Oct. 10, 1939. J. F. INGHAM 2,175,564

FLUE RADIATOR

Filed Aug. 4, 1937 3 Sheets-Sheet 1

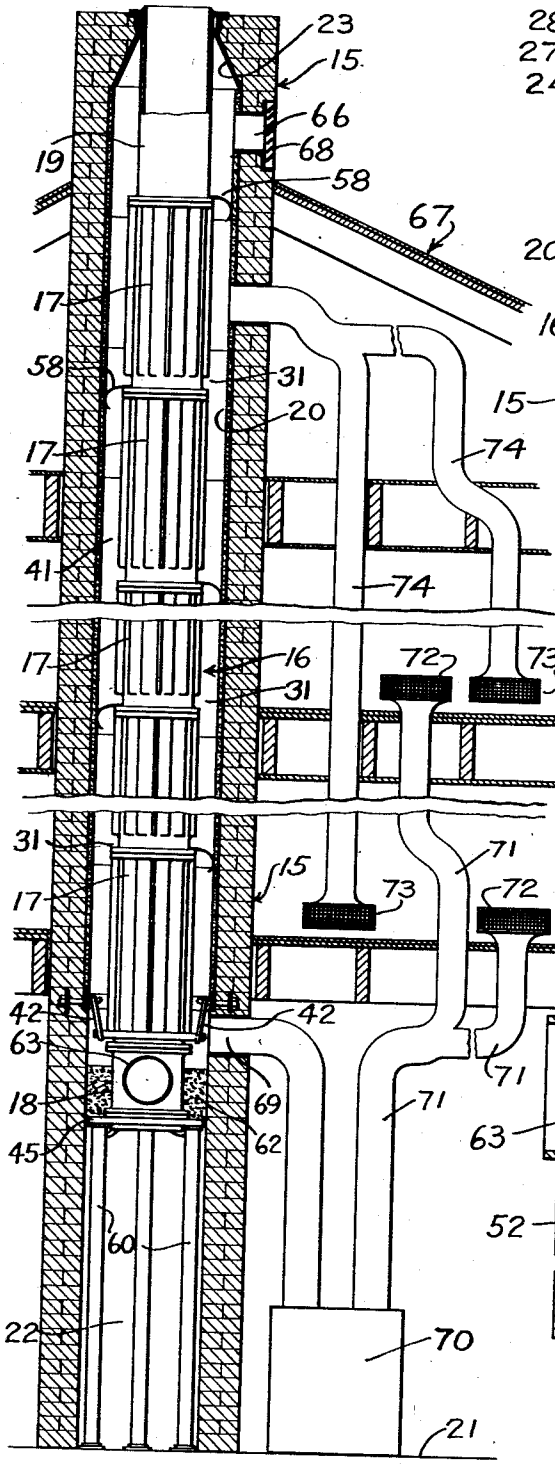


FIG. 1

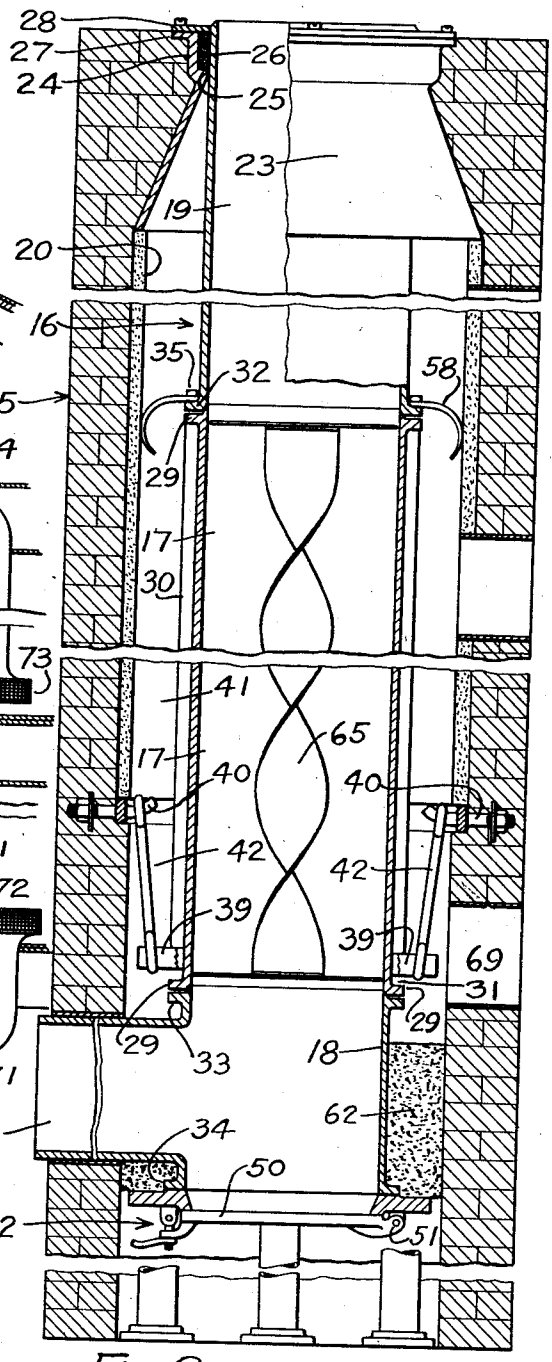


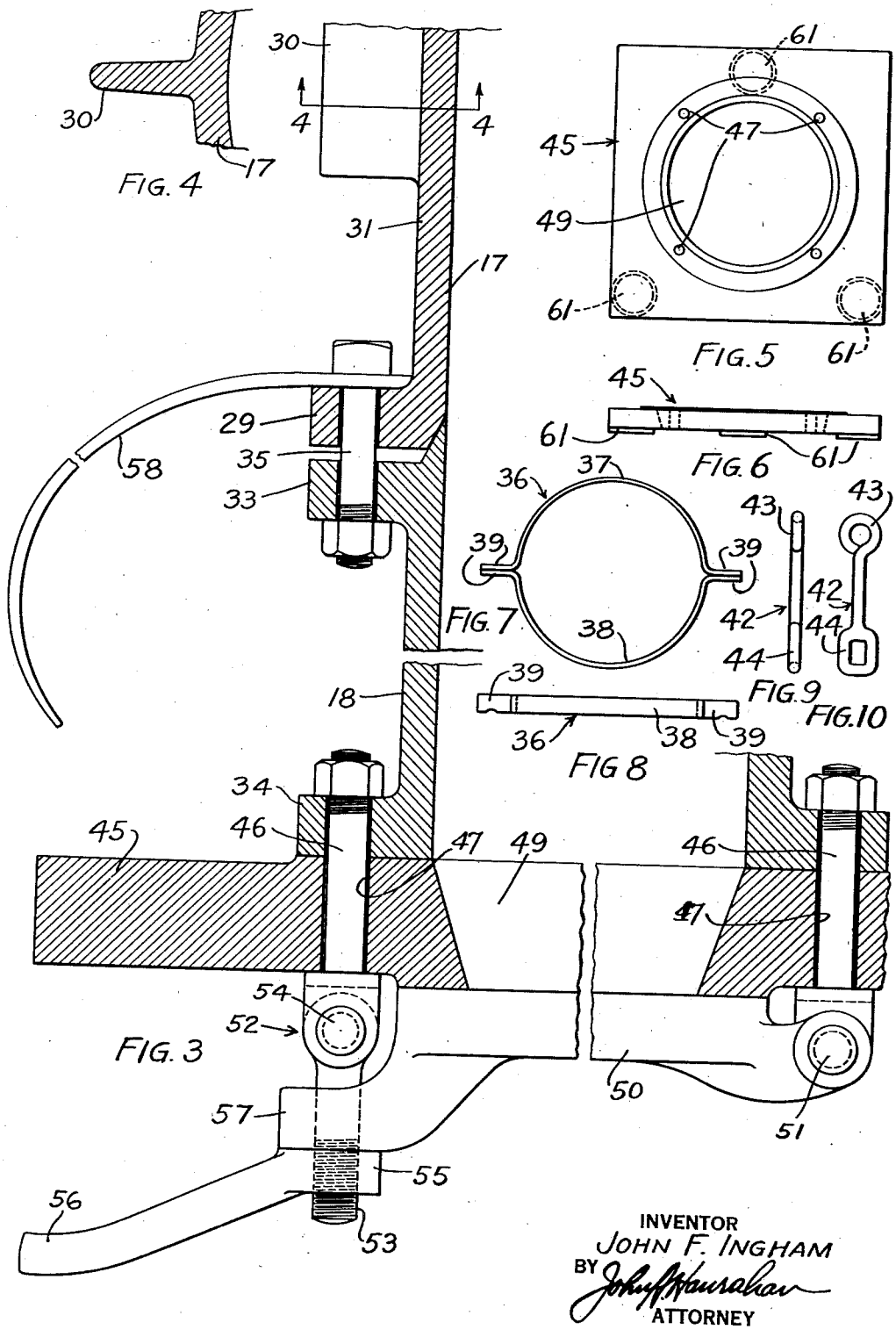
FIG. 2

