

Oct. 28, 1930.

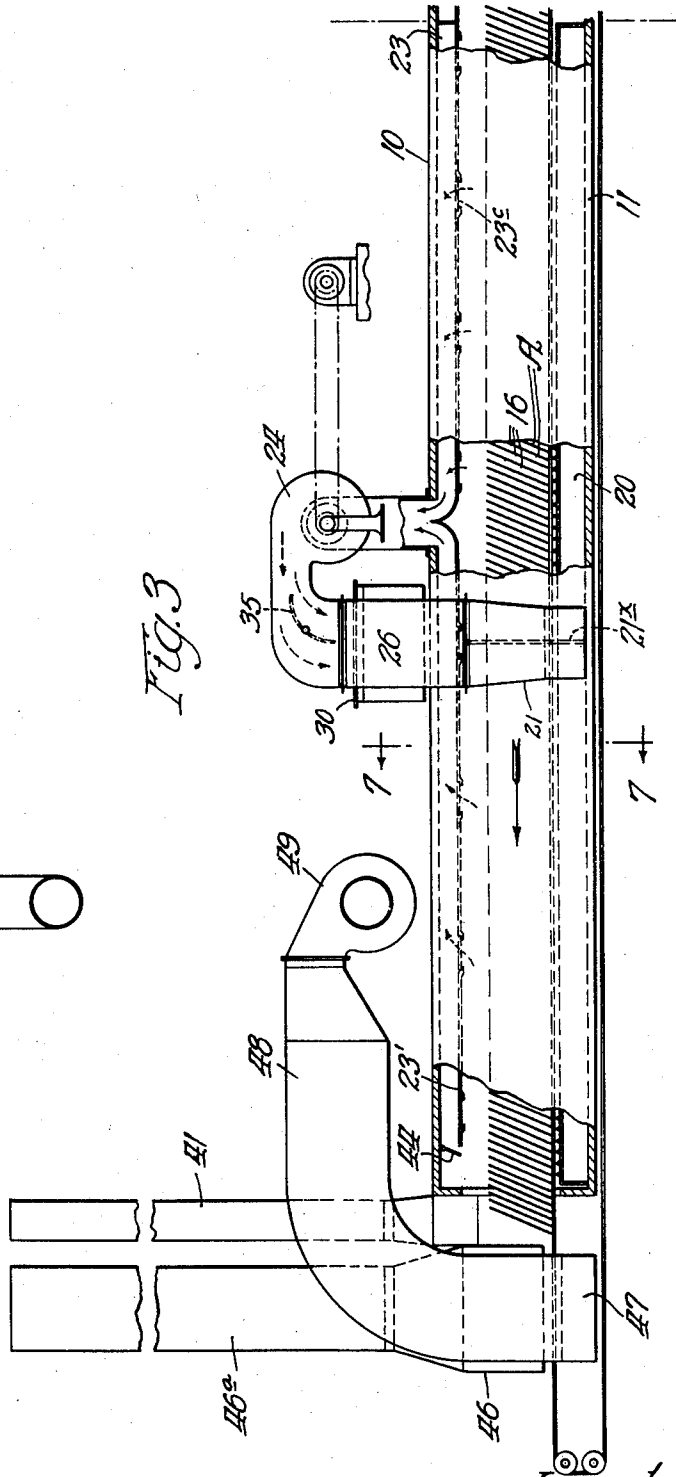
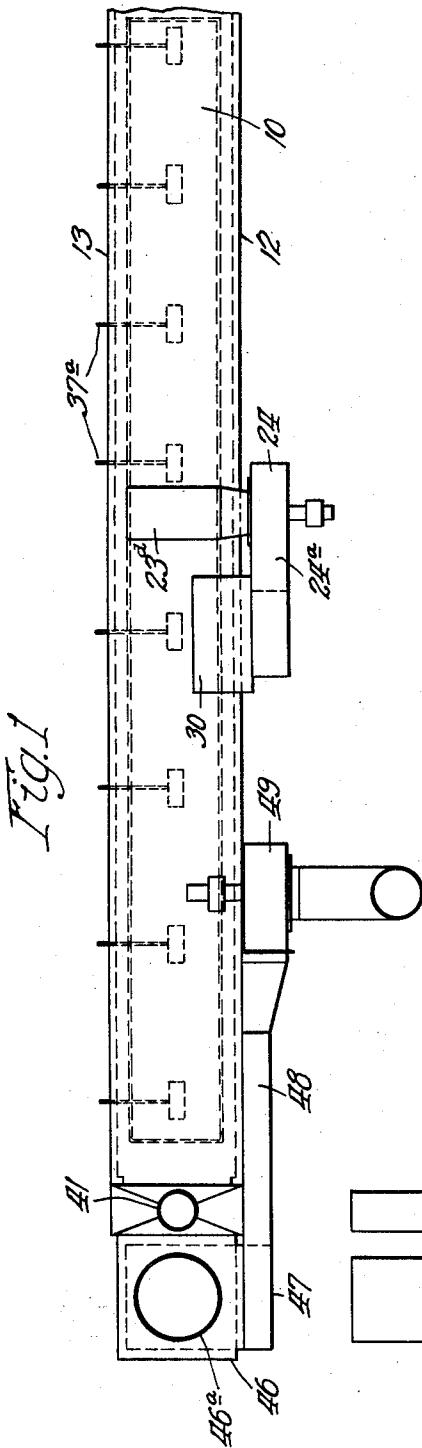
H. A. DREFFEIN

