Feb. 28, 1939. J. L. ROOF 2,148,713

DAMPER

Filed Feb. 17, 1937 2 Sheets-Sheet 1

Fig. 1.

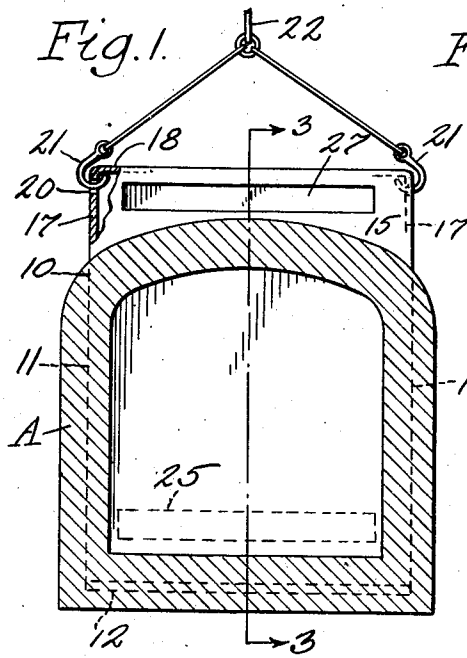


Fig. 3.

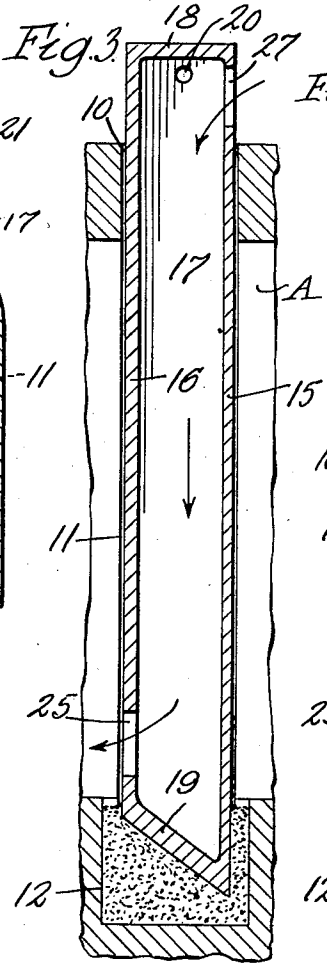
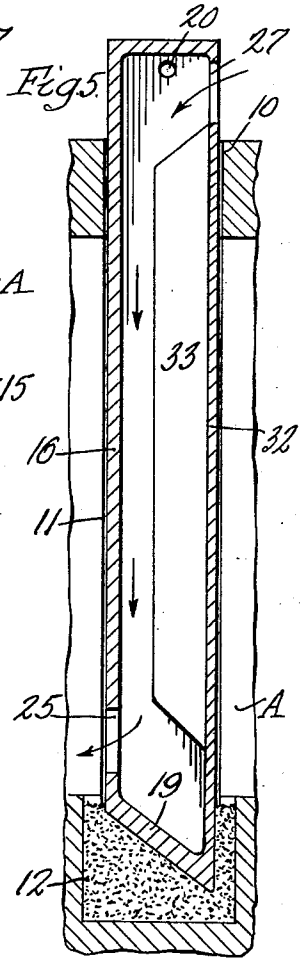


Fig. 5.



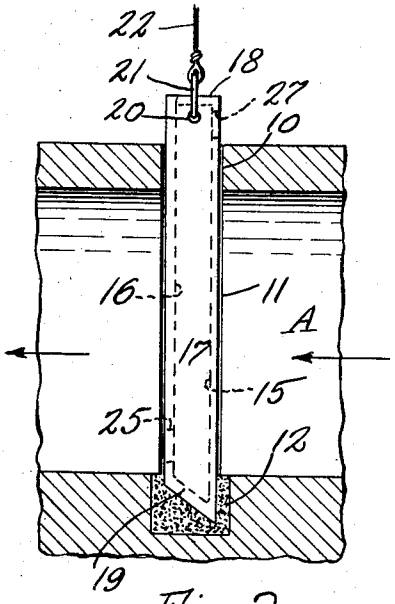


Fig. 2.