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FLUE RADIATOR

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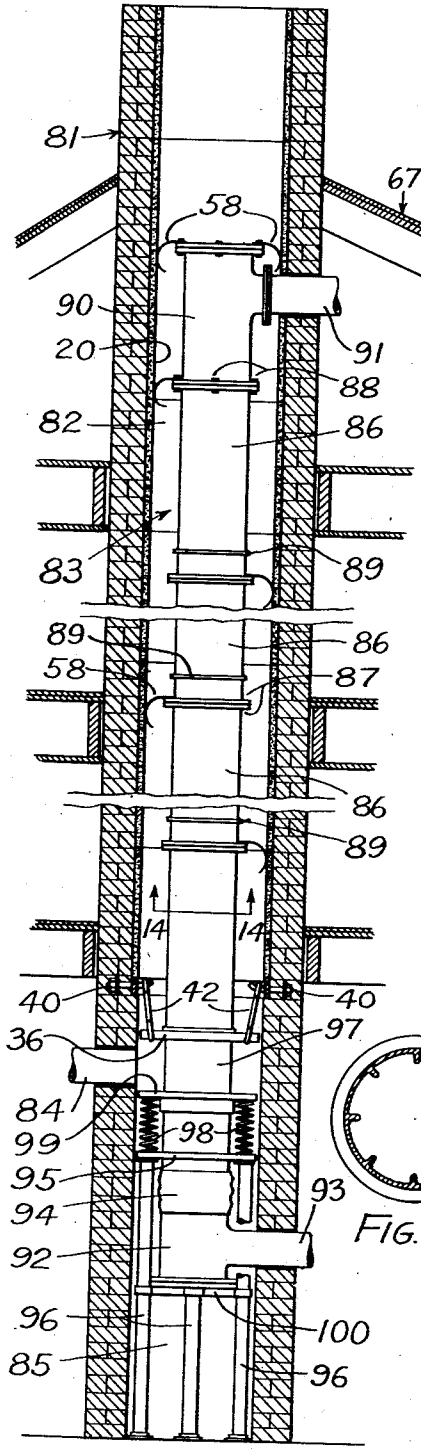


FIG. 13

FIG. 14

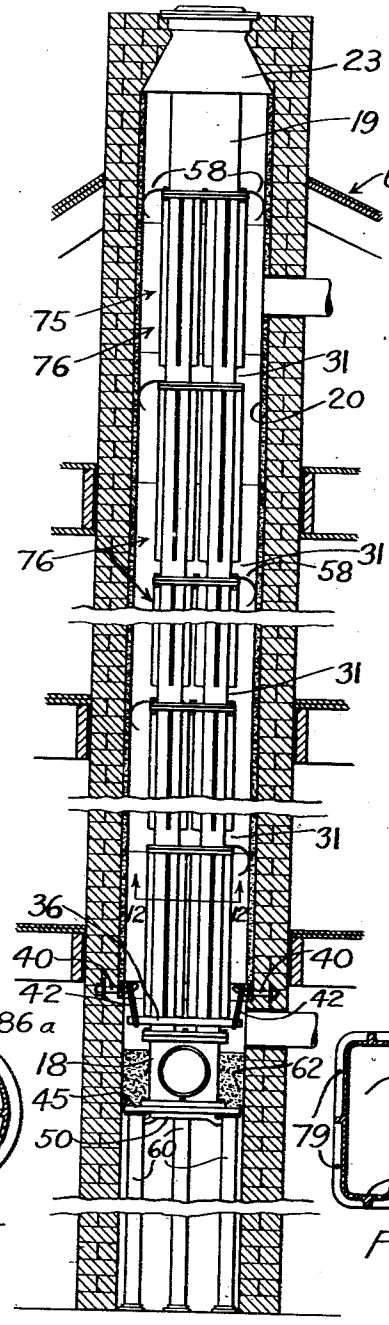


FIG. 11

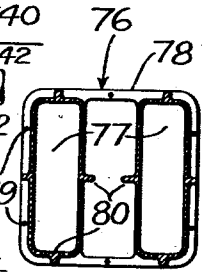


FIG. 12

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FLUE RADIATOR

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12 Claims. (Cl. 237—55)

This invention relates to new and useful improvements in heating apparatus and systems and has particular relation to a flue radiator.