1,779,622

OVEN

Filed Aug. 30, 1926

4 Sheets-Sheet 1



Inventor
Henry A. Dressein
Emery, Booth, Jamney & Varney Attys.

Oct. 28, 1930.

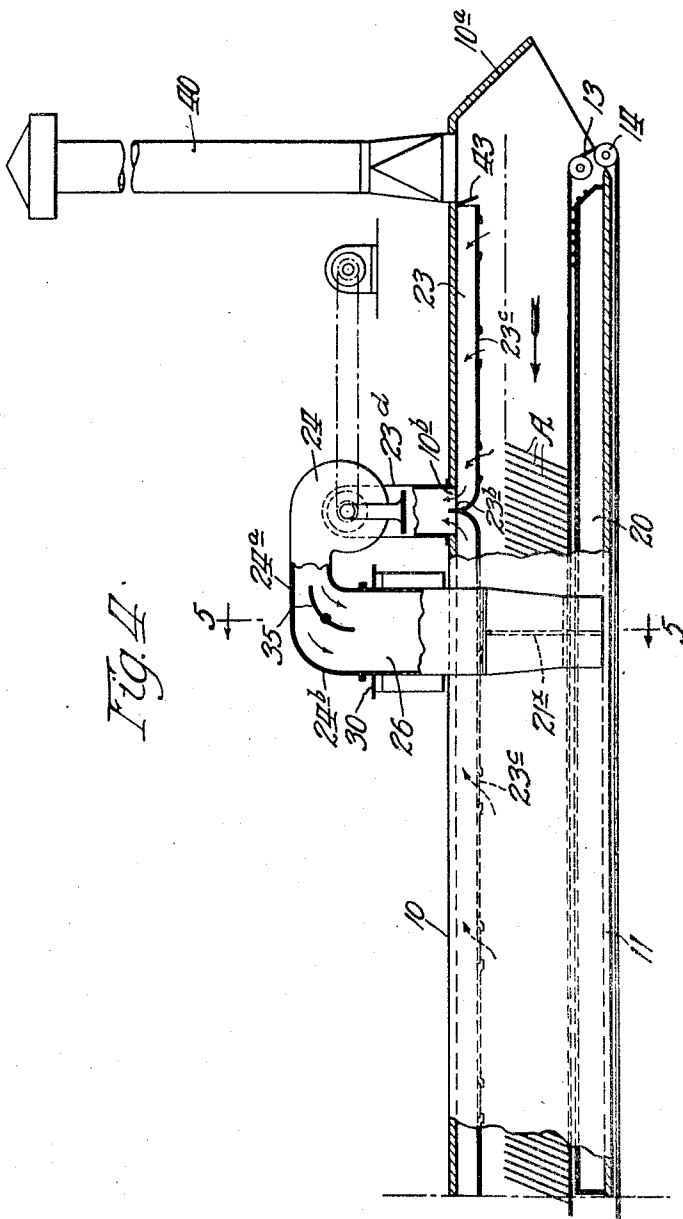
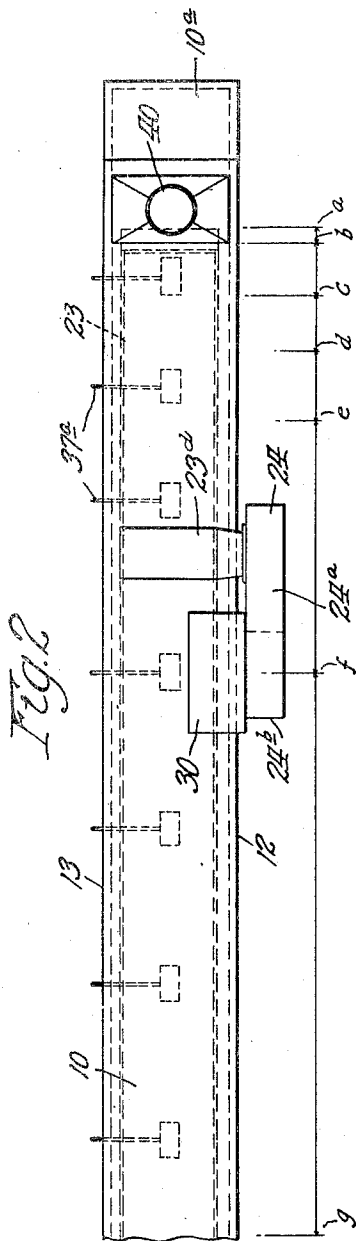
H. A. DREFFEIN

