Nov. 9, 1954 S. O. BYSTROM 2,693,941

AIR HEATER

Filed April 12, 1951 2 Sheets-Sheet 1

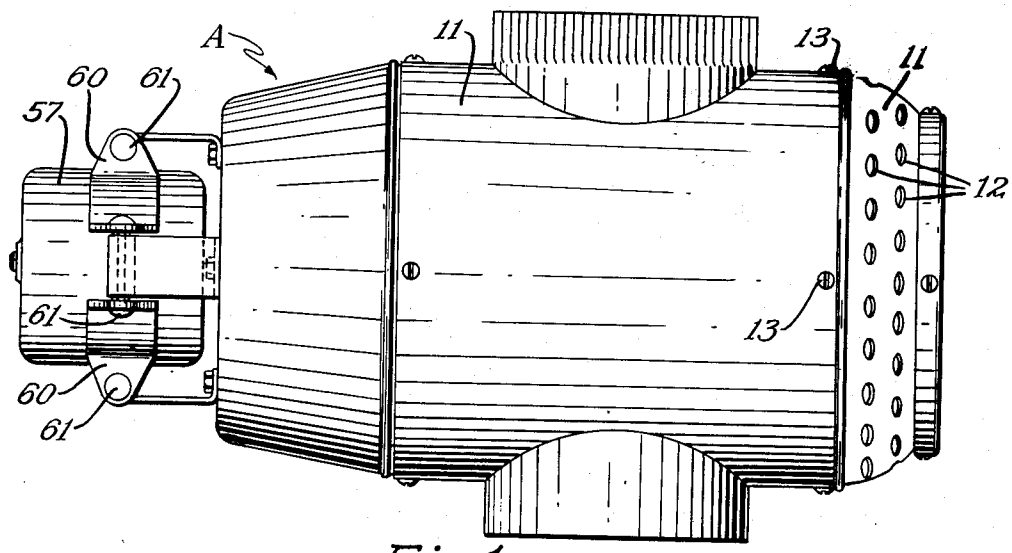


Fig. 1

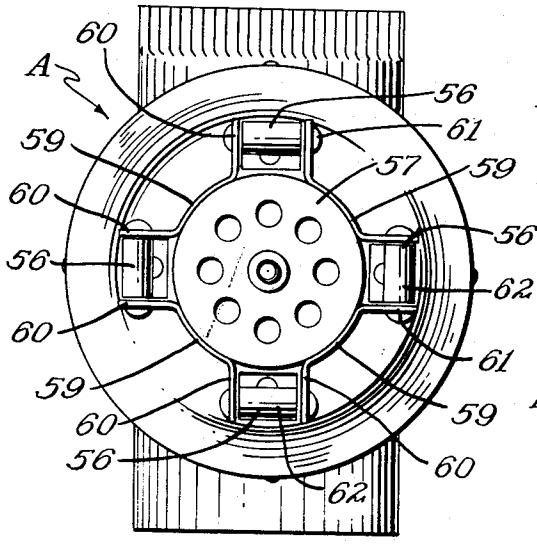


Fig. 2

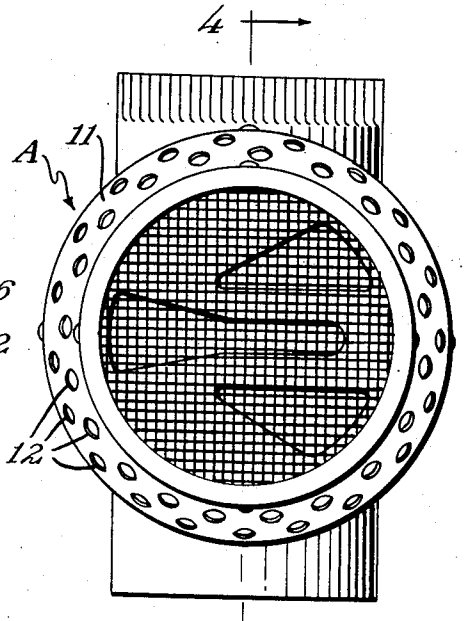


Fig. 3

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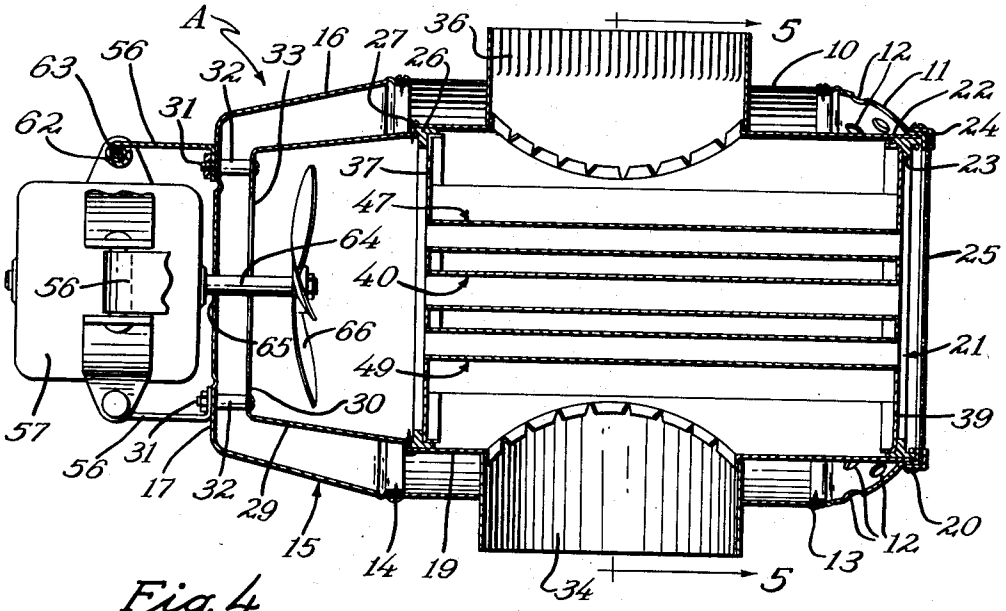


Fig. 4

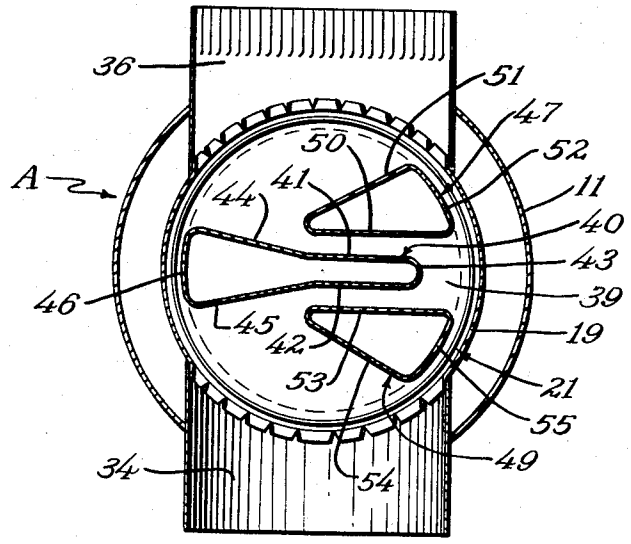


Fig. 5

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AIR HEATER

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Application April 12, 1951, Serial No. 220,669

1 Claim. (Cl. 257—171)

My invention relates to an improvement in heat saving apparatus and deals particularly with a device designed for insertion into a smoke pipe leading from a furnace to a chimney and capable of extracting heat from the chimney gases.

It has long been recognized that much heat from a furnace or boiler is carried by gasses up the chimney. Various types of devices have been interposed in the flue connecting the furnace or boiler to the chimney for reducing the temperature of the exhaust gases and transferring the heat to the air. Some of these devices have been found objectionable due to the fact that the gases can not follow their normal path in escaping from the furnace to the chimney. The present device is designed to heat the air without greatly interfering with the natural flow of air or gas through the furnace.

An object of the present invention lies in the provision of a heat saving device incorporating a fan. A heat transfer structure is interposed in the flue connecting the furnace to the chimney. The fan is arranged to flow air through this heat transfer device and thereby to provide an efficient heating of surrounding air.

A feature of the present invention resides in the provision of a heat saving device having a series of flues through which air may flow transversely of the path of the travel of the escaping gases from the furnace. These flues are elongated in form and are designed to permit gas to flow with a minimum of interference, but yet with a maximum of heat transfer. The flues are supported for rotation about a longitudinal axis so that the position thereof may be varied in a manner to increase or decrease heat transfer with a corresponding increase or decrease of draft interference.

Some furnaces are connected to chimneys which provide sufficient draft to draw the escaping gases through a tortuous passage. Other furnaces are connected to chimneys which provide relatively little draft effect and which therefore would be ineffective to draw gases through a zig-zag path. The present invention deals with a heat saver having flues which are adjustable in position so that the direction of travel of the gases may be regulated to suit each individual installation.

A feature of the present invention resides in the provision of a heat saver having an outer casing and an inner casing spaced therefrom. The inner casing is preferably cylindrical in form. The smoke duct communicates with the interior of the inner casing. Thus the inner enclosure is normally filled with smoke and furnace gases. The ends of the inner chamber are rotatably supported within the inner shell. Air flues are supported by the rotatable ends of the inner shell. Thus the position of the air flues may be varied by rotating the inner shell ends.

