July 5, 1927. 1,634,858

W. J. STOOP

NORMALIZING FURNACE

Filed Dec. 5, 1925 4 Sheets-Sheet 1

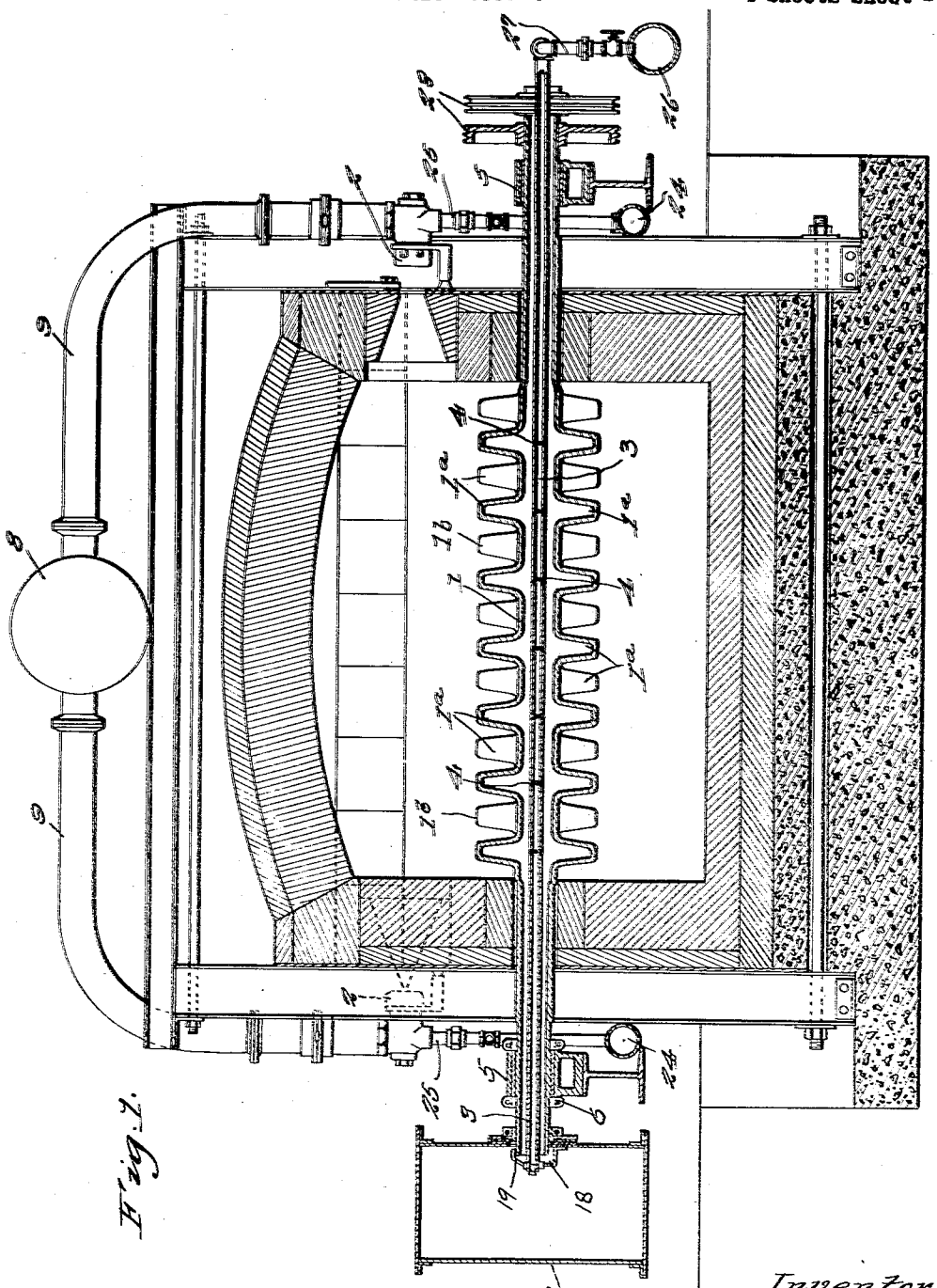


Fig. 1.