1,779,622

OVEN

Filed Aug. 30, 1926

4 Sheets-Sheet 2



Inventor
Henry A. Drefflein
Emery, Booth, Jarney & Varney
Attys.

Oct. 28, 1930.

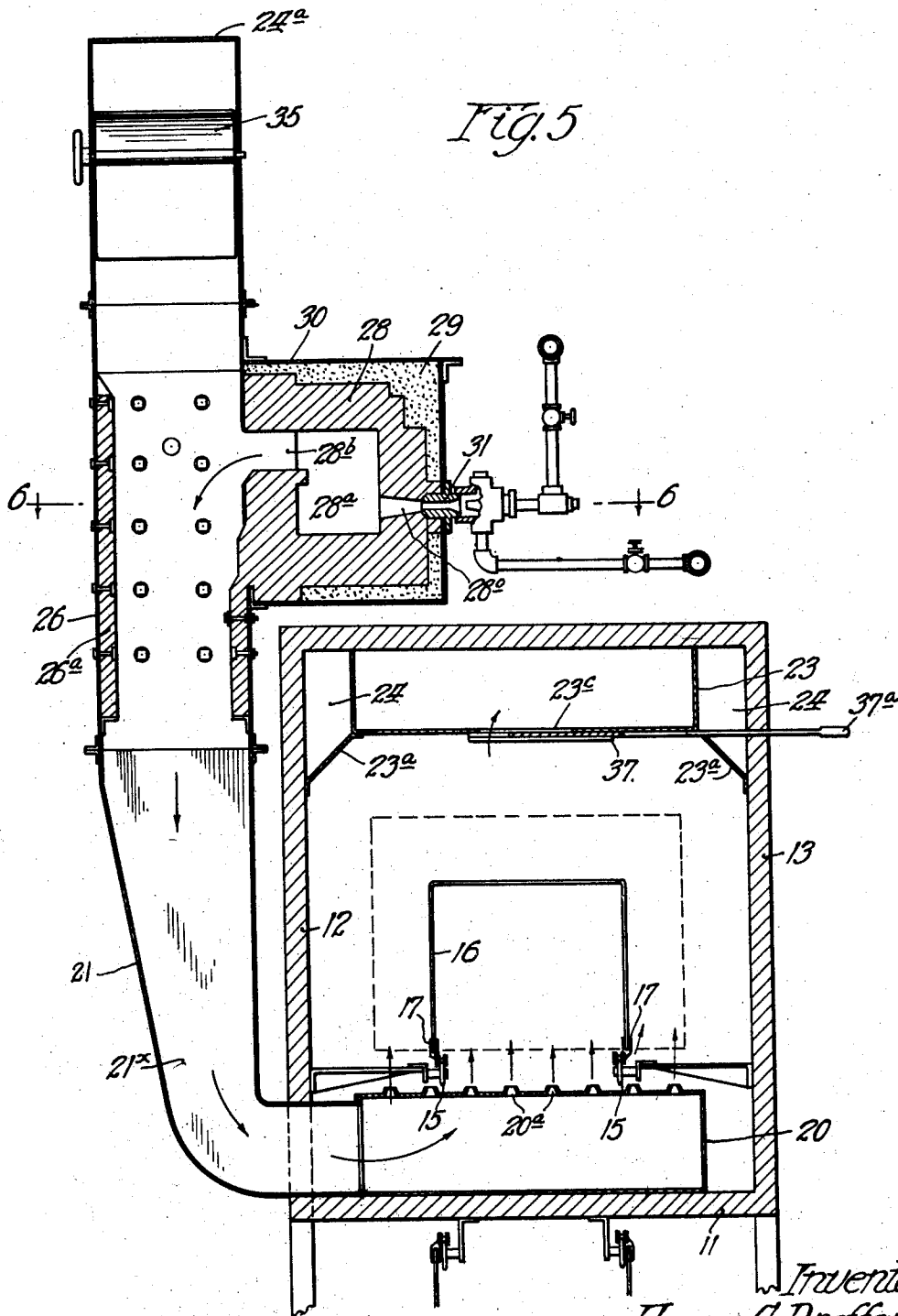
H. A. DREFFEIN

1,779,622

OVEN

Filed Aug. 30, 1926

4 Sheets-Sheet 3



Inventor
Henry A. Drefflein
Emory Barth, Jannay & Barry Attys.

Oct. 28, 1930.