An object of the invention is to provide a means or system whereby a substantial portion of the heat normally passing up the chimney and lost or wasted may be utilized for the heating of a building.

Other objects and advantages will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawings wherein satisfactory embodiments of the invention are shown. However, it is to be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawings:

Fig. 1 is a vertical sectional view through a portion of a building, parts being omitted, and showing an embodiment of the invention;

Fig. 2 is a somewhat similar view but at right angles to Fig. 1 and on a larger scale and through the chimney only of the building;

Fig. 3 is a detail sectional view on a yet larger scale and showing certain details of construction;

Fig. 4 is a detail sectional view taken as along the line 4—4 of Fig. 3;

Fig. 5 is a plan view, on a reduced scale, showing a supporting plate employed;

Fig. 6 is an edge view of said plate;

Fig. 7 is a plan view, on the scale of Fig. 5, of a split or clamping ring employed;

Fig. 8 is an edge view of the ring of Fig. 7;

Figs. 9 and 10 are edge and front elevational views respectively, also on the scale of Fig. 5, of a supporting link employed in connection with the ring of Figs. 7 and 8;

Fig. 11 is a vertical sectional view through a chimney showing a modification;

Fig. 12 is a transverse sectional view taken as along the line 12—12 of Fig. 11;

Fig. 13 is a view similar to Fig. 11 but showing another modification; and

Fig. 14 is a transverse sectional view taken as along the line 14—14 of Fig. 13.

Referring in detail to the drawings and at first more particularly to the form of the invention illustrated in Figs. 1 through 10, at 15 is shown a chimney constructed of bricks or the like as usual and within said chimney is a flue generally designated 16 and as here shown comprising a plurality of similar sections 17 together with a lowermost section 18 and an uppermost or top section 19. The chimney is provided with a lining 20 of tile or the like and at its lower end, beginning at the basement floor 21, includes a chamber or portion 22.

Built into the upper end of the chimney is a cone-shaped member 23 formed of metal and including an off-set portion 24 providing a shoulder 25 receiving a packing material 26. At the upper end of its off-set portion the member 23 includes a flange 27 to which is bolted or otherwise secured an annulus 28 serving to maintain the packing 26 in place against the shoulder 25.

Each section 17 comprises an elongated tubular cast metal piece having a flange 29 at each end and having ribs or radiating fins 30 extending from the underside of its upper flange 29 to a point spaced from its lower flange whereby to leave a space 31 free of said fins for a purpose to be set forth. The top section 19 is free of any radiating ribs or fins but at its lower end is provided with a flange 32 corresponding with one of the flanges 29 of the sections 17. Lowermost section 18 is likewise at its upper and lower ends provided with flanges 33 and 34 respectively the purpose of which will appear.

When assembling the flue in the chimney a jack is placed in the chamber 22 and a flue section is placed on the jack and jacked or raised up into the chimney. Such section is temporarily held in place within the lower portion of the chimney and the jack is lowered to receive the next section. Thereafter by means of the jack the next section of the flue is raised to have its upper end against the lower end of the section formerly raised into the chimney. Then the two adjacent ends of the mentioned sections are secured together as by the bolts 35. The two sections are then held while the jack is lowered to receive and raise the third section. Thus the operations are repeated until the entire flue is in place in the chimney.

For the purpose of supporting one or more sections within the chimney while the jack is lowered to receive the next section a split or two piece ring or clamp generally designated 36 and comprising sections 37 and 38 is used. This ring is placed about the flue section to be held or supported and is arranged below the lower ends of the ribs or fins 30 of such section occupying the space 31 and having the extending ends 39 of its sections 37 and 38 disposed against one another.

Bolts 40 are partly embedded in the chimney 15 but project into the space 41 between the chimney and the flue 16 and on or from the inner

ends of such bolts links 42 are suspended. Such links each include an eye 43 disposed over the projecting end of its supporting bolt and an eye 44 to be passed over the extending ends 39 of the ring sections 37 and 38 whereby to hold such ends against one another and to keep the ring sections clamped against the flue section to be supported thereby. After the ring is on the flue section and the links have been engaged with the ring as described the jack may be lowered since the flue section engaged by the ring as well as the section above such section will be supported by the links 42.