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NORMALIZING FURNACE

Filed Dec. 5, 1925 4 Sheets-Sheet 2

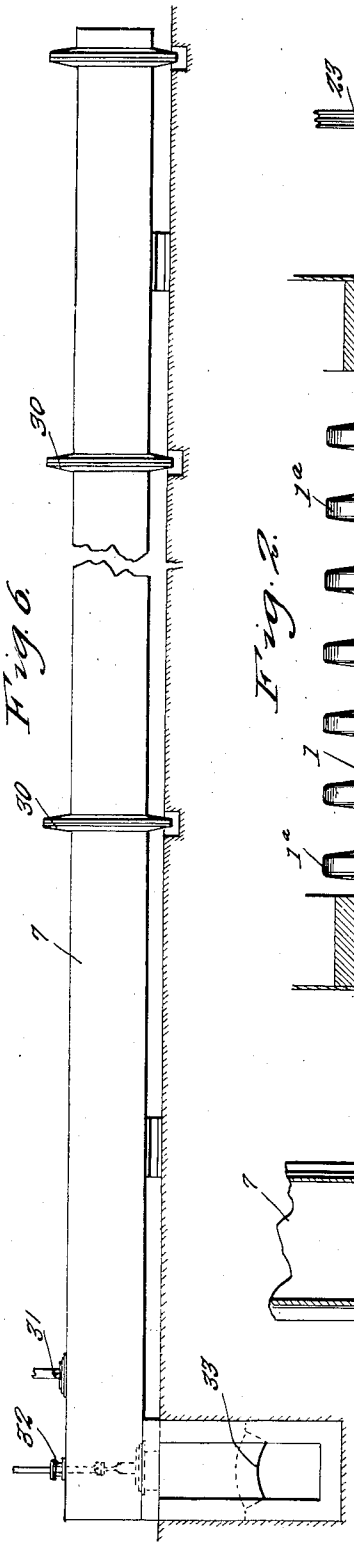


Fig. 6.

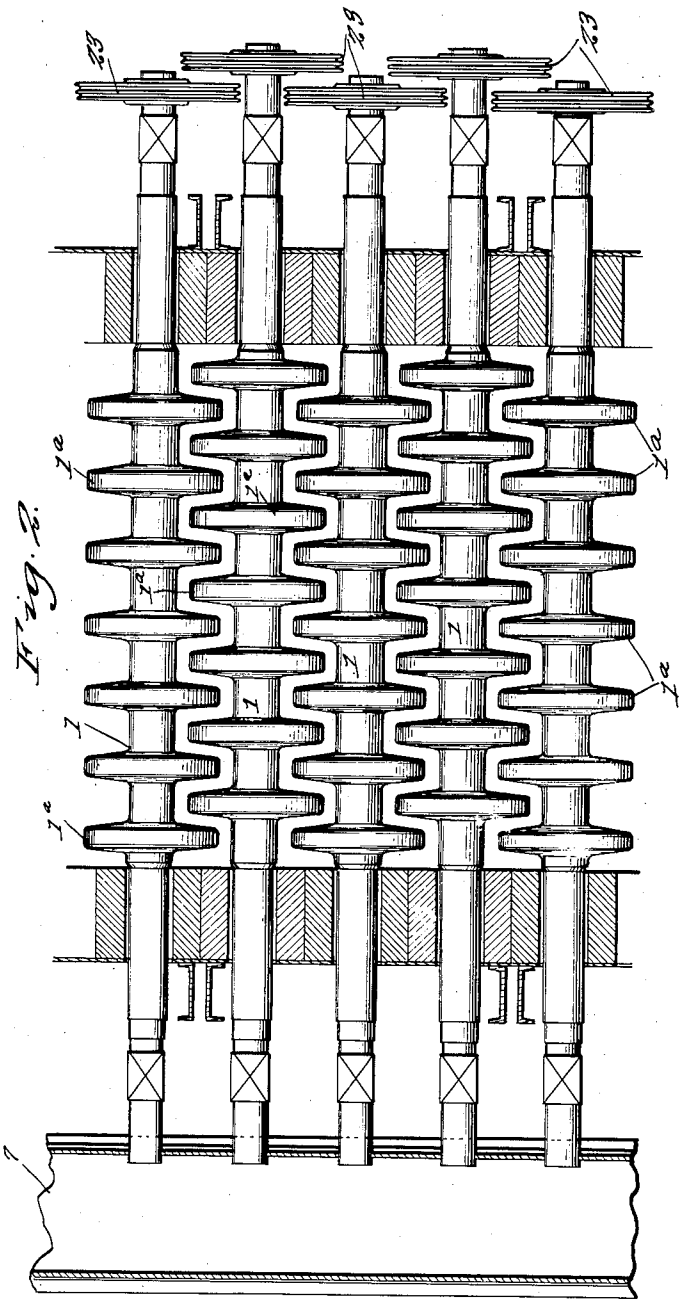


Fig. 5.

