W. S. ROCKWELL.

METAL HEATING FURNACE.

APPLICATION FILED AUG. 28, 1918.

1,288,202.

Patented Dec. 17, 1918.

2 SHEETS—SHEET 1.

Fig. 3.

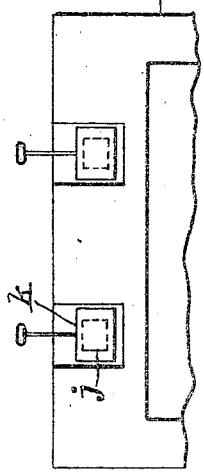


Fig. 2.

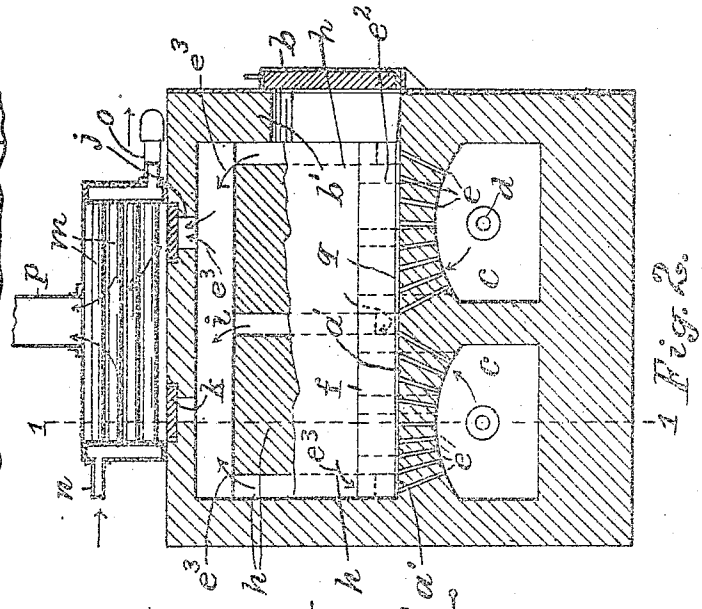


Fig. 1.

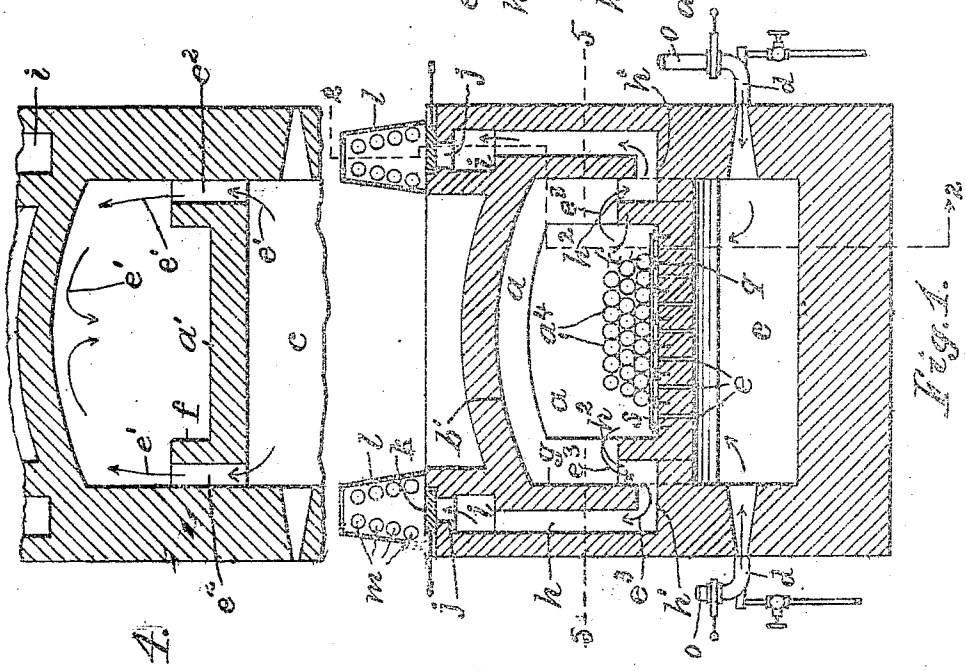


Fig. 4.

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per Thos. A. Crane.

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2 SHEETS—SHEET 2.

Fig. 6.