The jack being in lowered position the next flue section is placed on it and then raised by the jack to have the upper end of said next section engage the lower end of the section being held by the ring 36 and the links 42. Then the lower flange of the section supported by the ring and links is bolted to the upper flange of the section supported by the jack and the jack is further extended and raises all the sections in the chimney. The described operation is repeated until all the sections of the flue are in place, the last section being the bottom section 18.

The lower flange 34 of the section 18 is bolted to a supporting plate 45 as by bolts 46 passing through openings 47 provided in the plate. Plate 45 (see Figs. 5 and 6) is provided with a large central opening 49 comprising a clean-out opening and located in line with the main portion of the flue 16 and normally having its lower end closed as by a door 50 hinged to the plate at 51 and adapted to be secured in closed position as by latch means 52. This latter includes a bolt-like portion 53 hinged at 54 and having a nut 55 threaded thereon and provided with a handle 56. To close the door 50 a pair of spaced lugs 57 thereon are arranged to straddle the bolt-like member 53 and then the nut 55 is tightened by manipulation of the handle 56. It is noted that a pair of the bolts 46 securing the plate 45 to the flue section 18 serve to secure the hinge 51 and the latch means 52 to the plate 45.

Secured to the various sections 17 of the flue are spring fingers or guides 58 and such guides are secured in place as by means of the bolts 35 serving to secure the various sections together. Guides 58 are curved and engage the inner lining of the chimney whereby to maintain the flue sections centrally disposed in the chimney. Should the interior of the chimney be rough the spring guides will yield as the sections are being raised into place and yet will maintain the flue spaced from the surface of the chimney. Any desired number of the guides may be used but I have found that three equally spaced guides at each of the joints along the length of the flue are sufficient.

After the plate 45 is in place columns 60 are arranged under the same to take the weight of the flue. Bosses 61 are on the plate to receive or to be received in the upper ends of the columns, each such boss being ring-like. When the columns 60 are in place the space about the section 18 and at the upper side of plate 45 is filled as with bricks etc. 62 whereby to make a seal between the chamber 22 and the space 41. The heating plant (not shown) is connected to have its products of combustion delivered to a connection 63 whereby such products of combustion are delivered to the flue 16 and passing upwardly therethrough escape to the atmosphere.

Obviously with this arrangement the flue 16 becomes heated and serves to heat any air in the space 41 within the chimney but about the flue. The fins 30 on the flue sections serve as radiating means or serve to increase the radiating surface of the flue and thus additional heat is taken from the products of combustion passing through the flue and delivered up to the air in the passage 41. To prevent a hot stream of the products of combustion passing upwardly through the center of the flue without contacting the walls thereof a baffle or diffuser 65 is located in the center of the flue and extends longitudinally thereof for the desired distance.

A fresh air inlet 66 places the passage 41 in communication with the atmosphere at the outer side of the house or other building a portion of which is designated 67 and such inlet may be closed as by a louver 68. The air in passage 41 becomes heated from the flue and then is drawn through an outlet 69 by means of a fan or the like (not shown) contained within the air conditioner unit 70 of any or the usual construction. After being conditioned the heated air is forced through ducts 71 in and through registers 72 in the various rooms of the house or other building. Also the colder and heavier air in the various rooms of the building is taken up through registers 73 and ducts 74 and delivered into the passage 41 for heating and is then taken through the unit 70 as will be understood.

From the above it will be clear that with the disclosed apparatus air is continually circulated through the passage 41 and that heat is extracted from the products of combustion escaping up the flue and which heat otherwise would be lost or wasted. The material 62 providing a seal as above described it will be apparent that the suction of the conditioning unit 70 will not draw air from the chamber 22 which is not heated but will only draw heated air from the passage 41 about the flue.

The flue being installed as described should there be any necessity for such action the flue may be removed from the chimney for repairs as for the installation of new sections 17 or the like. The removal may be accomplished by placing a jack under the plate 45, removing the columns 60, removing the fill or sealing material 62, releasing the section 18 from the section 17 to which it is bolted and then lowering the plate 45 and the section 18 on the jack the other portions of the flue in the meantime being supported by the ring 36 and the links 42. Thereafter the jack is again raised and the links 42 removed or released from the ring 36 and the latter detached from the flue and the jack lowered, lowering the entire flue with it the distance equal to the length of a flue section.