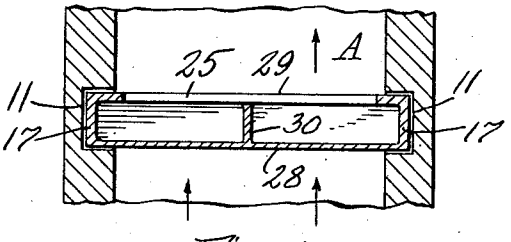


Fig. 4.

INVENTOR.
Jay L. Roof
By Parker, Prickett & Lamer.
ATTORNEYS.

Feb. 28, 1939. J. L. ROOF 2,148,713

DAMPER

Filed Feb. 17, 1937 2 Sheets-Sheet 2

Fig. 6.

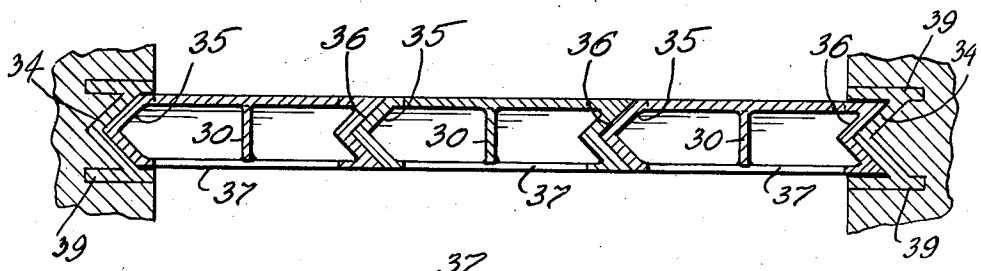
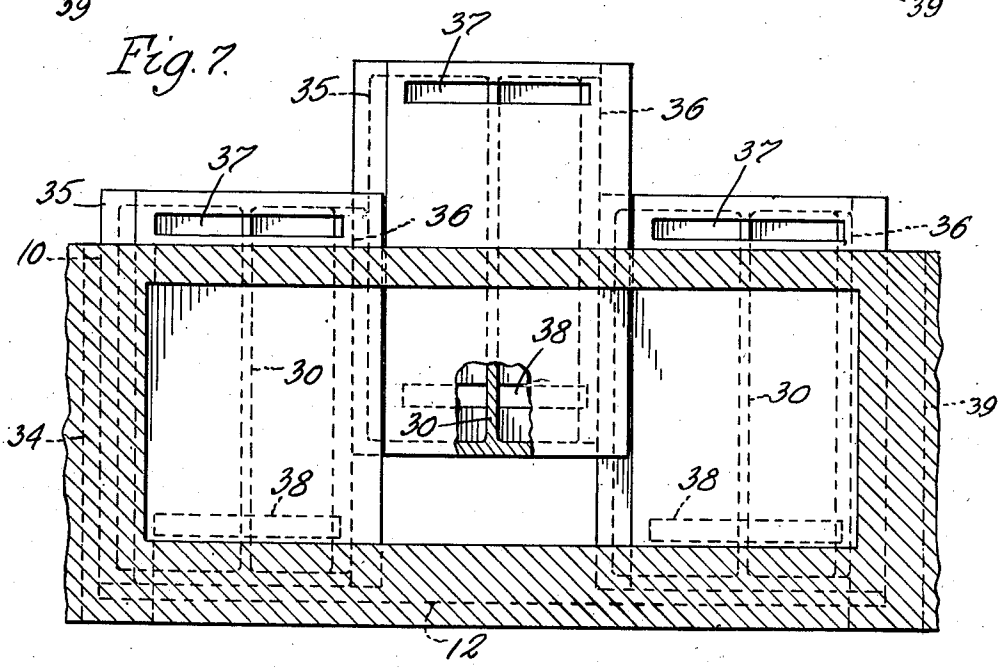


Fig. 7.



