

No. 771,420.

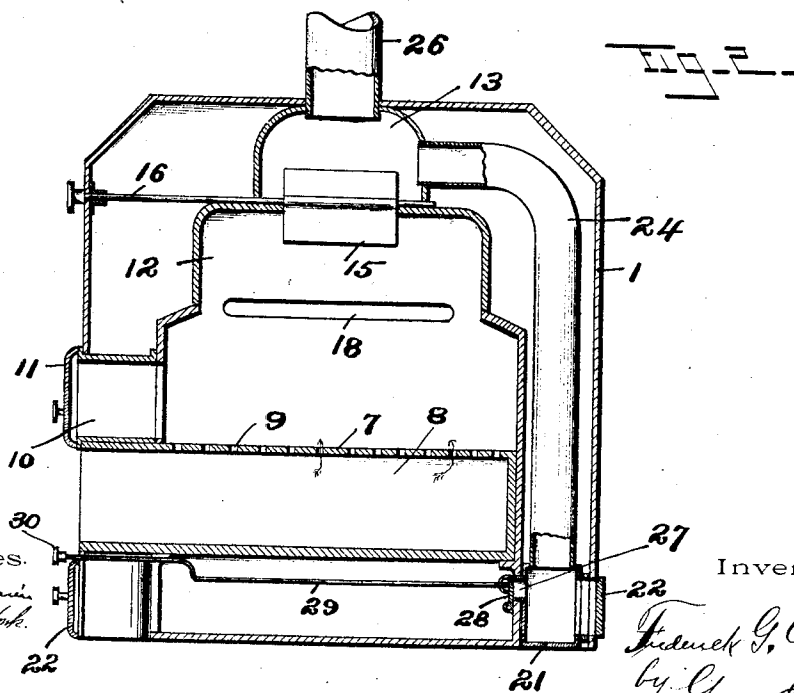
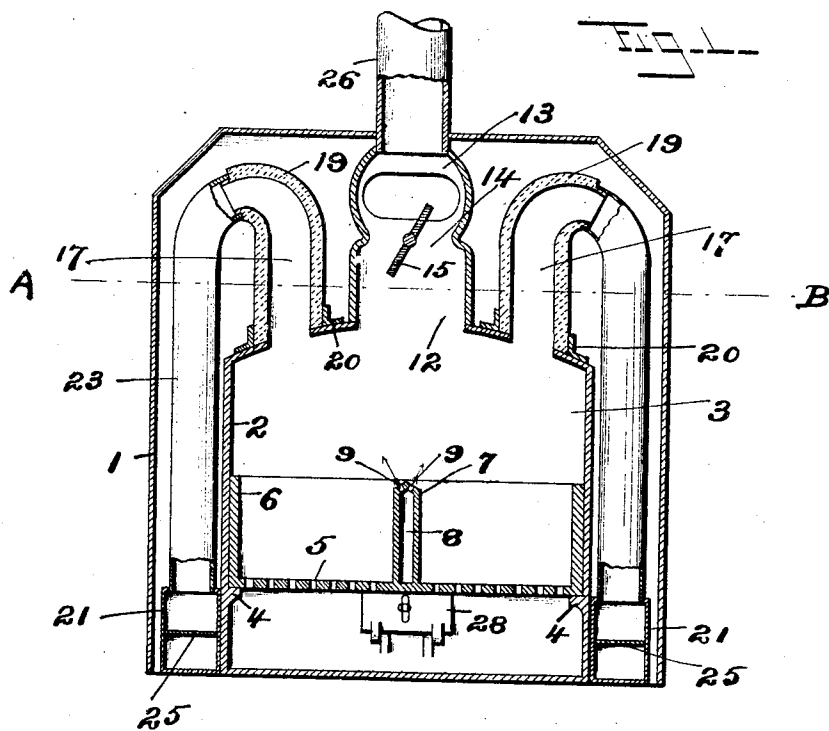
PATENTED OCT. 4, 1904.

F. G. COOPER.
FURNACE.

APPLICATION FILED JUNE 17, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses.

William O'Brien

Thomas H. Wink.

Inventor.

Fredrick G. Cooper

by George H. Hall

Attorney

No. 771,420.

