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2,084,408

AIR CONDITIONING AND HEAT ECONOMIZING ASSEMBLY

Filed Sept. 9, 1935

2 Sheets-Sheet 1

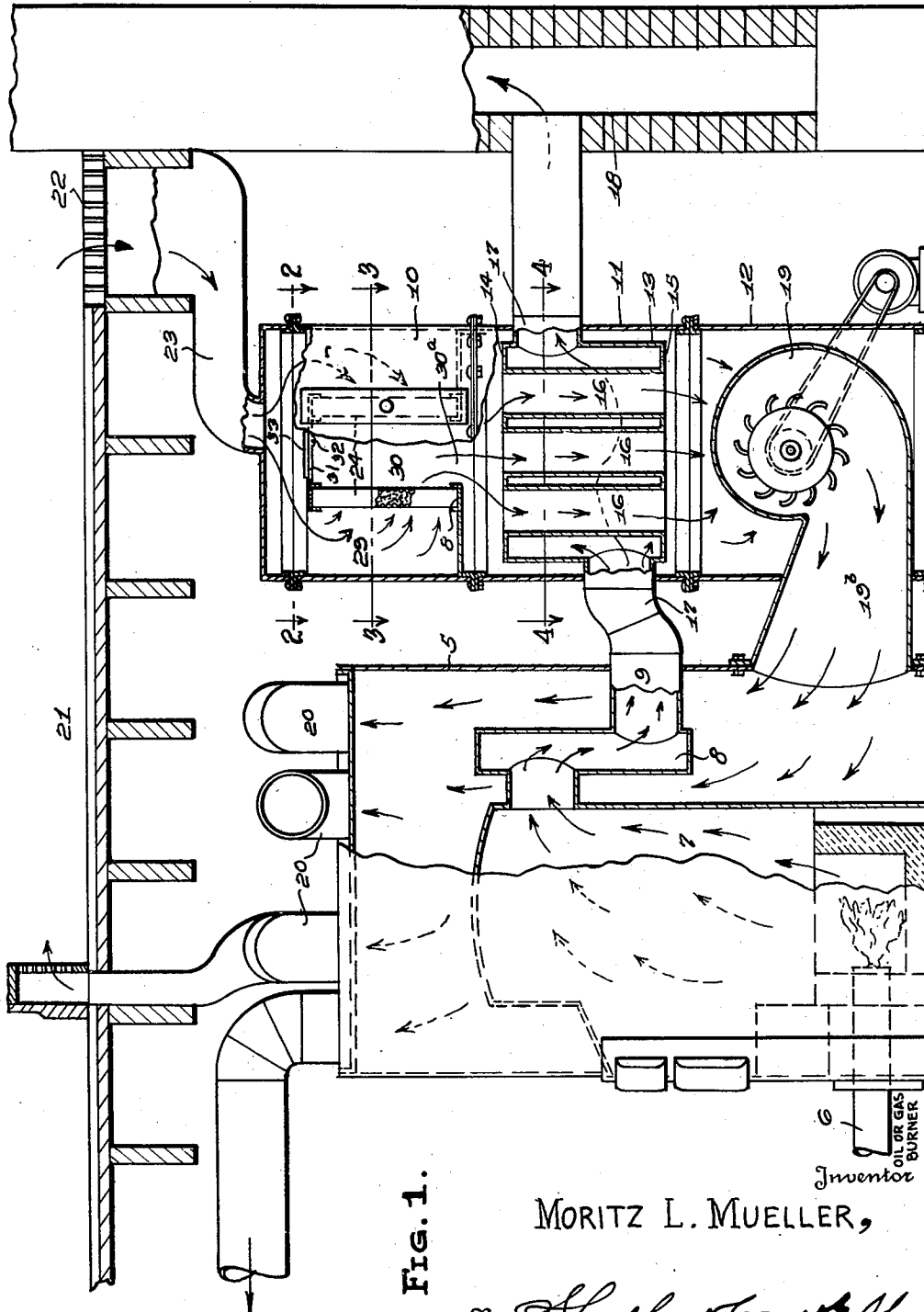


FIG. 1.

