Sept. 1, 1936. J. L. ANDERSON 2,053,235

SKELP RETORT

Original Filed Dec. 26, 1933 3 Sheets-Sheet 1

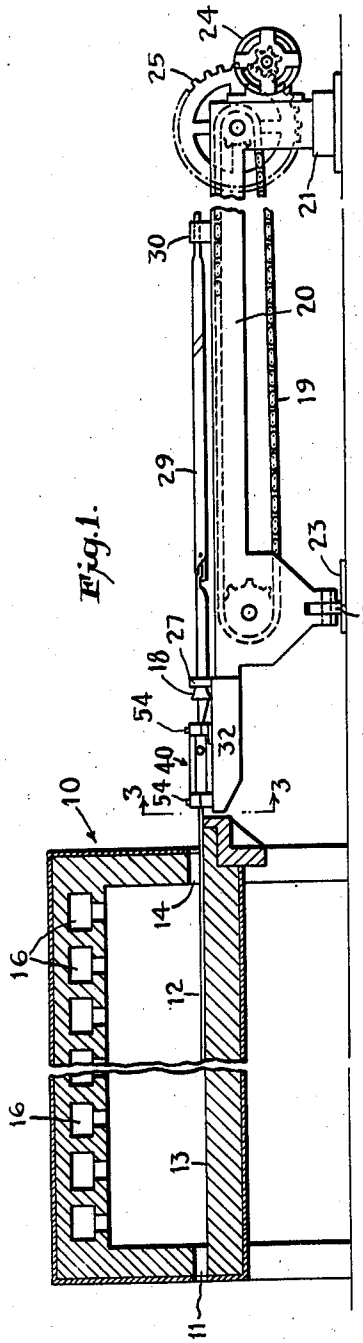


Fig. 1.

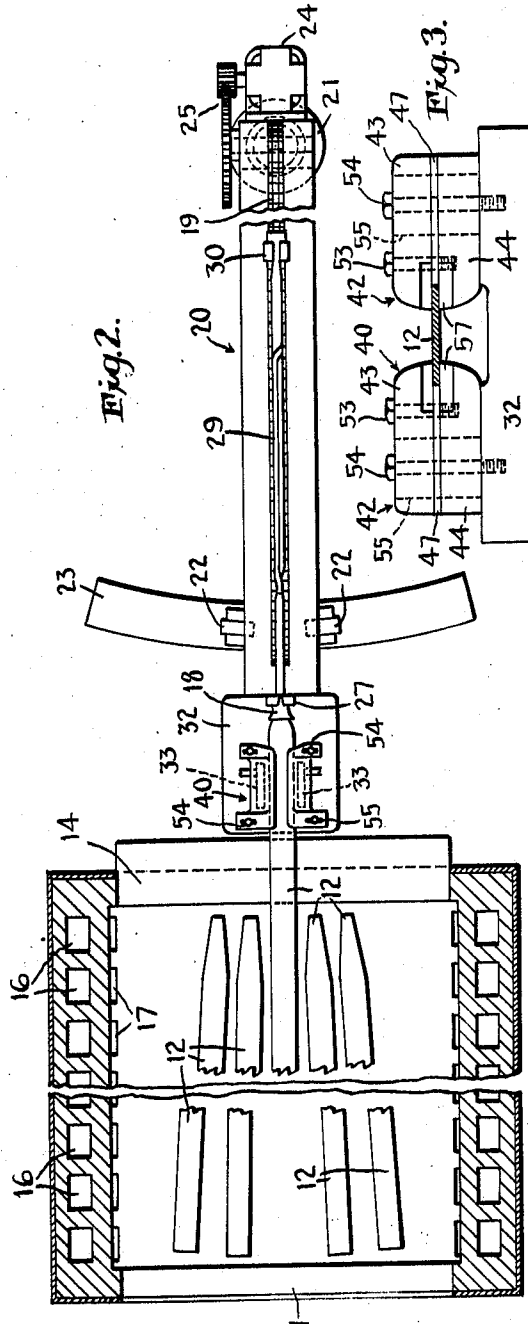


Fig. 2.

Fig. 3.

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Fig.4.