H. A. DREFFEIN

1,779,622

OVEN

Filed Aug. 30, 1926

4 Sheets-Sheet 4

Fig. 6

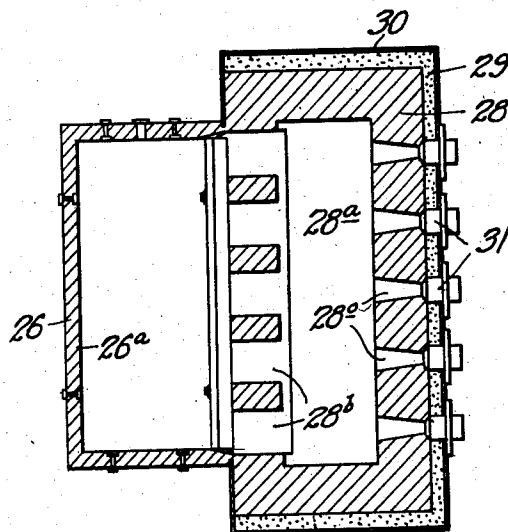


Fig. 7

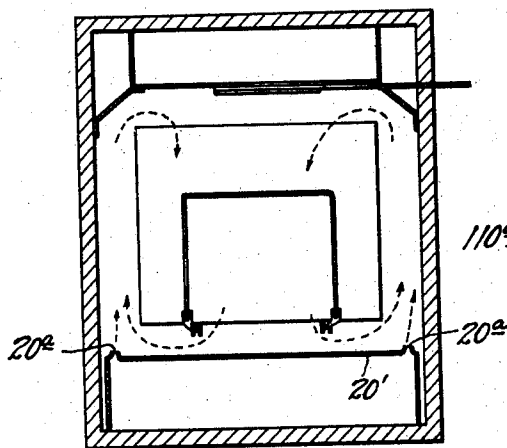


Fig. 9

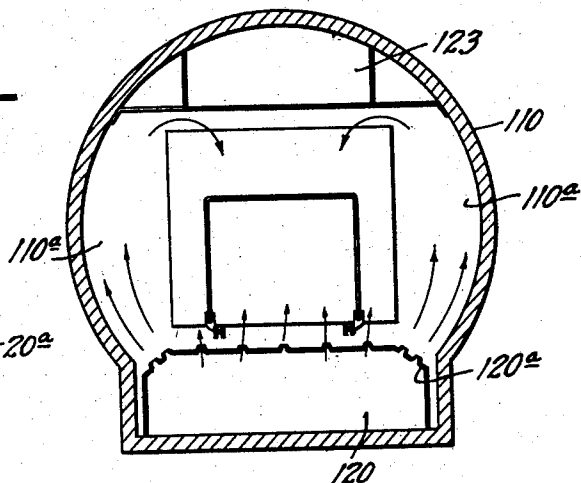
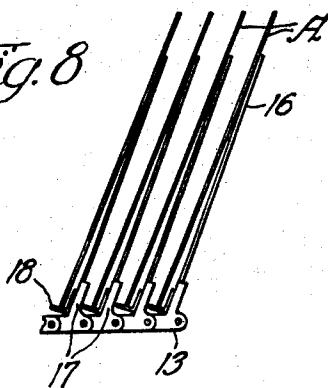


Fig. 8



Inventor
Henry A. Drefflein
Emory, Booth, Jamney & Varnay
Attys.

UNITED STATES PATENT OFFICE

HENRY A. DREFFEIN, OF CHICAGO, ILLINOIS

OVEN

Application filed August 30, 1926. Serial No. 132,371.

This invention relates to improvements in ovens and has for an object to provide an oven particularly adapted for treatment of coated or lithographed tin sheets. It is desirable to be able to coat or print or lithograph such sheets in flat form and thereafter bend to form them into the cans or other forms desired. After the coating or printing it is necessary to heat the plates so as to fix the coating and it is for that purpose that my oven is primarily intended.

Other objects are to provide an oven in which the entering plates will be quickly brought to the desired temperature and such temperature maintained for the necessary period of time thereafter; to provide a circulation of the heating gases by means of which they are continuously circulated and re-circulated through the spaces between the plates, and reheated during such re-circulation; to provide a structure by which the heating gases will not only be discharged between the plates but prior to discharge from the oven will be circulated around and between other plates, maintaining a substantially uniform temperature and substantially equalizing the differential between the temperature at the top and bottom of the plates, which would otherwise obtain; to