A feature of the present invention lies in the provision of a double walled heat saver body including an outer shell and an inner shell. Smoke and heated gases communicate with the inner chamber. Air is drawn in through one end of the outer chamber and through the space between the chambers to the end opposite the inlet end. From this point the gases are blown through flues extending through the smoke filled inner chamber and through an outlet located at the same end of the body as the inlet. Thus the air is heated both by the outer walls of the inner receptacle and the flue walls of the flues passing through the inner chamber.

These and other objects and novel features of my

invention will be more clearly and fully set forth in the following specification and claim.

In the drawings forming a part of the specification:

Figure 1 is a side elevation view of the heat saver when the same is interposed in a vertical smoke pipe and would comprise a plan view of the heat saver if placed in a horizontal pipe.

Figure 2 is an end elevation view of the heat saver.

Figure 3 is an end view of the opposite end of the heat saver from that illustrated in Figure 2.

Figure 4 is a longitudinal sectional view through the heat saver, the position of the section being indicated by the line 4—4 of Figure 3.

Figure 5 is a transverse section through the heat saver, the position of the section being indicated by the line 5—5 of Figure 4.

The construction of the heat saver is in general best illustrated in the sectional views showing the relationship between the various parts. In general the heat saver is indicated by the letter A. The heat saver includes an outer encircling shell **10** which is shown as being cylindrical in form. At one end this shell **10** is connected to a ring shaped cap **11** having perforations **12** therethrough. The shell **10** and cap **11** are connected by metal screws **13** or other suitable means. The other end of the shell **10** is connected by metal screws **14** or other suitable means to a cap or end closure **15**. This end closure **15** includes tapering walls **16** and a closed end panel **17**. In other words, this end closure **15** is pan shaped in form.

An inner sleeve **19** or inner shell is supported within the outer shell **10** in spaced relation thereto. The inner sleeve is cylindrical in form and is connected at one end to the cap **11** by metal screws **20** or other suitable fastening means. A reinforcing ring **21** of T-shaped cross section includes an outer peripheral flange **22** and an inwardly projecting flanges **23**. The metal screws **20** preferably extend into this flange **22** of this ring **21** to anchor these parts together. An outer ring **24** of angular cross section overlies the end of the cap **11** and is also fastened in place by the screws **20**. This outer ring **24** is right angular in cross section and holds in place a screen **25** or other foraminous plate through which air may flow. This screen **25** is clamped between the angularly shaped ring **24** and the reinforcing ring **21**.

A second reinforcing ring **26** is anchored within the opposite end of the inner shell **19** by metal screws **27** or other suitable fastening means. These screws **27** also anchor in place an inner baffle **29**. This baffle is pan shaped in form and is somewhat similar in outline to the end closure **15**, but is of smaller diameter so as to be continuously spaced therefrom. The baffle **19** includes an end wall **30** which is anchored to the end wall **17** of the closure **15** by bolts **31** which support spacing sleeves **32**. The bolts **31** connect the members **15** and **29** together but hold the same in longitudinally spaced relation. An enlarged aperture **33** is provided in the end wall of the baffle **29** to permit air to flow therethrough.

A smoke inlet pipe adapter **34** extends through a suitable hole in the outer shell **10** and is secured to the inner shell **19** as best illustrated in Figures 4 and 5 of the drawings. The adapter **34** is designed for connection with a furnace pipe through which gases pass from the furnace. A similar adapter **36** extends through the shell **10** in diametrically opposed relation to the adapter **34** and is anchored to the inner shell **19**. The adapter **36** is designed to connect with a pipe communicating with the chimney. In other words, the inner shell is subject to heated gases entering through the adapter **34** and leaving through the adapter **36** en route to the chimney.

A pair of end panels **37** and **39** are provided at opposite ends of the inner shell **19** to close the ends of this inner shell. The panel **37** encircles the lateral flange of the reinforcing ring **26** and is rotatably supported thereby. A gasket may be interposed between these parts to prevent the leakage of gas. A panel **39** is similarly supported by the inner end of the lateral flange **22** of the reinforcing ring **21**. Thus the two end panels may rotate about the axis of the sleeve **19**.

A series of flues are supported by the end panels **37**

and 39. The center of these flues is elongated in cross section and includes a relatively narrow end portion 40 which includes parallel sides 41 and 42 and a rounded end 43. Near the center of the structure the sides 41 and 42 diverge apart as indicated at 44 and 45 respectively, and are provided with a rounded connecting end 46.

A pair of flues 47 and 49 are provided on opposite sides of the center flue 40 spaced from the flattened end of the flue. The flues 47 and 49 are generally triangular in shape. The flue 47 includes a flat side 50 generally parallel to and spaced from the flat side 41 of the flue 40. An outwardly diverging side 51 connects the side 50 with the outer side 52 of the flue.