When the second flue section 17 reaches the position formerly occupied by the first section the ring 36 and the links 42 are used to support all of the flue except the section which is lowermost and it is unbolted and lowered by the jack. The operation is thus repeated until the entire flue or any particular section thereof is removed from the chimney.

While the flue is in place the member 23, built into the chimney permits the upper flue section to move upwardly through the chimney as required by expansion of the flue when heated. Also the inner surface of said member being conical the upper section 19 is guided into place as it is raised into position by the jacking operation above described. Packing 26 maintains a weather tight joint between the upper flue section and the off-set portion 24 of the member 23

and yet permits of such expansion and contraction as may occur in the flue and in addition prevents the fan of the unit 70 from drawing air through the outer end of the chimney.

Referring now to Figs. 11 and 12 the structure there shown is the same as that previously described with the exception that the flue generally designated 75 is made up of sections 76 each including a plurality of tubes 77, the sections in the drawings each including two such tubes although it will be understood that a greater number of tubes may be included in each section when desired.

The tubes 77 of each section are connected at their upper and lower ends by flanges 78 having holes 79 therein for the purpose of receiving bolts or other securing means whereby the sections in the assembled flue are connected together. Also the tubes are provided with heat radiating fins 80 corresponding with the fins 30 of the sections 17. Sections 76 to make the desired length of flue 75 are jacked into position in the chimney as described in connection with Figs. 1 through 10 and while the jack is being lowered to receive a second section the first sections are supported by the sectional ring 36 and the links 42 as has been described with reference to Figs. 1 through 10.

Figs. 13 and 14 show an arrangement somewhat the reverse of that shown in Figs. 1 through 10 as in Figs. 13 and 14 the products of combustion from the heating plant (not shown) are carried upwardly through the chimney 81 in the passage 82 about the flue 83. Thus the products of combustion enter the passage 82 by way of a connection 84 and circulate about the flue. A chamber 85 is provided at the lower end of the chimney and the flue is introduced into the chimney through such chamber, being jacked into place as explained in connection with Figs. 1 through 10.

Flue 83 comprises sections 86 each having upper and lower flanges 87 whereby the sections may be secured together as by bolts or the like 88 and on its inner side each section is provided with fins 86a. Toward its lower end each section 86 has a ring or flange 89 below which the ring 36 is located when the sections are being supported by the links 42. The topmost section, designated 90, is provided with a lateral inlet 91 connected as with the air inlet ducts 74 shown in Fig. 1 and the lowermost section, designated 92, is provided with a lateral outlet 93 connected with an air conditioning unit including a fan as usual. Obviously with this arrangement air will be drawn into the flue 83 through the connection 91 and the flue will be heated by the gases and other products of combustion passing upwardly about the same and such heat will be transferred to or taken up by the air moving downwardly through the flue. Thus a portion of the heat heretofore wasted is utilized.

A canvas or other flexible section 94 is arranged in the flue to take care of expansion and contraction thereof and above such section is located a plate 95 supported on columns 96 and having a central opening through which a section 97 may slide. Plate 95 supports springs 98 in turn supporting a plate 99 attached to the flue section 97. In the completed arrangement the links 42 are detached from the ring 36 and the latter removed from the chimney so that the weight of the flue is supported on the springs 98. Thus the springs together with the flexible section 94 take care of expansion and contraction of the flue. A bottom plate 100 also supported on columns 96 may be provided with a clean-out opening as will be understood.

Having thus set forth the nature of my invention, what I claim is:

1. In combination, a chimney, a flue within, and said flue passing up through the chimney for the carrying off of the products of combustion of a furnace, said flue comprising a series of detachable sections, supporting means secured to said chimney and extending into the same, and removable means on the lowermost flue section for cooperation with said supporting means as the sections are installed in and removed from the chimney.

2. The combination as in claim 1 wherein said supporting means comprises pivoted links and the removable means on the flue section comprises a sectional ring clamped into place on such flue section by said links.

3. In combination, a chimney, a flue within and spaced from the inner surface of the chimney to provide a passage within the chimney and about the flue, said flue passing up through the chimney for the carrying off of the products of combustion of a furnace, means providing a cold air inlet and a hot air outlet communicating with the passage about the flue, said flue comprising a series of detachable sections, the lowermost of said sections adapted for connection with a furnace, a plate on which said lowermost section rests, columns supporting said plate, and said plate having an opening communicating with the interior of said section and normally covered by a clean-out door.