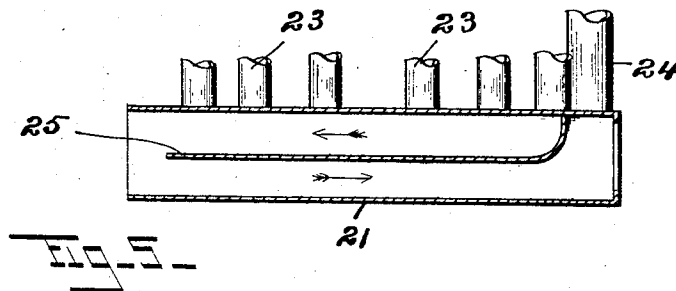
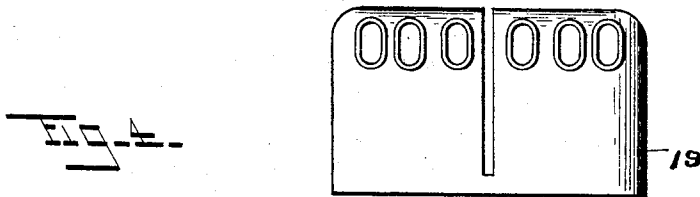
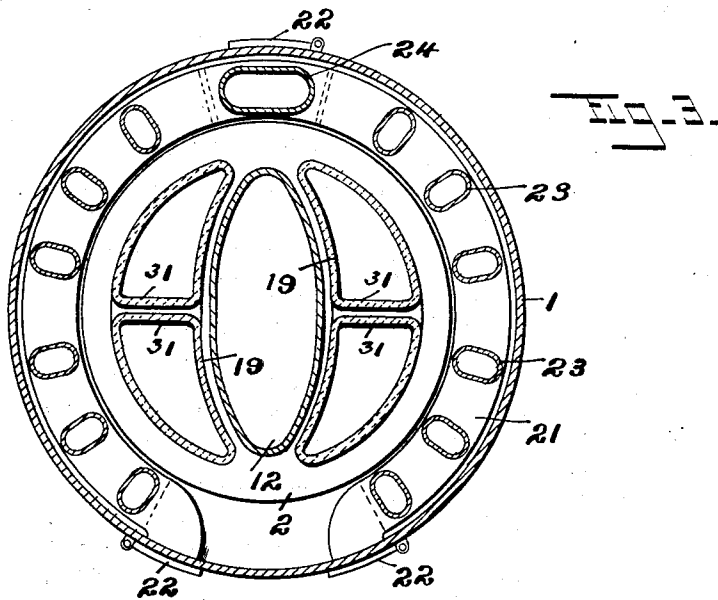
PATENTED OCT. 4, 1904.

F. G. COOPER.
FURNACE.

APPLICATION FILED JUNE 17, 1903.

NO MODEL.

2 SHEETS—SHEET 2.



Witnesses.

William O'Brien
Finney H. Munk

Inventor

Frederick G. Cooper
by *George C. Hall*
Attorney

UNITED STATES PATENT OFFICE.

FREDERICK G. COOPER, OF NEW HAVEN, CONNECTICUT.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 771,420, dated October 4, 1904.

Application filed June 17, 1903. Serial No. 161,844. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK G. COOPER, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to new and useful improvements in furnaces, and has for its object, among other things, the construction of a furnace in which the products of combustion will be indirectly and finally conducted from the combustion-chamber to a superimposed chamber having a damper connection therebetween, to provide a divided fire-pot and means for causing a current of fresh hot air to combine with the products of combustion within the combustion-chamber, and in general to so construct and design a furnace that it will give the largest amount of heat with the minimum consumption of fuel.

To these and other ends my invention consists in the furnace having certain details of construction and combination of parts, as will be hereinafter described, and more particularly pointed out in the claims.

Referring to the drawings, in which like numerals designate like parts in the several figures, Figure 1 is a vertical transverse section of a furnace embodying my improvements. Fig. 2 is a vertical section thereof from front to rear. Fig. 3 is a sectional plan view taken upon line A B of Fig. 1. Fig. 4 is a side elevation of the exhaust-casings, and Fig. 5 is a detailed fragmentary view of the gas-receptive chamber and some of its adjacent parts.