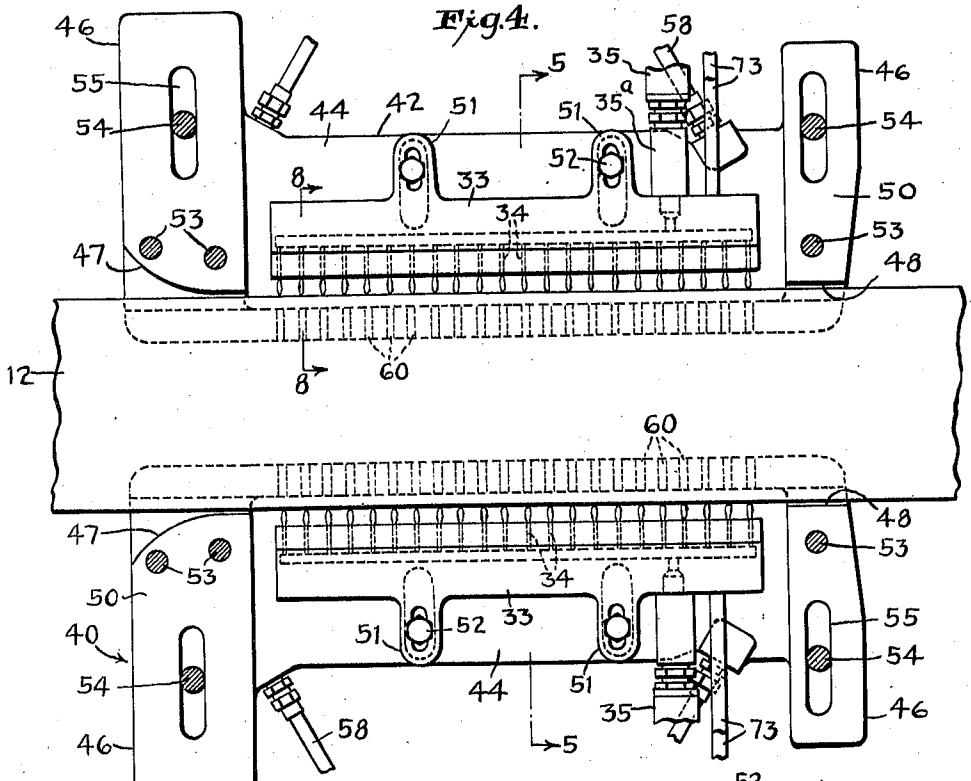
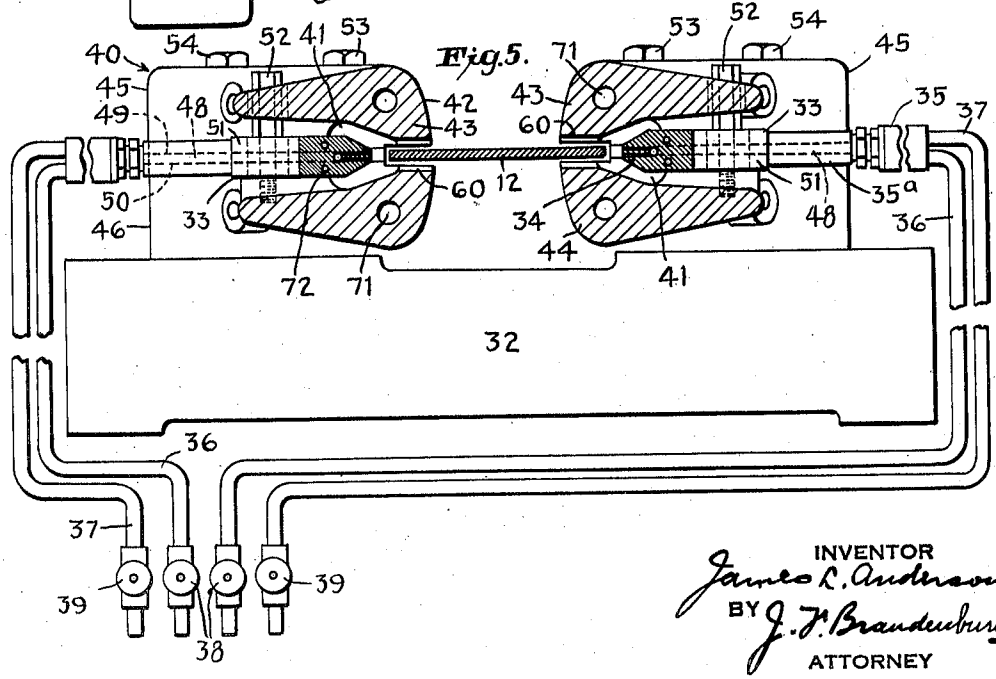


Fig.5.