The flue 49 is shaped similarly to the flue 47 and includes a flat side 53 in parallel spaced relation to the side 42 of the flue 40. An outwardly diverging side 54 and an outer side 55 complete the section of the flue 49.

It will be noted that the vertical depth of the flue 40 as viewed in Figure 5 is equal to or slightly greater than the distance between the flat sides 50 and 53 of the flues 47 and 49. It will also be noted that the total width of the flues 40, 47, and 49 is substantially equal to the diameter of the inlet and outlet adapters 34 and 36. When the flues are in the position indicated in Figure 5, the gas must travel a tortuous path in order to flow from the adapter 34 to the adapter 36. However, when these flues are turned at right angles the gas may pass almost, but not quite, on a straight line from one adapter to the other, thus providing a minimum of resistance while yet providing a large heat transfer area.

As will be seen a series of angularly spaced brackets 56 are anchored to the enclosure 15 to project outwardly therefrom. A motor 57 is supported by these brackets 56. As indicated in Figure 2 of the drawings a clamping ring is divided into several parts 59 equal in number to the brackets 56 and these parts 59 have a center portion which encircles the motor 57 and have outwardly directed ears 60 at each end thereof. The brackets 57 extend between the spaced pairs of ears 60 and mounting bolts 61 of any suitable type extend through the ears 60 and through tubularly bent ends 62 of the brackets 56 to hold these parts assembled. A sleeve 63 of rubber or other suitable cushioning material is preferably provided within each tubular bracket end 62 to cushion the mounting.

As will be seen when the clamping bolts 61 are tightened or secured in place the motor 57 will be supported with its axis aligned with the axis of the sleeves 10 and 19. A motor shaft 64 projects through an aperture 65 in the end 17 of the closure 15 and through the aperture 33. A fan 66 is supported on the motor shaft. This fan drives air through the flues 40, 47 and 49.

The operation of the device is believed obvious from the foregoing description. The apparatus may be placed either in a vertical section of pipe, a horizontal section thereof, or an inclined section of pipe. The pipe leading to the furnace is connected to the adapter 34 while the adapter 36 is connected to the chimney pipe. Thus the heated gases may flow through the interior of the inner shell 19 between the end panels 37 and 39 and about the flues 40, 47 and 49.

Some furnaces are connected to their chimneys in such a way that there is a relatively strong tortuous draft. As a result in these installations the gases may be caused to flow past the flues when arranged at right angles to the smoke passage. When arranged in this way a maximum amount of heat is transferred to the flues and to the encircling shell 19. In other furnace installations there is a relatively light draft provided and under all conditions the draft might not be sufficient to draw the smoke and gases past the flues. The flues may be rotated so that the longitudinal edges 41 and 42 extend substantially parallel to the normal smoke travel direction, thereby minimizing the deflection of the smoke and gases. Any angle between the extreme positions may be employed to suit each individual installation. The flue position is preferably set under minimum draft conditions so that even under minimum draft the smoke will pass through the heat saving device.

Air is drawn inwardly through the openings 12 in the cap 11 at one end of the outer shell 10. These gases are heated by contact with the outer surface of the inner shell 19 and by the surfaces of the adapters 34 and 36. The air is drawn between the outer and inner shells and between the closure 15 and the inner baffle 29. This air is then pulled through the aperture 33 by the fan 66 and is blown through the flues 40, 47 and 49 and out through the outlet screen 25. Thus the air travels first in one direction and then in the other in passing through the apparatus.

In accordance with the patent statutes, I have described the principles of construction and operation of my heat saving apparatus, and while I have endeavored to set forth the best embodiment thereof, I desire to have it understood that obvious changes may be made within the scope of the following claim without departing from the spirit of my invention.

I claim:

A heat saver including a generally cylindrical body, a pair of end panels rotatably supported within said body and forming end closures therefor, a series of flues supported by said end panels and forming air passages through the space between said panels, said flues being elongated in cross section and arranged in substantially parallel spaced relation, opposed inlet and outlet passages in said body communicating with the space between said end panels, said flues being rotatable from a position with the longitudinal axis of the section substantially in the path of flow of gases from said inlet to said outlet to a position at right angles thereto, an outer shell encircling said body, an air inlet at one end of said outer shell, and means near the other end of the outer shell for forcing air between said shells and then through said flues.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,108,033	Cooper	Feb. 15, 1938
2,311,984	Guild	Feb. 23, 1943
2,414,829	McCollum	Jan. 28, 1947
2,421,371	Budlane	June 3, 1947
2,575,894	Shireman	Nov. 20, 1951

FOREIGN PATENTS

Number	Country	Date
622,899	Great Britain	May 9, 1949