provide a heating and circulating means for an oven of this character by means of which the heating effect at different portions of the oven may be varied without substantial variation in the volume of heating gases supplied at such portions; to provide an apparatus of this character in combination with a means at the discharge end by means of which the plates in their travel will be quickly cooled to a temperature permitting manual handling and removal; and in general, to provide a structure and apparatus to effect the above objects and other objects which will be apparent as set forth in the following specification and shown in the accompanying drawings, in which:

Fig. 1 is a plan view of a portion of an oven embodying my invention;

Fig. 2 is a similar view showing a continuation of Fig. 1;

Fig. 3 is a side elevation of the structure

shown in Fig. 1, portions being broken away for illustration;

Fig. 4 is a view similar to Fig. 3 of the structure shown in Fig. 2;

Fig. 5 is a vertical section along the line 5—5 of Fig. 4, drawn to an enlarged scale;

Fig. 6 is a horizontal section along the line 6—6 of Fig. 5;

Fig. 7 is a vertical section along the line 7—7 of Fig. 3;

Fig. 8 is a side elevation of a portion of the conveyor showing the arrangement of the plates transported thereby; and

Fig. 9 is a section similar to that of Fig. 7 through a modified form of oven.

Like numerals refer to like elements throughout the drawings.

The oven illustrated in the Figs. 1 to 7 is formed of the top wall 10, the bottom 11 which is spaced from the ground level, and sides 12 and 13 respectively, all of these walls being suitable insulated against heat transference or radiation.

