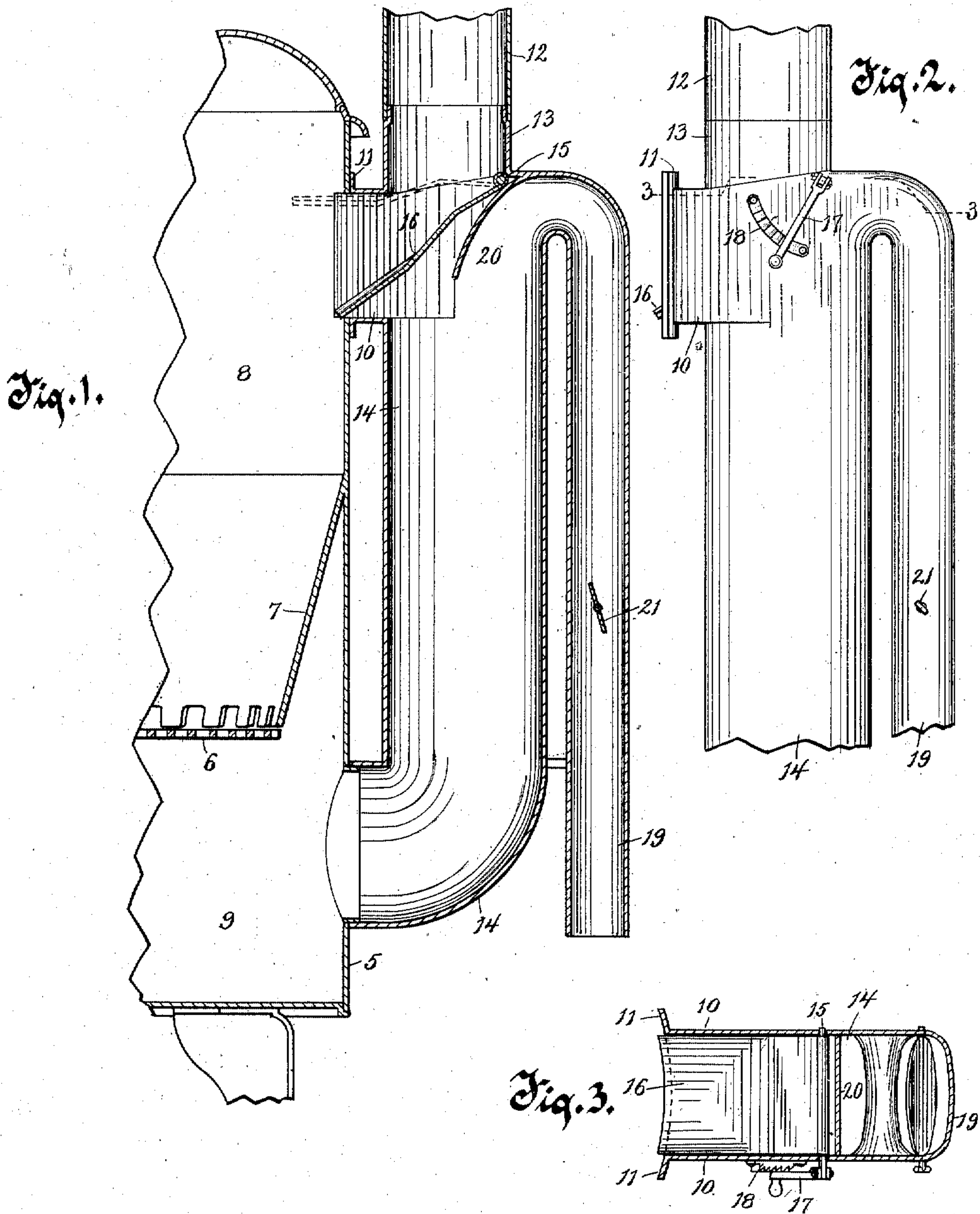


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RETURN FLUE FOR STOVES AND THE LIKE.

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# UNITED STATES PATENT OFFICE.

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## RETURN-FLUE FOR STOVES AND THE LIKE.

No. 825,747.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that we, FREDERICK W. MOLDENHAUER, residing in Oconomowoc, county of Waukesha, and LOUIS DORNFELD, residing in Watertown, county of Jefferson, State of Wisconsin, have invented new and useful Improvements in Return-Flues for Stoves and the Like, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

The object of this invention is to improve upon the construction of return-flues, so as to avoid the formation of soot-collecting pockets in the smoke-pipe, which in former constructions have obstructed the passage-way and interfere with the proper operation.

Another object of this invention is to provide for deflecting the inflow of fresh air to the return-flue in such a manner that it will be impossible for it to commingle with the smoke and gases passing up the smoke-pipe when the valve or gate is in an intermediate position.

Another object of this invention is to so construct the valve or gate that it may project into the combustion-chamber of the stove and there divide the smoke and gases to be returned from the steam and gases to be discharged, resulting in a more efficient operation than in former structures where the division was made within the smoke-pipe.