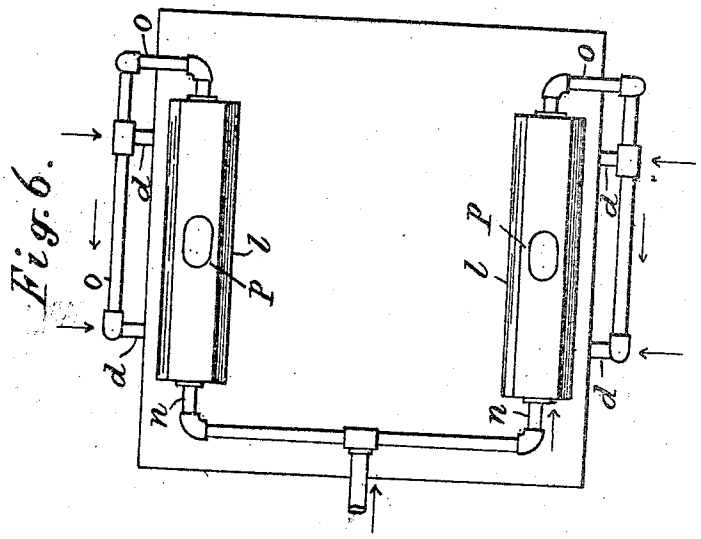
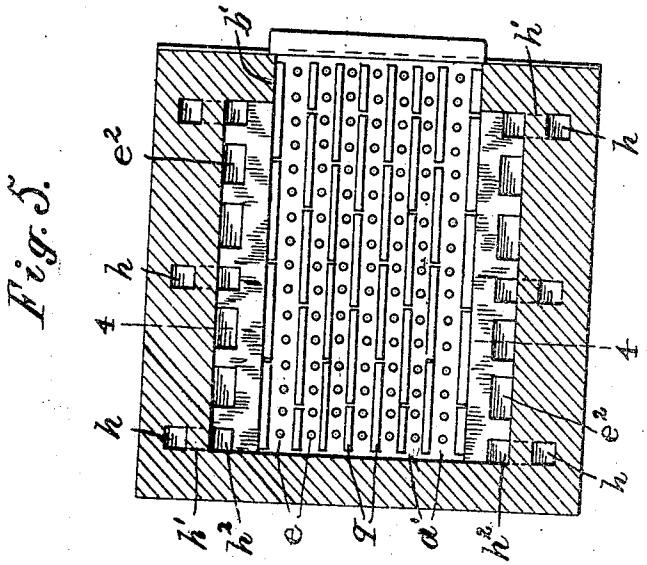


Fig. 5.



Inventor.
Walter S. Rockwell.
per Thomas L. Crane, Atty.

UNITED STATES PATENT OFFICE.

WALTER S. ROCKWELL, OF NEW YORK, N. Y., ASSIGNOR TO W. S. ROCKWELL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

METAL-HEATING FURNACE.

1,288,202. Specification of Letters Patent. Patented Dec. 17, 1918.

Application filed August 23, 1913. Serial No. 251,731.

To all whom it may concern:

Be it known that I, WALTER S. ROCKWELL, a citizen of the United States, residing at 300 West 106 street, New York, county of New York, and State of New York, have invented certain new and useful Improvements in Metal-Heating Furnaces, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to that class of furnaces employed in heating objects of various kinds in the operations of annealing, reheating, &c., particularly to furnaces in which the spent gases are discharged upwardly.

The improvement consists in the constructions herein described and claimed.

In the present invention the charge of material is placed upon the working-floor of a heating-chamber, and a combustion-chamber is arranged below the heating-chamber and flaming-gas passages are extended therefrom into the heating-chamber at a series of points in the floor of the chamber along the side-wall of the same.

The outlets or vent-openings from the heating-chamber are also formed near the floor of the said chamber at a series of points along its length.

By this arrangement, the floor of the heating-chamber is effectively heated, which is not always effected when the flaming gases are introduced through the side, or end of or over the heating-chamber.

The object of the present invention is first, to obtain an equal effect of the heat throughout all of the charge placed in the heating-chamber; and second, to secure economy in the use of the fuel.

To promote a uniform temperature throughout the heating-chamber, it is desirable that the flaming gases shall be admitted at many points in the floor and the spent gases of combustion be withdrawn from several points in the heating-chamber; and that the spent gases may not be permitted to escape through the vent-flues until they have been fully circulated within the heating-chamber.

To effect this result, it is necessary to control the movement of the spent gases through the vent-flues; and to avoid the necessity of regulating a damper upon each of the vent-flues, the present invention provides a collection-flue at the top of the several vent-flues upon each side of the furnace, which collection-flue is provided with one or more dampers, the adjustment of which regulates the rate at which the spent gases shall escape from the vent-flues.

The desired circulation in the heating-chamber is effected by directing the flaming gases upwardly which enter the chamber, and by placing the vent-flues near the level of the heating-chamber floor thus retarding the downward flow of the spent gases to such vent-flues.

This is preferably effected by extending ledges along the side of the floor of the heating-chamber and forming the inlet-passages from the combustion-chamber through these ledges which thus direct the flaming gases upwardly, and the escape of the spent gases to the vent-flues is retarded by extending the vent-flues downwardly into the ledges and thence laterally into the side-walls of the heating-chamber, through which they are finally carried upward.