At the entrance end the top wall 10 is divided with a downwardly inclined hood portion 10^a, as illustrated in Fig. 4. A suitable endless conveying means is provided, the same not forming an independent part of my invention, as any suitable conveyor may be utilized with my oven. The conveyor illustrated comprises the spaced chains 13 which run over suitable rollers 14 at the points of their turn and return, and these chains are supported upon smaller rollers 15 at points throughout the length of the oven. Any suitable means of imparting movement to the conveyor chains may be utilized. Extending between the chains 13 at intervals are the loops 16 of wire or the like, the same being attached at their extremities to the fingers 17 (see Figs. 5 and 8). From each of the fingers 17 which are carried by the chains are small brackets 18.

The plates A are fed or charged upon the conveyor by hand or mechanically by any suitable apparatus, the position of the plates being indicated in Fig. 8, where, as shown, the same are supported upon the brackets 18, and lean backwardly against the loops 16.

They are thus supported in spaced inclined relation in their passage through the oven.

At the bottom of the oven is provided a supply duct 20 to which gases of combustion are supplied for heating through the connecting duct 21. A partition 21^x divides the duct 21 and the duct 20 into two portions.

At the top of the oven is provided the exhaust duct 23, which is spaced at its ends from the side walls of the oven to which extend the wing plates 23^a inclined downwardly and outwardly as shown in Fig. 5, forming the dead air spaces 24 in the upper corners of the oven, these spaces serving to further insulate the oven at the top against escape of heat. In the top of the oven 10 are outlet ports 10^b in which are inserted the pipes 23^d leading to the exhausters 24. In the form shown, pipes 23^d are substantially co-extensive with the width of the duct 23^d and the latter is provided with the deflecting partitions 23^b underneath the ports 10^b as illustrated in Fig. 4. From the exhauster 24 leads the pipe 24^a which is provided with a curved elbow 24^b in alignment with and communicating with the duct 26 which in turn connects with the duct 21. Pipes and ducts 23^a, 21, 24^a, 24^b and 26 form what I term a connecting duct between the supply duct 20 and the exhaust duct 23, as will be apparent, the partition 23^b serving to substantially equalize the exhausting effect upon the duct 23 at either side of the exhauster 24.

The section 26 is provided with a refractory lining 26^a and at one side is provided the fire box 28 of suitable material surrounded with a heat insulating substance 29 enclosed in the metal jacket 30 (see Fig. 5). Fire box 28 is provided with the combustion chamber 28^a to which lead burner openings 28^c. Co-acting with the burner openings 28^c are the burners 31 provided with suitable supply pipes for fuel and air. From the combustion chamber 28^a lead the ports 28^b communicating with the interior of the connecting duct section 26 across one wall thereof, as shown in Fig. 6.

In the elbow 24^b is provided the curved deflector 35 which is pivoted intermediate its extremities for adjustment.

The top of the duct 20 is provided with nozzle-like jet openings 20^a, which in the front half of the oven, at least, are arranged in transverse rows, each row extending across the top of the duct 20.

At the entrance to the furnace the rows of jet nozzles 20^a are arranged relatively close together, as, for example, two inches apart between the points *a* and *b* indicated in Fig. 2. Spacing between the rows is then increased, as between the points *b* and *c*, three inches between rows for example, and, between the points *c* and *d* four inches. Between the points *d* and *e* the rows may be spaced five inches, while between the points

e and *f*, six inches, and between *f* and *g*, seven inches. These distances may be varied as desirable under varying conditions and characteristics.

In the bottom of the duct 23 at suitable points are the openings 23^c, the effective area thereof being variable by the slide dampers 37 which have handles 37^a for adjustment which project outwardly beyond the oven. These openings 23^c are spaced a considerably greater distance apart than are the rows of jets, for a purpose hereinafter explained.

At the charging ends of the oven is provided the escape stack 40 to permit escape of the excess gases, a damper (not shown) being provided for control of the exhaust.

Similarly at the exhaust end of the oven is provided a second stack or chimney 41 located just outside the discharge end of the oven. A swinging damper 43 is provided at the front end of the oven for the duct 23 and a similar damper 44 is provided at the discharge end of the oven for the duct 23'. These dampers permit entrance of gases at the ends of the oven to the exhaust ducts, thereby carrying the exhaust effect closer to the ends of the oven.