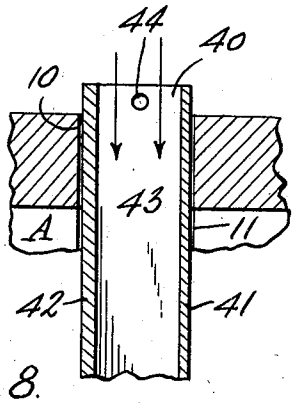


Fig. 8.

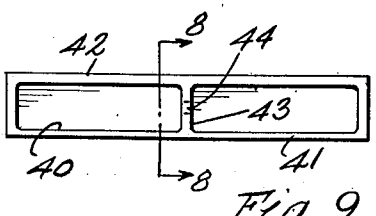


Fig. 9.

INVENTOR.
Jay L. Roof.
By Parker, Prochnow & Lasmer.
ATTORNEYS.

Patented Feb. 28, 1939

2,148,713

UNITED STATES PATENT OFFICE

2,148,713

DAMPER

Jay L. Roof, Hamburg, N. Y.

Application February 17, 1937, Serial No. 126,242

5 Claims. (Cl. 126—285)

This invention relates to improvements in dampers of the kind used in smoke ducts for controlling or regulating the passage of smoke and products of combustion to a chimney.

In dampers of this kind used in connection with large furnaces, the dampers commonly employed rapidly become damaged and destroyed due to the high temperatures to which they are exposed not only when in closed position, but also when partly open, at which time the portion of the damper which extends into the smoke duct is exposed to the high temperature of the smoke and products of combustion.

One of the objects of this invention is to provide a damper of this kind with means for cooling the same during all operative positions of the damper by means of cool air, the flow of which is induced by the draft of the chimney.

It is also an object of this invention to so construct a damper that cool air flowing through the same will contact with the greater portion of the exposed portion of the damper so that the damper will be kept cool enough to greatly increase the life of the same. Another object is to so construct a damper that the maximum cooling of the wall thereof nearest to the fire will be effected. Other objects of the invention will appear from the following description and claims.

In the accompanying drawings:

Fig. 1 is a transverse sectional view of a smoke duct having a damper embodying this invention incorporated therein.

Fig. 2 is a longitudinal sectional view of the smoke duct and a side elevation of my improved damper arranged therein.

Fig. 3 is a sectional elevation thereof, on an enlarged scale, on line 3—3, Fig. 1.

Fig. 4 is a sectional plan view of a slightly modified damper.

Fig. 5 is a vertical section similar to Fig. 3 showing a damper of another modified construction.

Fig. 6 is a horizontal section and Fig. 7 is an elevation of a damper of another modified construction, the same being shown in a smoke duct.

Fig. 8 is a fragmentary sectional elevation of a damper of modified construction taken on line 8—8, Fig. 9.

Fig. 9 is a top plan view of the damper shown in Fig. 8 on a reduced scale.

A represents the portion of a smoke duct in which my improved damper may operate and which duct may be of any suitable or desired type or construction, the portion shown being a part of a duct extending horizontally from a furnace or burner to a smoke stack, neither of which are shown. The portion of the smoke duct shown is provided with a slot or opening 10 in the top wall thereof through which the damper extends, and the smoke duct also has upright guide recesses 11 formed in the side walls of the duct and in registration with the opening 10 in the top of the same so that the damper may be guided in its movement by means of the channels or recesses 11. The smoke duct preferably is also provided with the usual trough-like channel or recess 12 in the bottom wall thereof in alinement with the upright guide channels or recesses 11 and this recess may contain sand or other material in which the lower edge of the damper may form a seal, or if desired, the recess may be made to snugly fit the lower end of the damper. While I have shown my damper in connection with a horizontal smoke duct, it is not intended to limit the invention to such ducts, since my improved damper may be used in connection with vertical or inclined ducts.