A collection-flue is preferably connected to the tops of all the vent-flues at each side of the heating-chamber, and has one or more vents provided each with a damper, the regulation of which controls the escape of the spent gases from the vent-flues, and may be used to increase or diminish the heat in either end or side of the heating-chamber. It also provides means to utilize the heat of the waste or spent gases to preheat the air supplied to the fuel-burners, and such heated air may be used with any kind of fuel.

The walls of the furnace are formed of masonry and the vent-flues are constructed in the body of the walls, and the collection-flues are also formed in the masonry at the upper ends of the flues.

With this arrangement, the vent from the collection-flue can be formed in its top and a casing readily applied over the same in which the waste gases may circulate around a pipe to heat the air therein.

The invention will be understood by reference to the annexed drawing, in which Figure 1 is a cross section of the furnace on line 1—1 in Fig. 2; Fig. 2 is a longitudinal section on line 2—2 in Fig. 1; Fig. 3 is a half-plan of the top of the furnace; Fig. 4 is a section on line 4—4 in Fig. 5; Fig. 5 is a section on line 5—5 in Fig. 1; and Fig. 6 is a plan of the furnace having pre-heaters.

The heating-chamber *a* is shown with door *b* and doorway *b'* in one end and two combustion-chambers *c* beneath its floor *a'*, fluid-fuel being preferably used and supplied through burner-openings and burners *d*.

Flaming gas inlet-passages are extended from the combustion-chamber into the heating-chamber through the floor *a'*, from two different parts of each combustion-chamber. From the middle portion, perforations or passages *e* are extended through the floor, and passages e^2 are extended from the ends of the combustion-chamber into a higher portion of the heating-chamber.

Ledges *f* are shown adjacent to the side-walls *g* of the heating-chamber and vent-flue openings h^2 are extended downwardly into the ledges next the side-walls and then laterally through passages *h'* into the body of the wall, through which the vent-flues *h* are extended upward directly to a collection-flue *i* in the top of each side-wall.

Three of the vent-flues are shown in each side-wall of the heating-chamber, with the collection-flues connected to their upper ends and provided with vents *j* to which the dampers *k* are applied.

The preheater for the air consists of a casing *l* arranged over one or more of the dampers so that the waste gases circulate through it, and an air conducting-pipe or pipes *m* arranged within the casing to be heated by such gases. Air is supplied to the upper part of such preheater by a connection *n*, and delivered therefrom to the burners *d* by a pipe *o*.

The casing is shown contracted toward its upper part, where the spent gases are allowed to escape, so as to crowd the hot gases against the air-pipes and the air is delivered from the lower part of the preheater, where it is exposed to the hottest gases, thus absorbing the heat most efficiently. The waste gases are finally discharged from the casing *l* by waste-pipe *p*.

This preheater for the air is very inexpensive, while it is highly efficient, as it utilizes the waste heat only, and causes the combustion to be greatly quickened and the heat of the furnace materially augmented by such hot blast, without any increased cost of operation.

The ledges *f* are extended upwardly above the tops of the passages *h'* so as to prevent the access of the spent gases to the ascending portion of the vent-flues without first passing downward in the ledges. This operates to retard the escape of the spent gases and the delivery of a greater part of their heat to the charge in the heating-chamber.

The passages *e* project the flaming gases from the combustion-chamber directly against the bottom of the pan or plate supporting the charge to be heated, which is raised a little above the floor by rails *q*, and also furnish direct avenues for the radiant heat which strikes through the passages *e*, and has a higher temperature than any of the flaming gases which reach the heating-chamber by a circuitous route, and thus operate most effectively in heating the bottom of the charge upon the floor.

The passages e^2 are extended upwardly from the combustion-chamber into the heating-chamber through the ledges, and thus direct a portion of the flaming gases toward the upper part of the heating-chamber. The passages e^2 enter the heating-chamber at intervals along the side-walls of the same; whereas the perforations *e* enter at numerous points over the entire floor of the heating-chamber.

The circulation of the flaming gases (indicated by the arrows *e'*) thus heats the chamber uniformly, and the regulation of the dampers *k* serves to retain the spent gases in the chamber until most of their heat has been imparted to the charge. Arrows e^3 show the movement of the spent gases.

A pan or plate of metal *s* is shown upon the floor of the heating-chamber in Fig. 1, with a pile of round bars a^4 thereon, to illustrate the action of the gases upon such a charge, which will be realized from the direction of the arrows *e'* shown in Figs. 1 and 4.

This construction thus produces and maintains a temperature in the part of the furnace at the bottom of the charge to be heated, exactly equal to the temperature above the charge at the crown arch for example, so that heat will penetrate the charge equally over all sides of the charge during its entire exposure, whereby perfectly heated material may be obtained, and in less time and with less fuel than otherwise would be possible.