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Fig. 6.

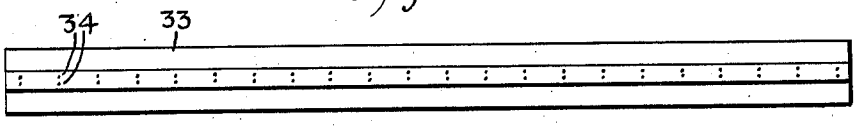


Fig. 7.

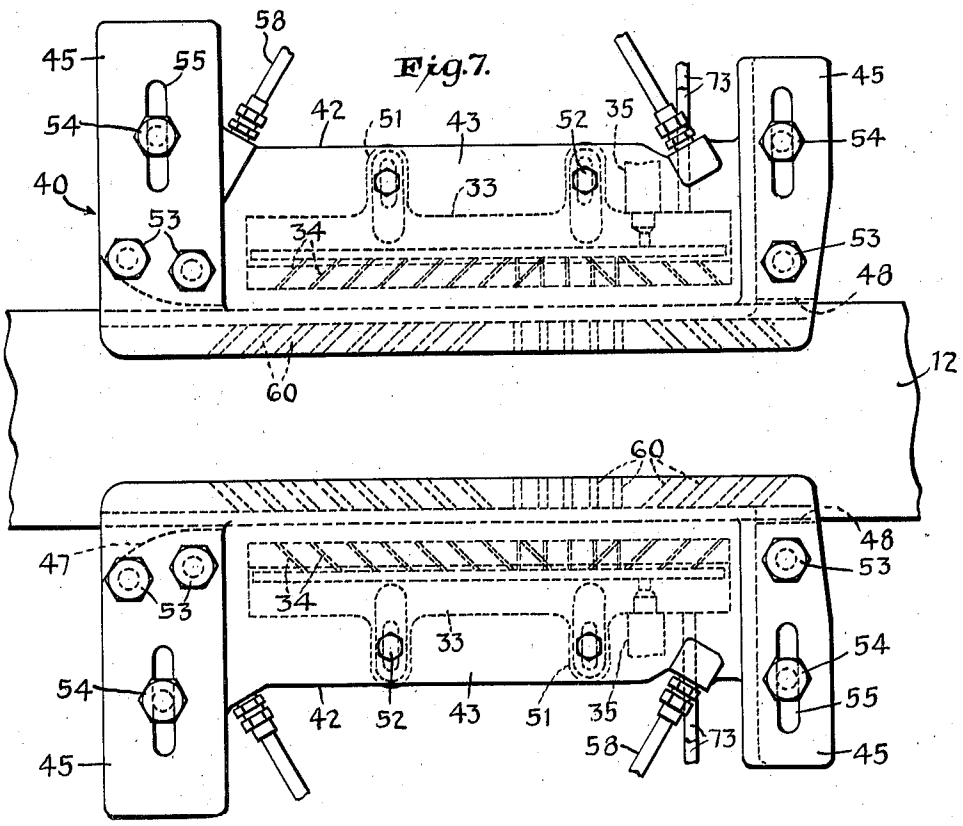
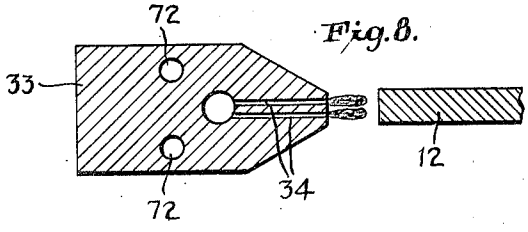


Fig. 8.



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UNITED STATES PATENT OFFICE

2,053,235

SKELP RETORT

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Original application December 26, 1933, Serial No. 703,901. Divided and this application October 31, 1935, Serial No. 47,590

12 Claims. (Cl. 205—9)

This invention relates to apparatus for heating the edges of the skelp in the manufacture of welded pipe and tubing.

The most widely used method of making welded pipe and tubing is the bell-weld process in which flat skelps are highly heated in a furnace and then drawn from the furnace through a bell die which forms the skelp into a tube and brings the edges together under pressure to make the weld. In modifications of this process the skelp is pulled through rolls which serve as rotating dies, or instead of being pulled through dies by a drawbench is advanced by power applied to the forming or welding rolls themselves.