In the embodiment illustrated I have provided in effect two circulating and heating units for the oven and the arrangement of each is substantially the same save that in the rear portion of the oven illustrated in Figs. 1 and 3 I provide in the upper wall of the supply duct 20' the jets 20^a only at the sides of the oven, the duct 20' being laterally extended to the sides of the oven so that the jets 20^a discharge into the spaces between the sides of the oven and the sides of the plates. Since in the proper operation of my oven the sheets or plates are brought to the desired temperature as quickly as possible after their entrance, when such temperature has been reached it is only necessary to prevent or neutralize radiation losses through the furnace to maintain the proper temperatures of the sheets. The radiation losses are so neutralized by directing the jets of heating gas in the manner disclosed through the notches 20^a at the sides of the oven between the sheets and the sides of the oven. In smaller installations I may use only one heating unit.

In the operation of my oven plates are fed or charged upon the conveyor at the entrance to the oven, the plates assuming the position illustrated in Fig. 8. During the initial travel in the oven the jets are so closely arranged that hot gases are being forced directly from the jets between all of the plates. This results in quickly bringing the plates to the desired high temperature, after which it is only necessary to maintain them at such temperature and the main necessity for additional gas supply is to compensate for radiation and other heat losses from the oven.

After the passage of the plates over the more closely arranged jets, they arrive over jets which are spaced farther apart longitudinally of the oven than the spacing between the plates. I supply heating gas to the duct 20 under pressure sufficient to obtain an injector effect from the jet nozzles 20^a so that the row of nozzles which is discharging the heating gases between a pair of plates will set up jets of some velocity which initiates a circulation between such pair of plates which draws gases downwardly through the plates in front and back of the pair, where due to the longitudinal spacing of the jets no direct gas supply from such jets is being had. This results in some gas which has passed from the jets between the plates to the top of the oven being drawn down between the plates at the front and rear to mingle with the gases coming out of the jets, so that there is an equalization between the temperatures of the gases at the top and bottom of the plates due to mixture of the partially cooled gases with the incoming hot gases so that the latter may be delivered at a higher temperature than would otherwise be permissible.

This interior re-circulation of the partially cooled gases is further aided by the natural tendency of the gases which are partially cooled by the time they reach the top of the oven to drop toward the bottom of the oven.

Inclination of the plates is advantageous because when they are charged with the pigment or other coated side toward the front of the oven the gas delivered from the nozzles impinges upon the uncoated or unprinted side. These gases obviously must be delivered at a temperature higher than that to which the plates are to be raised and impact of such gases upon the coated sides might be detrimental to the coating, whereas when they impinge upon the uncoated sides, the effect is not detrimental and the temperature is quickly reduced by the mixture with the cooled gases which have been drawn down from the upper portion of the oven.

Gases are being drawn constantly through the openings 23^c into the duct 23, but due to the spacing of the openings 23^c and the excess of gas in the oven, the circulation described above between the plates will not be prevented. Gas drawn into the duct 23 is drawn therefrom by the exhauster 24 and forced downwardly through the pipe 24^a, pipe 26 and pipe 21 into the supply duct 20. During its passage through the pipe section 26 it encounters the streams of gases of combustion from ports 28^b which mingle with the circulating gas and at the same time raise its temperature to the desired point. Pipe 24^a is of less width than pipe or duct 26.

Should it be desired to raise the temperature in either portion of supply duct 20, i. e., on either side of partition 21^a, the deflector

35 is rotated to one side or the other from the position shown in Fig. 4. If the lower end of the deflector 35 for example be moved toward the right as viewed in Fig. 4, it has the effect of increasing the heat of the gases circulated through the rear portion of supply duct 20 although the volumetric distribution of the gases in the two portions of this duct seems to be substantially the same. This result may be due to crowding or drawing of the gases from more of the ports 28^b to one side or the other of the duct section 26 although it is possible that it results from other causes which are not known to me.

The stacks 40 and 41 permit the necessary escape of excess combustion gases which would otherwise be forced into the space at the ends of the oven, since the gas is being circulated and added to constantly. The stack 41 being located just outside the discharge end of the oven, will catch any gases there escaping or pushed or carried out by the plates.