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2 Sheets-Sheet 2

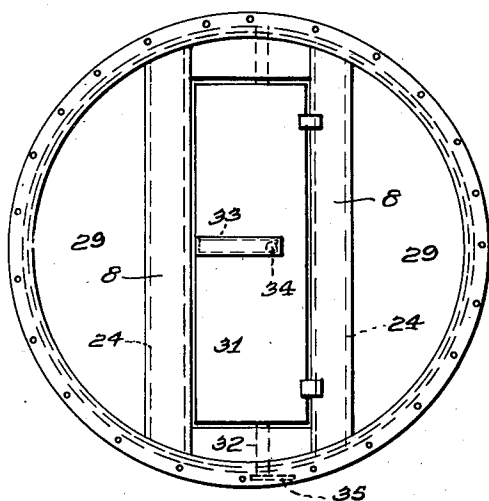


FIG. 2.

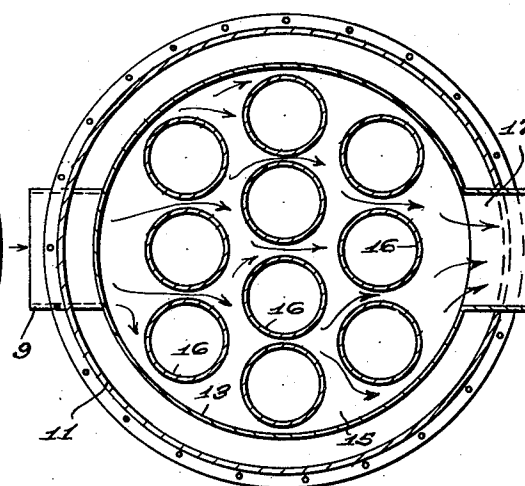


FIG. 4.

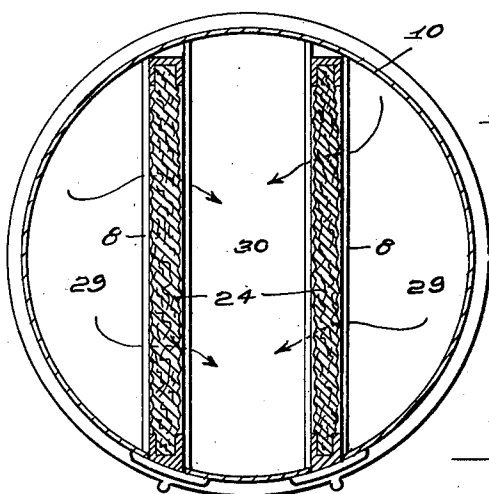


FIG. 3.

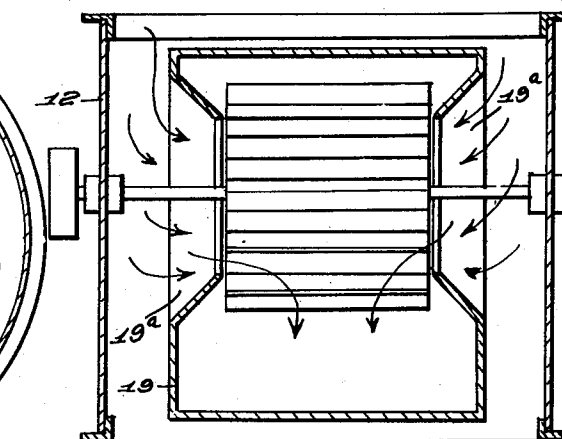


FIG. 5.

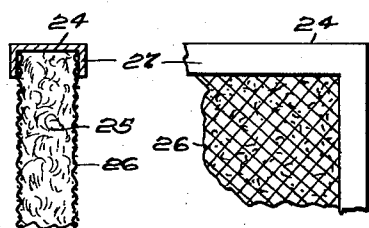


FIG. 6

FIG. 7.