My improved damper is made of such shape as to snugly fit the slot 10 and the channels 11 of the duct A and is made of a double walled construction so that an air space for the passage of a cooling current of air is formed between the two walls thereof. In the particular construction shown in Figs. 1 to 3, the damper is provided with a front wall 15 against which the hot products of combustion from the furnace impinge and a rear wall 16 which faces toward the smoke stack. These walls are connected by opposite side walls 17, a top wall 18 and a bottom wall 19 which may be inclined to form a bevelled edge at the lower end of the damper which readily embeds itself in any sealing material which may be located in the lower groove or channel 12 of the smoke duct. The bottom wall 19 may, of course, be of any other shape. The damper may be provided with any suitable or desired means for raising and lowering the same, such for example, as apertures or holes 20 arranged in the opposite side walls 17 and in which hooks 21 or other connecting means may engage to cooperate with suitable cables or other hoisting connections 22.

In accordance with my invention, I provide the damper with an opening or openings 25 in the wall 16 thereof, which may, for example, be in the form of a slot arranged as near to the lower end of the damper as is practical, this opening facing the smoke stack and being preferably arranged slightly above the bottom of the smoke duct A. I also provide the damper with means for admitting cool air into the interior thereof in all positions of the damper, and such cool air opening may, consequently, be arranged in any portion of the damper which extends to the exterior of the smoke duct when the damper is in closed position, and in the construction illustrated in Figs. 1 to 3, I have provided an opening or slot 27 in the upper part of the wall 15 of the damper. The slots or openings 25 and 27 preferably extend substantially from side to side of the damper, so that air will flow lengthwise

of the damper substantially throughout the entire width thereof, so that substantially all parts of the damper wall 15 will be contacted by the cooling air current.

In the operation of my improved damper, a certain amount of outside air flows through the interior of the damper at all times during the operation of the furnace. When the damper is in closed position, as shown in Figs. 1 to 3, outside air enters the opening 27 and flows downwardly between the walls 15 and 16 of the damper and in sweeping past the wall 15, cools the same and then passes out of the lower opening 25. The flow of air through the damper is induced by the draft of the chimney and the size of the openings 25 and 27 and the space between the damper walls is preferably made such that the amount of air which flows through the damper is just enough to effect a cooling of the same. It will also be noted that when the damper is raised to partly open the smoke duct, the flow of air through the interior of the damper will continue. This is important for the reason that the damper is frequently exposed to the highest temperatures when partly open. Even when the damper is almost entirely open, the passage of cooling air will continue. When finally the damper approaches a position in which the opening 25 is partly closed by the top wall of the smoke duct, the flow of cooling air is reduced by partly closing the opening 25 by the top wall of the smoke duct, and this reduced flow of air is then sufficient to cool the damper, since only a relatively small portion of the same is exposed to the hot smoke and products of combustion. When the damper is moved into an extreme open position in which the air discharge opening 25 is completely closed by the top wall of the smoke duct, damage to the damper due to hot gases is no longer probable since only the lower edge of the damper is exposed to the hot gases while the greater portion of the damper is in a cool atmosphere outside of the smoke duct and, consequently, the heat of the lower edge of the damper is readily dissipated by conduction to the cool parts of the damper.

The space within the damper may be unobstructed, or if desired, one or more longitudinal ribs or partitions may be provided which connect the front and rear walls thereof. In Fig. 4, I have shown a slightly modified form of damper in which the front and rear walls 28 and 29 of the damper are provided with a partition or intermediate web 30 which may be formed integral with the walls 28 and 29, and thus reinforce the damper and also provide an increased radiating surface through which heat may be transferred to the air flowing through the interior of the damper.

In Fig. 5 is shown another slight modification in which the wall 32 facing the furnace is provided with one or more heat radiating webs or fins 33 extending into the air passage of the damper to increase the transfer of heat to the air flowing through the damper. Any other type of fins of this kind may be employed and the fins 33 also strengthen that wall of the damper which is subject to the greatest heat.