The advantages to be gained by reheating the products of combustion after they have been once cooled and before entering the chimney are set forth in Letters Patent of the United States No. 727,750, issued to me the 12th day of May, 1903, and I will not, therefore, set them forth in detail in this application. Suffice it to say, however, that the reheating of the gases and products of combustion after they have reached a lower degree of temperature than when they leave the combustion-chamber accelerates the after or subsequent

movements of the products of combustion, and thus creates a much stronger and more uniform draft in the fire-pot and in the smoke-pipe and chimney-flue while the direct smoke-damper is in a closed position and when the direct draft through the ash-pit inlet is largely diminished or cut off than has heretofore been possible, and correlatively, if desired, a poorer grade of fuel can be used satisfactorily and economically.

Referring to the drawings, the numeral 1 designates the outer shell or casing of the furnace, within which is the furnace-body 2, having a dome-shaped top, and within which are the combustion-chamber 3 and the fire-pot, which is supported upon lugs 4 integral with the furnace-body 3. The fire-pot I preferably construct with a grate-bottom 5, sides 6, and the dividing-wall 7, within which is the chamber 8, which is open at one end through the casing 1 and closed at the rear end. (See Fig. 2.) The front end of said chamber is preferably closed by a plate or door having means connected therewith, as is common in the art, for regulating the volume of air entering the chamber 8. Through the top of the wall 7 and opening into the chamber 8 are the port-holes 9.

As the products of combustion rise from the fire-pot the current of air which enters the chamber 8 from the exterior of the furnace is heated and passes through the port-holes 9 into the combustion-chamber 3, where in its heated state it unites the more readily with the products of combustion and facilitates the consuming thereof. The feed-passage opening into the combustion-chamber above the fire-pot is designated 10 and is closed at its outer end by the feed-door 11 of the usual form and construction.

The location of the wall 7 is such as to divide the fire-pot into two substantially equal parts, and either one or both may be used at one and the same time, as desired, and when both are used alternate stoking will tend to maintain a uniform volume of heated air flowing through the hot-air chamber and register-pipes.

In mild weather when only a moderate fire is required to take the chill off the air pass-

ing through the heating apparatus it has hitherto been found quite difficult to so regulate the combustion as to keep the fire alive without excessively heating the building. In the method here described and shown by using only one of the fire-pots, in which a full fire can easily be maintained continuously, it is obvious that it has to perform the duty of heating double the amount of radiating-surfaces under conditions as stated than when both pots are in use. Therefore those desirable results can be and are readily, economically, and uniformly secured. When only one of the fire-pots is in use, a plate is laid over the top of the other, so as to shut off the draft that otherwise would come up through the grate-bars on that side.

Directly above the furnace-body 2 is the central gas-chamber 12, and above said gas-chamber is the reheating-chamber 13, the chambers 12 and 13 being connected with an opening 14 therebetween, which is closed by means of a damper 15, that is mounted upon a rod 16 and operated in a well-known manner. Fixed upon the top of the furnace-body 2 are the double casings 19, the chambers therein being in register with the slots 18. These casings are shown as secured to the furnace by means of collars 20; but this is only one of the many ways that may be adopted to secure these parts together. These casings are subdivided by the vertical walls 31, having an open passage therebetween that serve to direct and equalize the flow through the several downtakes. In practice these vertical walls could be omitted, substituting therefor vertical diaphragms; but this would entail a direct loss of valuable radiating-surface that it is desirable to retain.

Surrounding the bottom of the furnace-body 2 is the gas-receptive chamber 21, which is open at both ends and beneath the uptake for the purpose of cleaning out the same, which openings are closed by hinged doors 22. Connecting the casings 19 with the gas-receptive chamber 21 is a plurality of downtakes 23, and connecting the chamber 21 with the reheating-chamber 13 is the uptake 24. The shape of the downtakes and uptakes can be varied indefinitely, but are shown in the drawings as being oval, although I do not desire to be limited to such form or construction. Within the said gas-receptive chamber is a baffle-plate 25, which is turned upwardly at one end and connected with the top of said chamber adjacent to the uptake and terminates at the other end relatively adjacent to the front downtakes, thus dividing the said gas-receptive chamber into two horizontal chambers, the upper one of which is closed at one end and the other open at both ends. The closed end of the upper one can be provided, if desired, with a removable panel to facilitate the removal of soot, &c., through the rear clean-out door. As the gases pass through the downtakes they

strike the upper surface of the baffle-plate 15 and are caused to move in the direction of the upper arrow shown in Fig. 5 and then around the end of the gas-receptive chamber to the under side of the baffle-plate, from which they escape into the uptake. This construction prevents the products of combustion that pass through the downtakes nearest the uptake from passing directly into said uptake, but cause the same to travel through the same chambers as the products of combustion that passed down through the other downtakes.