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NORMALIZING FURNACE

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Fig. 4.

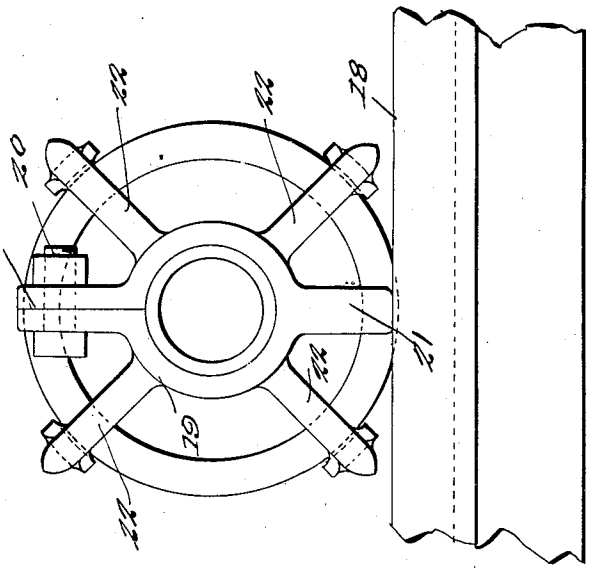


Fig. 5.

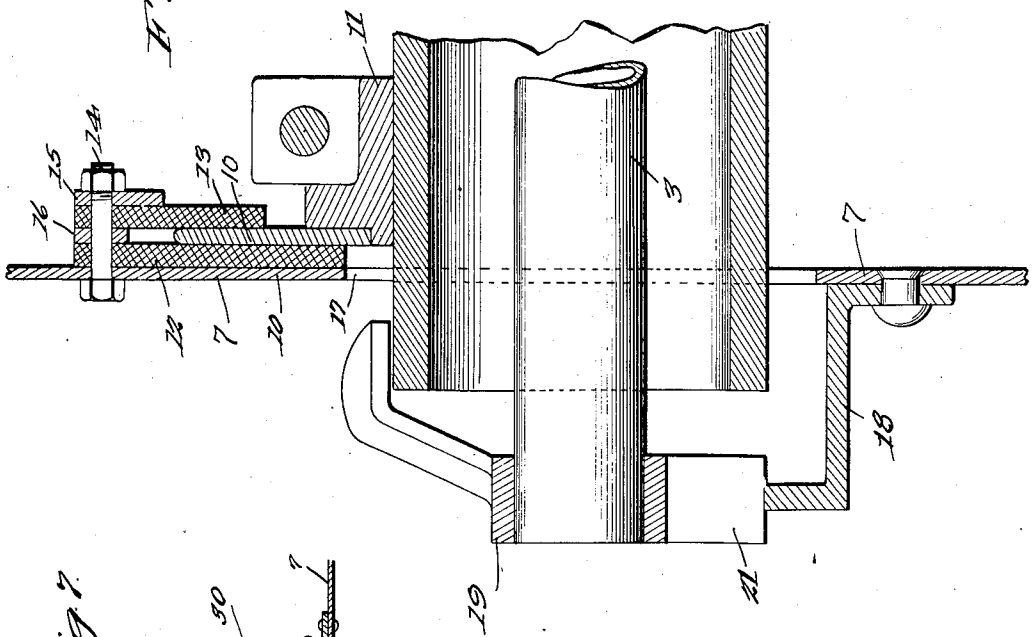
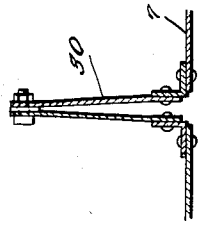


Fig. 7.