In all of the constructions shown, it will be noted that I have formed the front wall of the damper which faces the furnace of less thickness than the opposite or rear wall, and this is done for the purpose of effecting a more rapid transfer of heat through these walls. Since heat is transferred more readily through a thin wall than through a thick wall, it will be obvious that by the use of a thin wall, a more rapid transfer of heat to the cooling air will be effected, and consequently, a thin wall will be maintained at a lower temperature than a thicker wall, and will, consequently, be subject to less deterioration, buckling, etc. The back wall of the damper may be made thicker than the front wall, so that the back wall will supply the necessary structural strength. If desired, the opposite walls of the damper may, however, be made of the same thickness and it is not intended to limit this invention to the use of a thinner wall facing the furnace.

In Figs. 6 and 7, I have illustrated my invention as applied to dampers of large size in which the damper is formed of a plurality of sections for ease of handling. The individual sections may be formed in a manner similar to the dampers disclosed in Figs. 1 to 5, except that their side walls are preferably formed so as to interlock or interfit, to form a sliding connection with each other, which prevents displacement of the sections out of transverse alinement with each other. Any suitable means may be provided for this purpose, and in the construction shown, I have provided each of these damper sections with one edge wall 35 having a tapering or bevelled edge and the opposite side wall 36 is recessed in such a manner as to receive the tapering or bevelled portion 35 of an adjacent section. These edges, as shown in Fig. 6 will readily cooperate with upright channels arranged in the smoke duct. By means of this construction, one section of the damper may be raised independently of other sections and where the smoke duct is relatively wide, binding or jamming of the damper within its guide in the smoke duct is avoided. No hoisting means for the sections of the damper are shown, but it will be obvious that any suitable means for attaching hoisting cables or the like to the damper may be provided, and if desired, the hoisting means may be hooked into the upper air openings 37 of the sections of the damper. The lower portions of the dampers are provided with air discharge slots 38 similar to the slots 25 which have been described and the operation of each section of the damper is similar to the damper shown in Figs. 1 to 5. It will be noted, however, that the sections or parts of the damper may each be adjusted differently, so that accurate regulation of the damper opening can be obtained.

The outer sections of the damper may be guided in the side walls of the smoke duct in any suitable manner, for example, in guide channels which may be made of metal and which may have a middle web 34 of angle shape, the opposite edges of which terminate in parallel webs 39. The webs 39 may be secured in the side walls of the duct. By constructing the guide channels in this manner, the two channels may be identical and made from the same pattern if of cast metal and one side of the middle web may cooperate with a tapering or bevelled side 35 of a section of the damper, while the other side of the web of another guide channel may cooperate in the recessed side 36 of a damper section. Any other means for guiding the damper sections may, of course, be used, if desired.

In Figs. 8 and 9 is shown still another modified form of a damper in which the slot in the side wall of the damper is eliminated and the damper instead is provided with an open top, as shown at 40, so that air may flow directly down into

the space between the walls 41 and 42 of the damper. This damper is provided with a middle partition 43 formed integral with the walls 41 and 42, similar to the partition 30 shown in Fig. 4, and this partition is shown as provided near the upper portion thereof with an aperture 44 to which a hoisting cable or chain may be attached. Dampers shown in Figs. 8 and 9 may be made of slightly less height than those shown in Figs. 1 to 7 and may be used in cases where there is not much chance for dirt or other foreign matter to drop down into the open upper end of the damper.