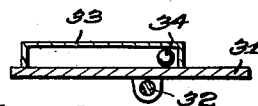


FIG. 8
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UNITED STATES PATENT OFFICE

2,084,408

AIR CONDITIONING AND HEAT ECONOMIZ-
ING ASSEMBLY

Moritz L. Mueller, Seattle, Wash.

Application September 9, 1935, Serial No. 39,856

10 Claims. (Cl. 257-244)

The primary object of the present invention is to provide instrumentalities of great simplicity and economy by means of which a great deal of the heat heretofore wasted in conventional types of hot air furnaces may be conserved and devoted to useful work.

The invention contemplates the provision of an economizer unit adapted for inclusion in the path of the products of combustion from a hot air furnace to a chimney or stack and adapted to receive the return air from the rooms of a dwelling, filter said air, heat the air by contact with elements which are in turn heated by the otherwise waste gases on their way to the chimney and deliver said air kinetically upon and about the walls of the combustion chamber of the furnace in such fashion as to not only rapidly carry away the heat delivered by the furnace, but to prevent damage to the fire pot of the furnace by overheating of the same.

It is a further object of the invention to secure the results above set forth through the medium of an economizer in the nature of an auxiliary unit through the use of which the effective heating area of the furnace is, in effect, increased.

An important feature of the invention resides in the novel combination and correlation of the parts constituting the economizer by virtue of which it is rendered of great flexibility. By that I mean that it is adapted for installation in conjunction with existing furnace units and under many widely varying conditions. Further, this economizer is built up of a plurality of superimposed units each of which is complete in itself. Each of these units may be shifted to varying positions circumferentially with respect to the remaining units. This facilitates installation under many widely varying conditions and adapts the unit for ready connection to existing furnaces.

In the accompanying drawings,

Figure 1 is a vertical sectional view of an apparatus constructed in accordance with the invention;

Fig. 2 is a horizontal sectional view on line 2-2 of Fig. 1;

Fig. 3 is a horizontal sectional view on line 3-3 of Fig. 1;

Fig. 4 is a horizontal sectional view on line 4-4 of Fig. 1;

Fig. 5 is a vertical sectional view through the lowermost or fan unit of the economizer;

Fig. 6 is a fragmentary transverse section through one of the filters;

Fig. 7 is a fragmentary side elevation of the structure of Fig. 6; and

Fig. 8 is an enlarged sectional view of a damper hereinafter described.

Like numerals designate corresponding parts in all of the figures of the drawings.

Referring now to Fig. 1, 5 designates the shell or casing of a conventional and well known type of hot air furnace. The source of heat may be an oil burner, indicated conventionally at 6, or the heat may be derived from coal, gas or any other suitable fuel. In furnaces of this type the products of combustion pass from the upper portion of the combustion chamber 7 into a radiator 8 and thence through smoke pipe 9 directly to the chimney. The particular embodiment of economizer unit which I have chosen for purposes of illustration comprises an upper filter section 10, an intermediate heat exchanger or radiator section 11 and a lower or fan section 12. The intermediate or radiator section contains a radiator in the form of a cylinder 13 having the upper and lower heads 14 and 15 and traversed vertically by the tubular members 16. This radiator is adapted for connection by piping 17 to the smoke pipe 9 of the furnace, the products of combustion passing around the tubes 16 and thence through pipe 17 to the chimney 18. In their passage around the tubes these gases part with a large proportion of the heat which would be wasted if delivered directly into the chimney and this heat is recovered by drawing air downwardly through the tubes 16 and delivering it into the shell 5 of the furnace whence it may find its way, by the various hot air pipes 20, to the spaces to be heated, such, for example, as a room, indicated at 21. The air drawn downwardly through the tube 16 may be the air returned from said spaces, said air being drawn through the register 22 and delivered through duct 23 into the top of the uppermost unit 10. To reach the tubes 16 the incoming air from the duct 23 must pass through filters 24. These filters are of the renewable cartridge type and their construction may be readily understood by reference to Figs. 3, 6 and 7. These filters comprise a body of filtering material 25 held in place by suitable screen or like reticulated material 26, the necessary stiffness and rigidity being imparted to the whole by marginal frames 27 of channel formation. These screens may be slipped into place in suitable guideways 28 and when in place constitute barriers between the side spaces 29 of the upper unit and the central chamber 30 of said unit and it is this central chamber that is in communication at 30a with