Such operation economizes in the use of fuel, because it circulates flame and live burning gases (not spent gases) under the charge as well as over it.

The ledges are not essential to all of the combinations claimed herein, as the application of the flame-inlets and the vent-outlets to the heating-chamber near its floor can be effected without employing the ledge.

One of the essential parts of this invention is the addition of a collection-flue to the tops of a series of vent-flues, and the provision of a plurality of waste gas-vents and dampers for controlling the escape of the gases from different parts of the collection-flue, so as to vary the distribution of heat within the heating-chamber.

Another object is to provide means in connection with the collection-flue for utilizing the heat of the spent gases to heat the air supplied to the fuel.

The construction is designed for use in

furnaces having a series of vent-flues, and avoids the application and manipulation of dampers upon all of such flues.

Having thus set forth the nature of the invention what is claimed herein is:

1. A furnace having a heating-chamber with a combustion-chamber beneath the same, a series of flaming gas inlet-passages extended from the combustion-chamber into the heating-chamber at a series of points along the edge of its floor, a series of vent-flues extended upwardly in the side-wall of the heating-chamber and a series of vent-openings connecting the lower part of the heating-chamber with the said vent-flues thus securing a distribution of the gases throughout the heating-chamber before their escape therefrom, and a collection-flue connected to the tops of the vent-flues and having a vent therefrom with damper to control the discharge of the spent gases.

2. A furnace having a heating-chamber with a combustion-chamber beneath the same, a series of flaming gas inlet-passages extended from the combustion-chamber into the heating-chamber at a series of points along the opposite edges of its floor, a series of vent-flues extended upwardly in the side-walls at a series of points along the length of the heating-chamber and a series of vent-openings at different points along its length connecting the lower part of the heating-chamber with the respective vent-flues, whereby the hot gases are admitted to and discharged from the lower part of the heating-chamber at both of its sides, and a collection-flue connected to the tops of the vent-flues at each side and having a vent therefrom with damper to control the discharge of the spent gases.

3. A furnace having a heating-chamber with a combustion-chamber beneath the same, vent-flue openings extended from the heating-chamber into its side-walls at the bottom thereof and vent-flues extended therefrom upwardly within the walls, ledges projected upwardly upon the floor of the heating-chamber adjacent to the vent-flue openings in the side-walls and such ledges projected above the vent-flue openings, collection-flues connecting the tops of the vent-flues, with vents extended from the said collection-flues, and dampers applied to the said vents, to control the escape of the gases therefrom.

4. A furnace having a heating-chamber with ledges disposed upon the floor of the chamber adjacent to its side-walls, a combustion-chamber beneath the heating-chamber with perforations extended from the same through the floor of the heating-chamber between the said ledges, a series of vent-flue openings extended downward into each of the ledges, and vent-flues extended upwardly therefrom in the side-walls of the heating-chamber, collection-flues connecting the tops of the vent-flues, and vents in the top of such collection-flues, with dampers to control the escape of the spent gases therefrom.

5. A furnace having a heating-chamber with ledges disposed upon its floor adjacent to its side-walls, a combustion-chamber beneath the heating-chamber with passages extended from the same through the ledges next the side-walls to heat the upper part of the heating-chamber, and vent-openings in the top of the ledges intermediate to the said passages, with vent-flues extended upwardly therefrom to vent the heating-chamber near the bottom thereof.

6. A masonry furnace having a rectangular heating-chamber with a combustion-chamber beneath the same, fluid fuel-burners to supply burning gases to the said combustion-chamber, a series of flaming gas inlet-passages extended from the combustion-chamber into the heating-chamber at a series of points along the edge of its floor, a series of vent-flues in the brick side-walls of the furnace extended upward from the lower part of the heating-chamber at a series of points in its length, a collection-flue connected to the tops of the vent-flues and having a vent therefrom with damper to control the discharge of the spent gases, a casing arranged over the said damper with gas-outlet upon the casing, whereby the spent gases circulate through the casing, an air-conducting pipe arranged within the casing to be heated by the gases, and means for supplying air to the said pipe and delivering the heated air therefrom to the fuel-burners.

7. A furnace having a heating-chamber with means for supplying flaming gases thereto, vent flue-openings extended from the heating-chamber into its side-walls near the bottom thereof, and vent-flues extended therefrom upwardly within the walls, a collection-flue connected to the tops of the vent-flues the said collection-flue having two vents one near each of its opposite ends, the said vents being provided each with a damper, whereby the escape of spent gases from either end of the heating-chamber may be varied to increase or diminish the heat in either end of said chamber.

In testimony whereof I have hereunto set my hand.

WALTER S. ROCKWELL.