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NORMALIZING FURNACE

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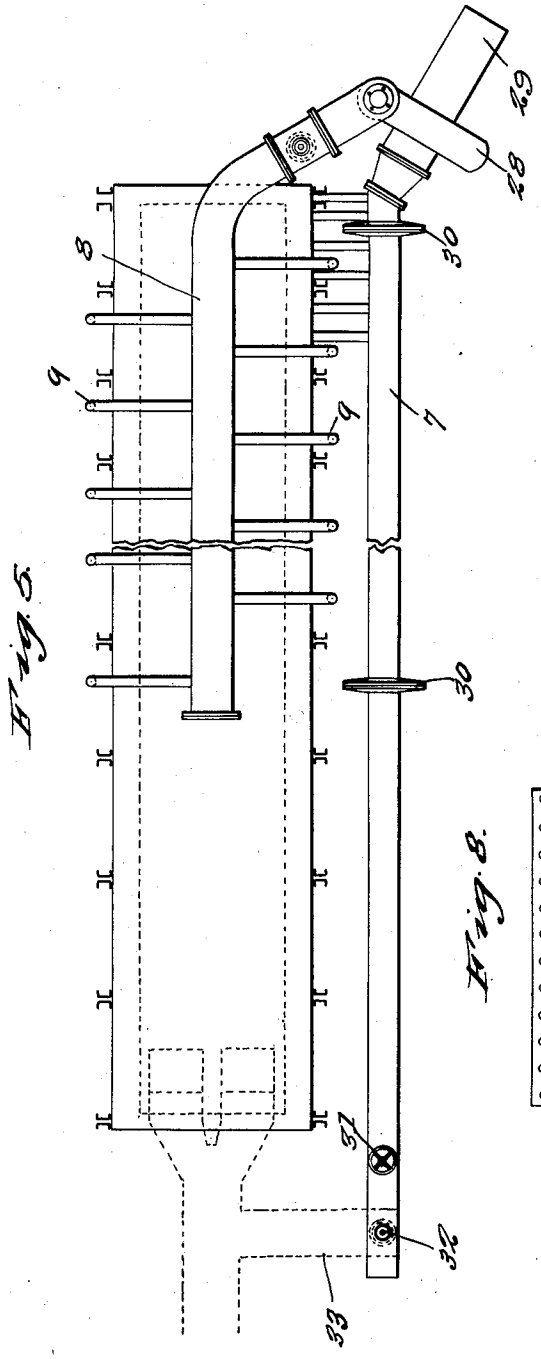


Fig. 5.

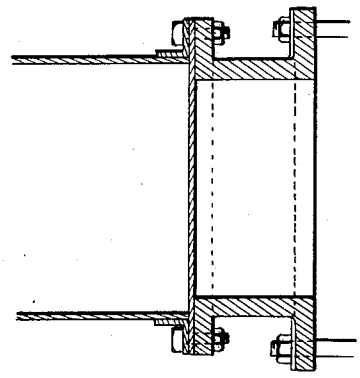


Fig. 9.

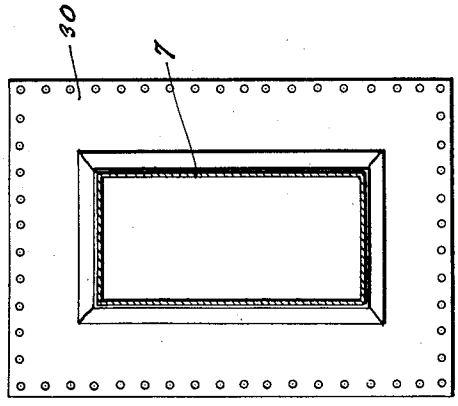


Fig. 8.

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Patented July 5, 1927. 1,634,858

UNITED STATES PATENT OFFICE.

WILLIAM J. STOOP, OF WHEELING, WEST VIRGINIA.

NORMALIZING FURNACE.

Application filed December 5, 1925. Serial No. 73,496.

The invention concerns furnaces for normalizing metal sheets by subjecting them to heat to eliminate the effects of stresses and strains to which they were subjected in the rolling operation by which they were formed.

The invention consists in the features and combination and arrangement of parts hereinafter described and particularly pointed out in the claims.

In the accompanying drawings:

Figure 1 is a transverse vertical section of the furnace embodying my improvements.

Fig. 2 is a diagrammatic plan view.

Figs. 3 and 4 are detail views.

Fig. 5 is a diagrammatic plan view of the apparatus.

Fig. 6 is a side view of the superheated air conduit.

Figs. 7 and 8 are views of the expansion joints of the air conduit.

Fig. 9 illustrates the anchorage of the air conduit.

In these drawings 1 indicates rolls of a series which by their rotation move the sheets through the furnace to be subjected to the heat from burners 2, arranged along opposite sides of the furnace. These rolls are formed hollow and are widely corrugated, providing spaced apart hollow disc-like portions 1^a, on the upper rim portions 1^b of which the sheets rest to be fed through the furnace by the revolution of the rolls. The rolls are staggered in respect to their hollow disc-like portions; that is to say, the disc portions of one roll enter the spaces between the disc-like portions of the other roll.