the central or radiator unit of the economizer. As will be seen from Fig. 3, the filter frames are slipped into place through the side walls of unit 10 and may be withdrawn when desired for purposes of renewal. The top of the central chamber 30 includes a damper 31 which is pivotally mounted off center upon a shaft 32. In addition this damper carries a transverse tube 33 having a rolling ball or equivalent weight 34 therein. As long as the filters are reasonably clean so that the major portion of the air may pass through said filters, the damper remains closed. That is to say, it is so balanced that under normal condition this damper lies horizontally and closes the top of chamber 30. However, if the filters become so dirty and clogged that the air cannot pass with reasonable freedom there-through, increased suction upon the underside of the damper will cause it to tip to a vertical or open position. When this happens the ball or weight 34 rolls to the opposite end of the tube and aids in positively holding the damper in fully open position. The damper remains in open position until clean filters are substituted for the dirty ones, at which time the damper is restored to its initial position by hand, with the ball or weight 34 in position to hold it there until the damper is again overbalanced and moved to open position by abnormal pressure thereon, arising from clogging of such substitute filters. Any suitable indicating means, such as a pointer 35 may be mounted in an exposed position upon the outer end of the shaft 32 where it serves to indicate that the damper has been opened and that the screens are clogged and need replacement. This broad combination of filter and relief damper has been made subject of a separate application Serial No. 39,857, filed September 9, 1935.

The filtered air after having been tempered by its passage through the intermediate radiator section 11, enters the open ends 19a of the fan 19 and is discharged transversely through the discharge duct 19b of said fan into the lower portion of the shell 5 in such direction as to impinge upon the lower rear portion of the combustion chamber. It is this portion of the combustion chamber of the average furnace which is subjected to the most intense heat and which tends to burn out more quickly than any other part. By directing a large volume of tempered air upon this spot I reduce the tendency to burning out, of this portion of the combustion chamber of the furnace and I increase the efficiency of the whole by rapidly carrying away the heat which the furnace is constantly delivering at that point.

The average hot air furnace relies upon the natural tendency of heated air to rise in order to bring about the necessary circulation of air over the heated metal surfaces of the combustion chamber 7. It will be noted that not only do I deliver a large volume of air directly upon the lower rear portion of the combustion chamber but that this air is caused to split and travel both laterally and upwardly over the combustion chamber walls. The result of this is to bring about a highly effective heat exchange between the metal surfaces and the air, accompanied by evenness of heat exchange over the whole furnace structure that would be impossible without induced air flow in the manner described.

Attention is directed to the fact that the several units of the economizer are not only adapted to be shifted to varying positions with respect to each other to facilitate ready installation under

all conditions of use but that since each of these units is complete in itself any one of said units may be taken out of the assembly and omitted altogether or another unit substituted therefor. This renders it possible for the purchaser to secure the two lower units, for example, omitting the filter unit, or the intermediate unit 11 could be omitted in summer time and a refrigerating unit could be installed in its place, utilizing the same fan and air delivery system comprising pipes 20 for delivering the cooled air to the room.

A feature of advantage inherent in the economizer structure comprising the units 10, 11 and 12 resides in the fact that the body of each of these units is a simple cylinder or drum. This construction is not only cheaper to build than rectangular cabinets but is stiffer and stronger in every way and consequently can be made of lighter material than rectangular structures. In addition, these cylindrical elements yield under the strains of expansion and contraction without the slightest damage to them whereas rectangular structures and especially those involving welded joints tend to break apart under these strains.