In operation the products of combustion as they rise from the fire-pot fill the combustion-chamber and escape through the chambers 17 into the downtakes, then into the gas-receptive chamber 21, from which they pass through the uptake 24 into the reheating-chamber 13, where they are subject to the influence of the heat within the combustion-chamber. During the passage of the products of combustion from the combustion-chamber through the down and up takes, &c., into the reheating-chamber 13 the temperature thereof will be considerably decreased; but after entering the said reheating-chamber 13 the heat in the combustion-chamber reheats the said gases, which being lighter pass immediately into the smoke-pipe 26 and into the chimney, thus causing a stronger draft, which considerably accelerates the movements of the products of combustion. This method of reheating the gases and smoke also serves to prevent the leaking of gases into the hot-air chamber through leaky or defective joints that long use or abuse may have developed in the structural parts. This is more noticeable in furnaces of the downward or indirect draft type, as the currents of smoke and gases tend as they become cooled to loiter and move sluggishly toward the exit, and the pressure of gases within the furnace, combined with the draft through the hot-air chamber, causes the leakage (if any) to be gas into the hot-air chamber, and consequently into the house; but the contrary result obtains in the method of construction herein described, whereby an increase of the temperature of the cooled gases and smoke being secured just prior to their exit to the chimney-flue counteracts the tendency outward of the confined gases through any defective joints, as the pull toward the chimney is the stronger, so any leakages of joints will be of hot air inward and go with the smoke, thus eliminating one of the most serious objections that have been found against the "downward-draft" type after lengthened use. The products of combustion can pass directly into the smoke-pipe 26 by opening the damper 15, as shown in Figs. 1 and 2.

To carry off the dust which is created in the ash-pot while shaking the grate and to minimize its rising within the combustion-chamber, I have provided a passage 27, which connects the ash-pot directly beneath the uptake

with the gas-receptive chamber 21, that is normally closed by a door 28, which is operated by a rod 29, having a button 30 upon its forward end. While the grate is being shaken 5 the door 28 is open, so as to make a direct connection between the uptake and ash-pot, and the upward draft in the uptake sucks the dust from the ash-pot into the uptake, and the same passes out through the smoke-pipe. 10 Preferably in this process the direct damper is closed, (contrary to the usual practice,) and thus in a large measure precludes the dust from rising in the combustion-chamber and settling within the downtakes and gas-recep- 15 tive chamber, and thereby avoids the accumulation and choking of the radiating-passages connecting with the uptake and resulting diminution of the volume of heated air within the hot-air chamber.

20 In practice a clean-out can be provided for the reheating-chamber 13 by a horizontal flue either at rear or at front. In the latter case it would preferably contain the damper-rod, thus cutting off the possibility of any leak of 25 gases or smoke into the hot-air chamber where the rod passes through the wall of the reheating-chamber 13.

There are many minor changes and alterations that can be made within my invention 30 aside from those herein shown and suggested, and I would therefore have it understood that

I do not limit myself to the exact construction herein shown and described, but claim all that falls fairly within the spirit and scope of my invention.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a furnace, the combination with the combustion-chamber, of a reheating-chamber 40 without said combustion-chamber but arranged to be heated thereby, a dampered connection between said chambers, indirect smoke-passages providing communication between said chambers, and a smoke-flue communicat- 45 ing with said reheating-chamber.

2. In a furnace, the combination with the combustion-chamber, of a reheating-chamber without said combustion-chamber but arranged to be heated thereby, a dampered con- 50 nection between said chambers, a horizontal chamber below said reheating-chamber, a plurality of downtakes leading from said combustion-chamber to said horizontal chamber, and an uptake connecting said horizontal chamber 55 with said reheating-chamber.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK G. COOPER.

Witnesses:

GEORGE E. HALL,
WALLACE S. MOYLE.