Numerous difficulties have been experienced in heating the skelp to a welding condition. Some material can not stand the high furnace temperature without having its desired characteristics destroyed, and it has not been possible to make such material into pipe or tubing by the bell-weld method. Some skelps react with the silica to the furnace bottom to form a coating of "enamel" on the surface of the pipe. This coating prevents satisfactory galvanizing of the pipe. No economical method of removing this enamel coating from new pipe is known, but after pipes have been in service for a long time the coating flakes off the inside surface and may cause serious trouble in valves or other restricted portions of the system.

Loss of physical strength of the skelp at the high furnace temperature sometimes causes caving of the seam during welding and sometimes causes the skelp to break under the strain of pulling through the bell or other closing die. Skelp which is not left in the furnace long enough does not make a satisfactory weld, but skelp left in the furnace too long may be destroyed or so weakened that the drawing operation can not be successfully performed.

Efforts have been made to concentrate the heat in the skelp edges so that the body of the skelp need not be heated to such a high temperature, but so far as I am aware the only edge-heating process which has met with outstanding success is the one described in my copending application Serial No. 703,901, filed December 26, 1933, (now Patent No. 2,040,164, dated May 12, 1936), of which this case is a division.

It is an object of this invention to provide apparatus for heating the edges of the skelp when making pipe or tubing according to the method described in said copending application.

Another object of the invention is to provide improved apparatus for heating the edge faces of a skelp with gas while the skelp moves toward a bell or other closing die. Another object is to guide the skelp accurately and maintain the edge faces in a substantially constant relation to the heating means so that the edge faces are heated uniformly.

The invention comprises a retort adapted to be located between the furnace and welding bell in conventional bell-weld pipe mills, but also suitable for raising the temperature of the edges of skelp which has had little or no pre-heating. The retort includes chambers through which the edges of the skelp travel and in which the edge faces are heated by gas to a temperature suitable for welding.

Another object of the invention is to provide an edge-heating retort in which the products of combustion of heating flames are efficiently utilized to heat the metal back from the edge faces so as to reduce conduction losses. One feature of the invention is a retort construction which causes the envelope gases of oxy-hydrocarbon fuel flames, as for example the oxyacetylene flame, to blanket the edge portions of the skelp with a reducing atmosphere and to burn in the vicinity of the edge faces in order to assist the heating action of the primary flames.

Another object of the invention is to provide a heating retort with skelp-supporting and guiding surfaces which permit free passage of the tongs for welding with a drawbench.

Other objects, features and advantages of the invention will appear or be pointed out as the specification proceeds.

In the accompanying drawings, forming part hereof:

Fig. 1 is a diagrammatic side view, partly in elevation and partly in section, showing the retort apparatus of this invention installed between a skelp heating furnace and a drawbench for putting additional heat into the edges of the skelp before the skelp is pulled through a bell die on the head-block of the drawbench;

Fig. 2 is a plan view, partly in section, of the apparatus shown in Fig. 1;

Fig. 3 is a view on a larger scale taken on the line 3—3 of Fig. 1, showing the entrance end of the retort and the skelp-guiding means;

Fig. 4 is a plan view, on a still larger scale, of the retort and skelp guide, with the upper portion removed to show the torches. The high temperature cones of the flames are indicated in their relation to the skelp edges, no attempt being made, however, to show the envelope flame and gases;

Fig. 5 is a transverse section on the line 5—5 of Fig. 4, with the upper part of the retort in place;

Fig. 6 is an edge view, on a yet larger scale, of one of the burner blocks;

Fig. 7 is a plan view of the retort with the top in place. This view illustrates a disposition of jet passages and gas channels which extends these regions of heating beyond the effective length of the systems of jet orifices; and

Fig. 8 is an enlarged cross-section through a portion of the skelp and one of the burner blocks.

A skelp heating furnace 10 has an entrance 11 at one end through which skelps 12 are introduced into the furnace to lie on the bottom 13 until they become highly heated. The skelps are withdrawn one at a time through a discharge opening 14. The hot gases which heat the furnace may enter through flues 16 and pass out of the skelp heating chamber through flues 17.

In a bell-weld plant, the heated skelp is moved from the furnace and through a bell 18, which constitutes a forming and welding die, by pull applied to the forward end of the skelp and exerted by the chain 19 of a drawbench 20. The drawbench may be pivotally supported at 21 at its end remote from the furnace and at its end near the furnace may be supported by wheels 22 movable on a track 23, so that the drawbench can be shifted into line with each skelp next to be drawn from the furnace. The chain of the drawbench is constantly driven by a motor 24 through gearing 25.