4. In combination, a chimney, a flue within and spaced from the inner surface of the chimney to provide a passage within the chimney about the flue, said flue passing upwardly through the chimney, said flue comprising a series of detachable sections, means detachably connecting said sections, releasable means supporting said flue from its lower end, and means providing below the lower end of said flue a space of such size as to receive said flue a section at a time whereby said flue may be installed in and removed from said chimney through the lower end thereof.

5. In combination, a chimney, a flue within and spaced from the inner surface of the chimney to provide a passage within the chimney about the flue, said flue passing upwardly through the chimney, said flue comprising a series of detachable sections, means detachably connecting said sections, releasable means supporting said flue from its lower end, means on and movable with said sections and serving to space them free from the walls of said chimney, and means providing below the lower end of said flue a space of such size as to receive said flue a section at a time whereby said flue may be installed in and removed from said chimney through the lower end thereof.

6. In combination, a chimney, a flue within and spaced from the inner surface of the chimney to provide a passage within the chimney about the flue, said flue passing upwardly through the chimney, said flue comprising a series of detachable sections, means detachably connecting said sections, releasable means supporting said flue from its lower end, spring fingers on said sections and maintaining them spaced from the walls of the chimney, and means providing below the lower end of said flue a space of such size as to receive said flue a section at a time whereby said flue may be installed in and removed from said

chimney through the lower end thereof, and said spring fingers fixed to said sections whereby to be installed in and removed from the chimney with the sections.

7. In combination, a chimney, a flue within and, said flue passing upward through the chimney for carrying off the products of combustion of a furnace, means providing a lateral connection from a furnace to the lower portion of said flue, said flue comprising a series of detachable sections, means detachably connecting said sections, releasable means supporting said flue from its lower end, and means providing below the lower end of said flue a space of such size as to receive said flue a section at a time whereby said flue may be installed in and removed from said chimney through the lower end thereof.

8. In combination, a chimney, a flue within and spaced from the inner surface of the chimney to provide a passage within the chimney about the flue, said flue passing upwardly through the chimney, said flue comprising a series of detachable sections, means detachably connecting said sections, a plate engaging the lowermost of said sections and closing the lower end of the flue, and columns supporting said plate and through it supporting the entire weight of said flue independent of said chimney.

9. In combination, a chimney, a flue within and spaced from the inner surface of the chimney to provide a passage within the chimney about the flue, said flue passing upwardly through the chimney, said flue comprising a series of detachable sections, means detachably connecting said sections, a plate closing the lower end of said flue and on which the lowermost of said sections rests and on which the entire weight of said flue is supported, and means providing a space below said plate equal at least to the length of one of said sections, and removable columns in said space and supporting said plate independent of said chimney.

10. In combination, a chimney, a flue within and spaced from the inner surface of the chimney to provide a passage within the chimney about the flue, said flue passing upwardly through the chimney, said flue comprising a series of detachable sections, means detachably connecting said sections, releasable means supporting said flue from its lower end, means providing below the lower end of said flue a space of such size as to receive said flue a section at a time whereby said flue may be installed in and removed from said chimney through the lower end thereof and each of said flue sections comprising a plurality of tubes spaced throughout their lengths for the passage of air between them.

11. In combination, a chimney, a flue within the chimney, said flue comprising a series of detachable sections, pivoted links secured to said chimney and extending at the inner side thereof, and removable means on the lowermost of said sections for cooperation with said pivoted links as the sections are installed in and removed from the chimney.

12. In combination, a chimney, a flue within and spaced from the inner surface of the chimney, said flue passing upwardly through the chimney and comprising a series of sections, means connecting said sections, means in the upper end of the chimney and closing the space between the flue and the inner surface of the chimney, said means including a packing engaging the flue and through which the latter may move as it expands and contracts, locating fingers carried by the flue sections and engaging the inner surface of the chimney to maintain the flue in position in the chimney but spaced from the inner surface thereof, said fingers slidable along the inner surface of the chimney as the flue expands and contracts, means providing a space below the lower end of said flue, and means in said space and supporting said flue from the lower end thereof entirely independent of said chimney whereby the flue may expand and contract entirely independent of the chimney.

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