For cooling the rolls a pipe 3 extends lengthwise of each of them and these pipes are provided with discharge openings 4 for the cooling fluid, which is air in the form of the invention illustrated. These discharge openings are in line with the hollow interiors of the disc-like portions of the rolls, so that the coling medium is directed radially of the hollow disc-like portions and against the inner side of the comparatively thin walls of the rims of these disc-like portions of the rolls, so that the cooling medium will act upon these comparatively thin walls where they contact with the metal sheets. The hollow rolls have hollow journal extensions mounted in suitable bearings 5. The journal is shouldered on each side of the bearing, and having a collar 6 clamped thereon adjacent the shoulders to resist longitudinal displacement of the shaft. The sheets resting on the rims of the hollow disc-like portions of the rolls are moved through the furnace continuously, while subjected to the heat derived from the burners, and said plates are therefore normalized by the heat in their passage from end to end of the furnace. In this action the sheets contact with the cooled peripheral or rim portions of the hollow disc-like sections of the rolls. By the cooling of the rolls they are prevented from burning out and the collection of carbon on the surface of the rims is prevented, because the rolls are not hot enough to fuse the scale and carbon.

After passing through the hollow rolls the air passes into a box-like conduit 7 which extends along the outside of the furnace and this air, which is now highly heated, passes to a conduit 8 arranged over the furnace, from which conduit branches 9 extend down to the burners 2, which are directed through the sides of the furnace, and which may operate with natural gas, coke gas or oil, the hot air also being supplied to these burners.

In making the connection between the hollow journal extension of the roll and the air conduit 7, provision is made to render the joint air tight, and for this purpose a steel disc 10 is carried by a ring 11 clamped about the hollow journal, to rotate with the same, and this disc works between a ring of asbestos 12 and an outer ring of asbestos 13, which are bolted as at 14 to the side of the conduit 7, a steel ring 15 and a washer 16 forming parts of the structure which clamps the parts in place. The end of the hollow journal of the roll passes through an opening 17 in the side of the conduit, which opening is larger in diameter than the hollow journal and it is this opening that is closed by the structure just described.

The end of the air supply pipe 3 extends from end to end of the roll and into the conduit 7, and is supported by a bracket 18 secured to the inner wall of the conduit, and a spider 19 which is split at 19^a and is clamped by the bolt 20 to the end of the air supply pipe. This spider has an arm 21 resting on the upper edge of the bracket 18 and it has other arms 22 reaching over the end of the hollow journal extension of the roll, with slight clearance between. The conduit 7 will be subject to expansion under the heat of the air passing therethrough and the support just described will permit the ex-

pansion and contraction to take place. In this action the bracket 18 will slip in its contact with the supporting arm 21.

Any suitable expansion joint may be embodied at the desired point or points along the air conduit and in the walls thereof, for the purpose of permitting the expansion and contraction to take place.

The rolls may be made by casting or stamping them in longitudinal sections, which may be welded together.

The rolls may be rotated in any suitable manner. I have shown pulleys 23 for this purpose.

The gas may be supplied by a conduit 24 from which branches 25 lead to the burners. The air may be supplied from a conduit 26 from which branch pipes 27 lead to the perforated air pipes within the hollow rolls.

Referring to Fig. 5, it will be noticed that there is a blower located at 28 between the superheated air box 7 and the overhead conduit 8. This blower is driven from a suitable motor, indicated generally at 29.

The expansion joints in the superheated air conduit may be of any desired form, as shown at 30 in Figs. 6, 7 and 8. There are about four of these, so that each section of the air conduit can expand and contract independently of the others, and abnormal expansion the full length of the air conduit will be prevented.

Fig. 9 indicates how the air conduit is supported.

The superheated air box is provided with a cold air valve and a hot gas valve at 31 and 32 respectively, and these are automatically controlled in any suitable manner. The hot gas valve gets its supply from the gases passing from the discharge end of the furnace to the stack through the conduit shown at 33 in dotted lines in Fig. 5 and in Fig. 6.

The purpose of these valves is to maintain in the air conduit a predetermined temperature to supply the gas valves or oil valves through the overhead conduit. If the temperature in the conduit falls below the degree predetermined upon the automatic regulator will open the hot gas valve in the bottom of the conduit so as to admit hot gases to bring the temperature up to the desired degree.

If the gases in the conduit are hotter than desired then the automatic regulator will open the valve in the top of the conduit and admit cold air thereby balacing the temperature within ten or twenty-five degrees.