Another object of this invention is to mount the valve or gate in such a manner that soot deposited thereon may be returned to the combustion-chamber.

With the above and other objects in view the invention consists in the return-flue as herein described and claimed, its associated parts and combinations thereof, and all equivalents.

Referring to the accompanying drawings, in which like characters of reference indicate the same parts in the several views, Figure 1 is a sectional elevation of a fragment of a heating-stove provided with a return-flue constructed in accordance with this invention. Fig. 2 is a side elevation of the return-flue detached from the stove, and Fig. 3 is a sectional view thereof on the plane of line 3-3 of Fig. 2.

In the drawings, 5 represents a fragment of an ordinary heating-stove having a grate 6

and a fire-pot 7, with a combustion-chamber 8 thereabove and an ash-pit 9 therebelow, all of usual construction. While the invention is shown in connection with this particular form of heating-stove, it is to be understood that it is not limited in its application to such stove, but may be attached to or constitute a part of any suitable heating apparatus, such as a furnace or a range or the like.

A valve-chamber 10, rectangular in cross-section, is provided with a curved collar 11 to fit the contour of the stove-body and takes the place of the ordinary elbow connection for the smoke-pipe 12, which is here connected with the valve-chamber by means of the stovepipe connection 13, leading from the top of said valve-chamber close to the stove.

The bottom of the valve-chamber is connected by means of a return-pipe 14 with the ash-pit of the stove beneath the grate, so that there is a complete return conductor or return-flue from the combustion-chamber 8 through the valve-chamber 10 and the return-pipe 14 to the space beneath the fire-bed on the grate. At that meeting edge of the stove-pipe connection 13 with the valve-chamber 10 which is farthest from the combustion-chamber is journaled a shaft 15, carrying a valve 16, with its side edges closely fitting against the parallel side walls of the valve-chamber and its free end projecting within the combustion-chamber. The valve 16 is preferably of sheet metal with the free end portion bent to an arc shape in cross-section for the double purpose of closely fitting against the curved lower edge of the valve-chamber when in its lower position and of forming a small passage-way at the top of the valve-casing from the combustion-chamber to the stovepipe connection when in its upper position, and thereby preventing the possibility of entirely closing the outlet to the smoke-pipe for the lighter spaces.

On the outside of the valve-chamber the shaft 15 has pivotally connected to it a crank-handle 17, by means of which the valve may be swung from one position to another and which is adapted to be locked in its various adjustments by engaging with the teeth of an arc-shaped rack 18, secured to the valve-chamber.

A cold-air pipe 19 connects with the upper part of the valve-chamber close to the pivotal connection of the valve and is always in



communication with the return-pipe 14. A deflector-plate 20 is located in the valve-chamber and extends downwardly from a position near the pivotal connection of the valve, so as to deflect the inflow of fresh air from the cold-air pipe away from the valve and the passage-way for the smoke-pipe through the valve-chamber. The fresh-air pipe 19 leads upwardly from near the floor and is provided with a valve or damper 21 for closing the communication therethrough when desired.

In operation the valve 16 is in its closed position, as shown in full lines in Fig. 1, while the fire is being started, and in this position the drafts are the same as the direct draft in the ordinary flue constructions, except that fresh air is taken beneath the grate through the cold-air pipe 19 instead of through the ash-pit door, as usual. With this direct draft there is no return of the gas to the grate, for the valve 16 tightly closes the return-flue and the gases pass unimpeded through the stovepipe passage-way of the valve-chamber to the chimney. When the fire has become fairly started, the crank-handle 17 is moved upwardly to lift the valve 16 to any desired position, which will depend upon the nature of the fuel being burned, the usual position of the valve with hard coal being its full open position against the upper wall of the valve-chamber, as shown in dotted lines in Fig. 1. Now the smoke and gases coming from the combustion-chamber will for the greater part be drawn by suction downwardly through the return-pipe 14, where they will commingle with and heat the fresh air drawn in by induction through the cold-air pipe 19 and become thoroughly intermixed therewith during the passage down the return-flue, so that as the mixture enters the chamber beneath the grate it is in a perfectly combustible state, and on passing through the grate and into contact with the live coals it will burn freely and contribute to the heating effect. Inasmuch as the stovepipe passage-way through the valve-chamber cannot be completely closed by means of the valve 19, even when in the full open position, the steam and lighter non-combustible gases which naturally travel along the top of said passage-way are permitted to separate from the smoke and heavier combustible gases by passing through the small passage-way provided by the curvature of the valve or through the space above the valve and escape by way of the chimney. The valve 16, therefore, in addition to its valve functions of opening and closing the various passages, serves as a gas-separator operating within the combustion-chamber to select the combustible gases from the non-combustible gases and guide them to the return-flue, while allowing the non-combustible gases to escape to the chimney. In burning wood or soft coal which

contain an abundance of moisture the valve 16 is preferably locked in an intermediate position to increase the space above it, through which the steam and lighter gases may pass out.