By referring to Fig. 1, it will be seen that the several drum sections of the units 10, 11 and 12 are provided with end flanges held together by bolts. In the manufacture of these flanges bolt holes are spaced exactly the same in all of them so that ready interchangeability between and substitution of these units may be readily resorted to.

It will be apparent that many ways will readily suggest themselves to the skilled engineer of modifying and bringing about new relations between the economizer units herein shown and described. Consequently, I wish it to be understood that the invention is not limited to the precise arrangement shown but that it includes within its purview whatever changes that come within either the terms or the spirit of the appended claims.

Having described my invention, what I claim is:

1. An economizer apparatus of the character described comprising a plurality of superposed cylindrical units, connecting means between said units by which they may be secured in a plurality of positions circumferentially with respect to each other, air handling and modifying means in the respective units, means for delivering air into the uppermost unit, and means for delivering air from the lowermost unit.

2. Apparatus of the character described comprising three superposed units, a fan in the lowermost unit, a radiator in the intermediate unit and a filtering mechanism in the uppermost unit, the radiator unit of the intermediate section comprising means for delivering hot combustion gases thereto through the side of said unit at one point and for delivering said hot combustion gases therefrom through the side of said unit at another point.

3. A filtering unit of the character described comprising a drum-like body closed at the bottom by a wall having an opening therethrough, a pair of cartridge filters, means for mounting said filters in said drum in such manner as to define a central chamber between them, and means for closing the top of said chamber to thereby require the air which passes through the opening in the lower wall to first pass through said filters.

4. A structure as recited in claim 3 wherein the

means for closing the top of said chamber comprises a counterbalanced relief damper operable under the air flow when the filters become clogged to move to open position.

5 5. A filtering unit of the character described comprising a drum-like outer body, a wall closing the lower end of said drum except for a center opening therethrough, transverse guide-ways upon opposite sides of said central opening
10 and cartridge filtering units slidably mounted in said guideway and insertable through the wall of said drum, said filtering unit comprising bodies of filtering material, stiffening frame members and reticulated sides.

15 6. An air conditioning and heat economizer apparatus of the character described, consisting of a columnar structure comprising a plurality of super-posed cylindrical units, interchangeable connecting means between said units by which
20 they may be secured in a plurality of positions circumferentially with respect to each other, air handling and modifying means in the respective units, means for delivering air into the uppermost unit, and power-driven means in the lowermost unit for drawing air forcibly downward
25 through all of said units.

7. A structure as recited in claim 6, wherein the air modifying means in at least one of said units comprises a heat exchanger.

30 8. An air conditioning and heat economizing structure of the character described, comprising a plurality of super-posed sections, interchangeable means for connecting said sections to adapt them to be shifted to varying positions circumferentially with respect to each other, air forc-

ing means in the lowermost of said sections, a heat exchanging means in another of said sections, a filtering means in the remaining section, means for introducing air into the top of the uppermost section and for discharging said
5 air centrally from the bottom of said section, the structure of the intermediate section being such as to permit direct vertical flow of air there-through to the air forcing means of the lowermost section.

10 9. An air conditioning and heat economizing apparatus of the character described, consisting of a columnar structure comprising a plurality of superposed, tubular units, interchangeable connecting means between said units by which they
15 may be secured in a plurality of adjusted positions in horizontal planes, an air filtering means in one of said units, an air forcing means in another of said units and heat exchanging media in a third of said units, said heat exchanging
20 media comprising passages for air longitudinally through the heat exchanging section, and means for conducting hot gas laterally through said section and around and between said passages.

25 10. A filtering unit of the character described comprising a tubular body closed at one end by a wall having an opening therethrough, a pair of cartridge filters, means for mounting said filters in said body in such manner as to define
30 a central chamber between them, and means for closing the other end of said chamber to thereby require the air which passes through the said opening of the wall, to first pass through said filters.

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