principles of construction of the sections 22, except that the external sheath 58 and the corresponding flue member 44' is similarly bent, ordinarily at a right angle, and these elbow sections are secured to the straight sections in the same manner as that already described. A vented section generally indicated at 60 may be constructed, as illustrated in Figure 1, with similar attachment means at one end thereof and an inwardly turned lip flange 62 to contact the flue section 64 of simple cylindrical design. This flue section 64 may have attachment means at one end thereof similar to that already described and the other end of this section will ordinarily be adapted for connection to a chimney flue. The sheath portion of the section 60 is provided with a vent 66 having a bead 68 corresponding to the bead 34, so that other sections of tubular character similar to the sheath portion 32 may be connected to the vent 66 when it is desired to communicate this vent with an area remote from this portion of the heat exchanger.

In a modified form of this invention the flue sections are constructed with terminal cylindrical tube portions 70 provided with bead attachment members 72 corresponding to the bead 34 and a plurality of cylindrical tubular members 74 arranged in radially offset relation between the cylindrical tubular members 70 and terminally secured to inclined annular plate members 76 which are apertured as at 78 to allow communication between each of these tubular members 74 and the interior of the cylindrical end members 70. It should be carefully noted that the inclined annular plate 76 communicates with a center tube 80. The tubes 74 are secured by spacer members 82 to a sheath 32 constructed in a manner already described.

The operation of this invention will be clearly understood from the foregoing description of the mechanical details thereof, taken in connection with the above recitation of the objects sought to be achieved by this invention and, in recapitulation, it need only be added that the combustion gases will flow upwardly from the combustion chamber in the heater 10 to what has been described above as the flue sections, these sections being of course, heated by these gases. In the preferred embodiment of this invention, the fan 26 is operated air will be drawn in through the vent 66 and downwardly through the space provided between the flue sections and the sheath

sections 32 into the depending portion 24 and into the air heating chamber of the circulatory heater, and thence into the room which it is desired to heat. When it is desired to delete the fan 26 and the motor 28, the bottom of the depending portion 24 is opened as illustrated in Figure 1 and air is drawn into the lower open end of the portion 24 and moves upwardly by convection between the flue sections and the sheath sections 32, to be expelled from the vent 66. It is thus seen that this invention may be used in two ways, the otherwise wasted heat from the flue being utilized in either case.

Obviously many minor variations may be made in the detailed construction and proportionment of the various elements of this invention, and though there has been shown a particular embodiment of this invention, this application is not limited to this particular embodiment, but it is desired to include in the scope of this invention the construction, combination and arrangement of parts and portions substantially as set forth in the appended claims.

Having described the invention, what is claimed as new is:

1. A flue and heat exchanger assembly comprising a heated flue, a sheath secured to said flue in spaced relation thereto, an inlet and an outlet in said sheath spaced apart longitudinally, said flue being a smoke flue connected to a stove, and said flue having transversely arcuate portions, whereby the areas of the internal and external surfaces of said flue are increased for exposure to separate streams of gases, said flue and said sheath being constructed in sections, the ends of the sections having annular beads, and annular band clamps securing juxtaposed beads together, the ends of said flue sections being reduced in dimension to increase the space between said flue and sheath adjacent said ends.

2. A flue and heat exchanger assembly comprising a heated flue, a sheath secured to said flue in spaced relation thereto, an inlet and an outlet in said sheath spaced apart longitudinally, said flue being a smoke flue connected to a stove, and said flue having transversely arcuate portions, whereby the areas of the internal and external surfaces of said flue are increased for exposure to separate streams of gases, said flue and said sheath being constructed in sections, the ends of the sections having annular beads, and annular band clamps securing juxtaposed beads together, the ends of said flue sections being reduced in dimension to increase the space between said flue and sheath adjacent said ends, said flue sections being longitudinally coextensive.

WILLIAM EDWIN RYAN.

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