The valve 16 serves the double purpose of controlling the degree of opening through the smoke-pipe passage of the valve-chamber and also controlling the communication between the smoke-pipe passage-way and the return-flue, so that a single operation of the valve is all that is necessary to change the drafts from a direct draft to a return draft.

The valve 21 in the cold-air pipe is only used in event of the fire becoming too hot, when it may be closed more or less to control the supply of fresh air, and thereby the degree of combustibility of the gases introduced beneath the grate by the return-flue. Obviously the cold-air pipe 19 extends down to near the floor, so as to take the coldest air in the room, and thereby facilitate the heating of the room.

There is no liability of the gases of combustion passing down the cold-air pipe and out into the atmosphere, because of their being lighter than the cold air in said pipe, and therefore unable to displace it, and for the further reason that the draft of the fire is drawing these gases down the return-pipe instead, and the deflector-plate 20, standing between the two inlet-passages to the return-pipe, keeps the gases and the air separate until its lower end is reached, which is some distance below the mouth of the fresh-air pipe.

Under no circumstances can cold air from the cold-air pipe be drawn by the draft in the chimney past the valve 16, because of the tight fit of the valve in the valve-chamber in all of its positions and because of the further fact that the opening of this cold-air pipe into the return-flue is beneath the valve and the passage of the hot gases through the space opened by the valve effectively prevents any passage of air in the opposite direction.

Soot which may be dropped from the smoke-pipe onto the valve is not retained thereby to form an obstruction to the smoke-pipe passage-way, but owing to the inclined position of the valve when lowered any deposit thereon may slide down into the combustion-chamber.

The separation of the combustible from the non-combustible gases within the combustion-chamber is found in practice to be far more efficient than such separation when made in the smoke-pipe after leaving the combustion-chamber.

The means for moving the valve from one position to another and locking it in its adjusted positions is simple in its construction and avoids the necessity for interior connections through openings in the smoke-pipe.

What we claim as our invention is—

1. In a return-flue for stoves and the like,



a connection having a smoke-pipe passage, a return-pipe leading from the smoke-pipe passage to beneath the grate, a valve for controlling communication between the smoke-pipe passage and the return-pipe and projecting into the combustion-chamber, and a cold-air pipe communicating with the return-pipe between the valve and the discharge end of the return-pipe.

2. In a return-flue for stoves and the like, a valve-chamber having a smoke-pipe passage-way, a return-pipe leading from the valve-chamber to beneath the grate, a valve pivotally connected in the valve-chamber so as to nearly close the smoke-pipe passage-way in one position and to close the return-pipe in another position, said valve having its free end projecting into the combustion-chamber, and a cold-air pipe communicating with the return-pipe between the valve and the discharge end of the return-pipe.

3. In a return-flue for stoves and the like, a valve-chamber communicating with the combustion-chamber and having a stove-pipe connection, a valve pivotally connected in the valve-chamber beyond the stovepipe connection and extending into the combustion-chamber, said valve being curved to fit the wall of the combustion-chamber and to provide a passage between the valve and the top of the valve-chamber for the escape of gases to the smoke-pipe when the valve is in the upper position, a cold-air pipe communicating with the valve-chamber, and a return-pipe leading from the valve-chamber to beneath the grate.

4. In a return-flue for stoves and the like, a valve-chamber having connection with the combustion-chamber, a valve pivotally connected at the upper wall of the valve-chamber, a smoke-pipe connection for the valve-chamber located directly above the valve and adapted to be nearly closed by the valve

when the valve is in its upper position, a cold-air pipe communicating with the valve-chamber, and a return-pipe leading from the valve-chamber to beneath the grate.

5. In a return-flue for stoves and the like, a valve-chamber having connection with the combustion-chamber, a valve pivotally connected at the upper wall of the valve-chamber, a smoke-pipe connection for the valve-chamber located directly above the valve and adapted to be nearly closed by the valve when the valve is in its upper position, a crank-handle connected with the valve on the outside of the valve-chamber, a rack to be engaged by the crank-handle for locking the valve in its adjusted positions, a cold-air pipe connecting with the valve-chamber beneath the valve, and a return-pipe leading from the valve-chamber to beneath the grate.

6. In a return-flue for stoves and the like, a valve-chamber having connection with the combustion-chamber, a valve pivotally connected at the upper wall of the valve-chamber, a stovepipe connection leading from the valve-chamber above the valve, a cold-air pipe connecting with the valve-chamber beneath the valve, and a deflecting-plate leading downwardly from near the valve to deflect the inlet of cold air downwardly into the return-pipe.

In testimony whereof we affix our signatures in presence of two witnesses.

FREDERICK W. MOLDENHAUER.  
LOUIS DORNFELD.

Witnesses to Frederick W. Moldenhauer's signature:

H. C. BEHREND,  
WM. ZIMMERMAN.

Witnesses to Louis Dornfeld's signature:

W. J. COVILL,  
LEO J. KIENBERGER.