Rearwardly of the stack 41 is provided a hood 46 formed with the stack portion 46^a, this hood being open at the bottom and extending downwardly at the sides to partially surround the plates passing therethrough. Underlying the conveyor beneath the hood 46 is the air box 47, with which communicates the duct 48 from the blower 49. This blower forces cooling air upwardly through the plates into the hood 46, thus quickly bringing the plates to a temperature where they may be handled without danger or injury.

In Fig. 9 I have illustrated a modified form of oven providing a supply duct 120 and escape duct 123, the body of the oven being formed of the curved or partially cylindrical wall 110. This type of oven provides enlarged spaces 110^a at the sides of the plates and I construct the duct 120 with the inclined top corner portions 120^a in which are also provided jets.

In other respects this construction is substantially similar to that previously described, the main difference in operation and function being that the jets in the inclined duct portions 120^a create a circulation upwardly in the spaces 110^a tending to set up counter currents downwardly between the plates at the sides thereof in addition to the circulation and re-circulation described in connection with the arrangement illustrated in Figs. 1 to 7, for example.

It will be apparent that my invention is susceptible of departure and variation from the form shown and described, and I do not wish to be restricted to such form except as defined in the appended claims.

What I claim is:

1. In combination, a heating oven, a conveyor movable therethrough, said oven being provided with a supply duct, said duct having openings arranged longitudinally thereof,

said openings being arranged more closely together at the charging end of said oven.

2. An oven, a conveyor associated therewith, a duct with openings to supply heating gas to said oven, said openings being arranged in transverse rows across said oven for a portion of the length thereof and located at the sides only for another portion of the length thereof.

3. In combination an oven, a conveyor movable therethrough, a supply duct in said oven provided with openings to supply heating gases to said oven, said openings being arranged closer together at the entrance end of said oven.

4. An oven having an exhaust duct in the upper portion and a supply duct in the lower portion, a connecting duct establishing communication between said first named ducts, means associated with said connecting duct to heat the gases passing therethrough, said heating means comprising a combustion chamber and ports leading therefrom into said connecting duct, and a deflector mounted in said connecting duct and adjustable to vary the flow of gas at the two sides of the connecting duct past said heating means.

5. An oven having an exhaust duct at the upper portion thereof and a supply duct at the lower portion thereof, a connecting duct between said supply and exhaust duct, means to heat the gases flowing through said connecting duct comprising gas supply ports communicating with said connecting duct, means to vary the heating effect of said ports in different portions of said supply duct without varying the volume of gas supplied through said ports.

6. An oven having an exhaust duct at the upper portion thereof and a supply duct at the lower portion thereof, a connecting duct between said supply and exhaust duct, a partition in said connecting duct and said supply duct to separate the latter into two portions, means to heat the gases flowing through said connecting duct comprising gas supply ports communicating with said connecting duct, means to vary the heating effect of said ports in different portions of said supply duct without varying the volume of gas supplied through said ports.

7. An oven having an exhaust duct at the upper portion thereof and a supply duct at the lower portion thereof, a connecting duct between said supply and exhaust duct, means to heat the gases flowing through said connecting duct comprising gas supply ports communicating with said connecting duct, means to vary the flow of gases past said heating means in different portions of said connecting duct without varying the volume of said gases and without varying the volume of gas supplied through said ports.

8. An oven having an exhaust duct at the upper portion thereof and a supply duct at

the lower portion thereof, a connecting duct between said supply and exhaust duct, means to heat the gases flowing through said connecting duct comprising gas supply ports communicating with said connecting duct, means to vary the flow of gases past said heating means in different portions of said connecting duct; said last named means comprising an adjustable deflector in said connecting duct.

9. In combination, an oven, a conveyor movable therethrough, a supply duct in the bottom thereof beneath said conveyor and provided with nozzles to discharge heating gas into said oven, said nozzles being located at the sides of said oven, and arranged to discharge such gases upwardly into the space between the sides of said oven and plates carried upon said conveyor.

In testimony whereof, I have signed my name to this specification.

HENRY A. DREFFEIN.