Dampers made in accordance with my invention herein described are much more durable and have much longer life than single walled dampers as heretofore commonly used and are particularly desirable for use in smoke ducts of large furnaces or burner installations, in which the dampers are subjected to very high temperatures. For example, in gas fired steel heating furnaces, in which the steel is left in the furnace for a considerable period of time after the supply of fuel is shut off, my improved dampers are very effective in keeping the heat in the furnaces during such periods in that the high temperatures to which the dampers are exposed do not cause the dampers to buckle or warp, so that they tightly close the smoke duct. The cooling air which passes through the damper is not of sufficient volume to have any material effect upon the draft or suction in the smoke duct and, furthermore, when the damper is in wide open position, as is the case when the maximum draft is required, the air discharge opening in the inner part of the damper is closed so that no reduction whatever in the amount of draft takes place.

I claim as my invention:

1. An air cooled damper arranged to slide transversely of a smoke duct through a slot therein and having one end thereof extending to the exterior of said duct, said damper including walls spaced apart and each extending transversely of said duct and forming between them an air space which is substantially coextensive with the area of the damper, that one of said walls facing the discharge end of said duct having an opening at the end thereof remote from said end of said damper which extends to the exterior of said duct through which air can pass when said damper is in closed position, the portion of said damper which extends to the exterior of said duct having an opening through which air can flow into the space between said walls to said first mentioned opening, whereby the draft in said duct causes air to be drawn from the exterior of said duct through the space between said walls and out of said lower opening for cooling the damper.

2. An air cooled damper arranged to slide transversely of a smoke duct through a slot therein and having an outer portion extending outside of said duct through said slot, said damper including a pair of walls extending parallel to each other and transversely of said duct and spaced apart to form between them an air space extending substantially throughout the width of said damper, said damper being provided with an opening in the outer portion thereof arranged exteriorly with reference to said duct and through which air may pass into the space between said walls, and said damper having another opening in one of said walls adjacent to the end thereof which is remote from said other opening, said second opening facing toward the discharge of said duct, whereby the suction in said duct causes air to flow through the space between said walls and out of said last mentioned opening into said duct for cooling said walls, said last mentioned opening extending substantially throughout the width of said damper to provide a sheet-like flow of cooling air throughout substantially the entire length and width of said damper when said damper is in closed and partly closed positions.

3. An air cooled damper arranged in a smoke duct and having a portion thereof extending to the exterior of said duct and having a pair of walls which are substantially coextensive with the width and length of said damper and which are spaced apart to form between them a space for a current of air, said damper being provided with an opening for admission of air to said space which is arranged at the exterior of said duct and also with an opening in the wall thereof facing the discharge of said duct, through which air from the interior of said damper is withdrawn by suction in the smoke duct and said last opening being at the end of said damper remote from said other opening, the wall of said damper which faces the furnace being relatively thin, to provide for rapid cooling of said wall, and said other wall being relatively thick to provide structural strength for said damper.

4. A sectional air cooled damper for use in a smoke duct having a slot in the side thereof and having guide grooves therein, said damper including a plurality of sections extending through said slot in said duct and guided in said grooves in moving into and out of said duct, each of said sections having a pair of walls spaced apart and extending transversely of said duct and forming between them an air space, each section having an opening in the portion thereof extending out of said duct through which exterior air may enter said space and an opening facing the discharge end of said duct through which air may be withdrawn from said space, each section being provided at opposite edges thereof with guide means arranged to cooperate with corresponding guide means on adjacent sections and with a guide groove of said duct whereby each section of said damper may be moved into and out of said duct independently of other sections.

5. A sectional air cooled damper for use in a smoke duct having a slot in the side thereof and having guide grooves therein, said damper including a plurality of sections extending through said slot into said duct and guided in said grooves in moving into and out of said duct, each of said sections having a pair of walls spaced apart and extending transversely of said duct and forming between them an air space, each section having an opening in the portion thereof extending out of said duct through which exterior air may enter said space and an opening facing the discharge end of said duct through which air may be withdrawn from said space, each of said sections being provided at one edge portion thereof with a guide recess for receiving a projecting edge portion of an adjacent section for guiding adjacent sections in their movement transversely of said duct, either of the edge portions of said sections being formed to cooperate with said guide grooves of said duct for guiding said sections transversely thereof.

JAY L. ROOF.