Reverting to the use of the collars 6 and the shouldered construction of the shaft, the intention here is to have the shaft expansion take place at that end or portion thereof which lies to the right of these collars or in other words, at the end of the shaft where the rollers are driven by the wire rope sheaves. This will leave the roll shaft stationary at the portion where the shaft connects with the superheated air conduit.

I do not limit myself to air, as the cooling medium for the rolls.

I claim:

1. In combination in a furnace, means for heating the same, means for supporting and moving metallic sheets through said furnace, said last named means comprising hollow circular rotatable discs, staggered in position and overlapping to provide closely disposed contacting points for the sheets to support and move the same in one normal plane substantially without sagging, means for supporting and rotating the discs, and means for cooling the interior thereof.

2. In combination, a furnace having heating means, and rolls therein to support and move metallic sheets through the furnace, each of said rolls consisting of a main cylindrical hollow central portion carrying integral therewith spaced apart hollow disc-like portions, the interior of which communicate with the interior of the main cylindrical central portion, and an air pipe extending axially of the roll for supplying air thereto, said air pipe forming between itself and the said main central portion of the roll, an annular space, connecting the interior of one hollow disc with the other, substantially as described.

3. In combination with a furnace, heating means therefor, hollow rolls, each composed of a main cylindrical central hollow portion which provides the journals for said roll, and circular hollow disc portions having their interiors communicating with said central portion, an air pipe extending axially of the central portion with an annular space between said air pipe and said central portion, said air pipe having jet openings disposed at spaced points along its length to discharge cooling air into the hollow roll and the hollow disc-like portions, a conduit for receiving the air after its passage through the hollow journal portion of the roll, said journal portion having an air tight connection with said conduit, substantially as described.

4. In combination with a furnace, heating means therefor, hollow disc rolls each comprising a hollow central shaft portion having hollow disc portions integral therewith, for moving metallic sheets through the furnace, air pipes extending through the hollow rolls for discharging air thereinto for cooling them, an air conduit to receive the air discharged from said hollow rolls, and an air tight connection between the said hollow rolls and the said conduit, said air tight connection comprising discs carried by the hollow rolls and plates secured to the conduit between which the discs rotate, substantially as described.

5. In combination, a furnace, hollow disc rolls therein for transporting sheets to be heated, said rolls each comprising a hollow central shaft portion having hollow disc portions integral therewith, pipes for delivering air into the hollow disc rolls for cooling them, an air conduit to receive the hot air discharged from said rolls, air tight joints between the hollow disc rolls and the air conduit, supports for the cooling air pipes resting on a part of the air conduit and having a slip bearing therewith, said supports having arms embracing the end of the hollow rolls, substantially as described.

6. In combination with a furnace, hollow disc rolls, said rolls each comprising a hollow central shaft portion having hollow disc portions integral therewith, air cooling connections to discharge air into said hollow rolls for cooling them, means for heating the furnace, a superheated air conduit for receiving the hot air from the rolls, connections from said conduit to the heating means, air tight connections between the rolls and the air conduit, said connections permitting movement of the air conduit under expansion and contraction relative to the hollow rolls, and an expansion joint or joints in the air conduit, substantially as described.

7. In combination with a furnace, hollow disc rolls, said rolls each comprising a hollow central shaft portion having hollow disc portions integral therewith, air cooling connections to discharge air into said hollow rolls for cooling them, means for heating the furnace, a superheated air conduit for receiving the hot air from the rolls, connections from said conduit to the heating means, air tight connections between the rolls and the air conduit, said connections permitting movement of the air conduit under expansion and contraction relative to the hollow rolls, and an expansion joint or joints in the air conduit, a cold air valve to supply cold air into said superheated conduit, and a valve for supplying hot gases into said superheated conduit, substantially as described.

8. In combination with a furnace, hollow disc rolls, said rolls each comprising a hollow central shaft portion having hollow disc portions integral therewith, air cooling connections to discharge air into said hollow rolls for cooling them, means for heating the furnace, a superheated air conduit for receiving the hot air from the rolls, connections from said conduit to the heating means, air tight connections between the rolls and the air conduit, said connections permitting movement of the air conduit under expansion and contraction relative to the hollow rolls, and an expansion joint or joints in the air conduit, a cold air valve to supply cold air into said superheated conduit, and a valve for supplying hot gases into said superheated conduit, said hot gas valve being in a conduit receiving the gas passing from the furnace to the stack, substantially as described.

In testimony whereof, I affix my signature.

WILLIAM J. STOOP.