While the skelp is being drawn, the bell 18 is supported against a head-block 27 mounted on the drawbench at some distance from the skelp discharge opening of the furnace. The skelps are withdrawn from the furnace by tongs 29, which are passed through the bell and engaged with the front end of a skelp. When the skelp is ready to be drawn, the end of the tongs is hooked in a dog 30 on the drawbench chain, whereupon the skelp is pulled through the forming and welding bell.

Means for heating the skelp edges are mounted on a base 32 forming an extension of the frame of the drawbench projecting into proximity to the front of the furnace. The intense heating instrumentalities here disposed comprise two elongated burner blocks 33 arranged at opposite sides of the path of the skelp. These burners are of the type which is adapted to handle a mixture of oxygen and hydrocarbon gas supplied under pressure and to deliver the mixture through a multiplicity of flame jet orifices 34 (Figs. 4 and 5). Each burner block is supplied with the gases through a stock 35 to which pipes 36, 37 are connected to conduct the gases from the sources of supply. The pressures of the gases supplied to the burners are regulated by adjustable pressure regulators (not shown), and the respective flows are further adjusted by oxygen and fuel valves 38 and 39, shown in Fig. 5, these valves being disposed at a convenient control station. The internal passages in the stocks and burner blocks need not be illustrated in detail. Suffice it to say that the oxygen and fuel gas, the latter preferably acetylene, are mixed by suitable mixers in the stocks 35 or in the stems 35^a of the burner blocks, that the mixture is distributed by longitudinal passages in the blocks and issues in jets through the orifices 34, and that the burning of these jets creates a very high temperature. With a mixture of oxygen and hydrocarbon, such as acetylene for example, the amount of pure oxygen mixed with the fuel gas is much less than the amount required for combustion, the highest temperature being realized at or very near the tips of the inner cones of the flames, which represent the primary stage of combustion. These cones are relatively short, and in order to obtain an edge heating sufficiently uniform for best results it is important to maintain a substantially uniform spacing of the skelp edges from the torches or burner blocks 33. In the case of a ribbon flame of oxygen and acetylene, which may be employed, the cone may extend about an eighth of an inch from the outlet of a slit orifice, whereas with small, individual orifices such as shown in the drawings the cones may extend a quarter of an inch or more.

A retort 40 is secured to the base 32. The burner blocks 33 are housed in chambers 41. The retort comprises two transversely spaced retort bodies 42, each of which comprises upper and lower sections 43, 44, which are hollowed to form the chamber 41 and have mating portions 45, 46 at the front and rear ends. Shims 47, 48 are preferably interposed between these mating portions to establish the proper vertical distance between surfaces 49 and 50 of the retort sections. These surfaces overlap the upper and lower sides of the skelp, for a limited distance inward from the skelp edge, and are spaced by a distance slightly greater than the thickness of the skelp to permit free movement of the skelp but at the same time make it fairly straight, without undue resistance if it is more or less undulatory.

Guidance of the skelp in the lateral sense is even more important, and in a drawbench operation this guidance is particularly useful at the entrance to the region of edge treatment, or before that region is reached by the successive cross-sections of the skelp. The forward shims 47 of the two retort bodies may be made to serve as these edge guides. The rear shims 48 may also guide the edges, but it is not necessary that they do so. The shims acting as edge guides may be made of, or plated at their edges with copper or other metal which will not tend to stick to, or be readily worn by, the edges of the hot skelp drawn from the furnace. Too close lateral confinement of the edges of the skelp is not permissible, but I have ascertained that a total lateral clearance may be given which will be ample to allow for variations in the skelp width and for practical operation and still keep the skelp edges suitably spaced from the orifice faces of the blocks 33.

The blocks 33 are provided with slotted ears 51 through which clamping screws 52 pass into bosses on the lower retort sections, on which the burners are supported and trued. The slots in the ears extending transversely to the length of the burner blocks make it possible to set the burners at the precise position of retreat with respect to the edge guides which is desirable under particular conditions.

The upper and lower sections of each retort body, together with the shims or guides, are clamped together by screws 53. Other screws 54 may secure the retort bodies to the base. For a given width of skelp and given size of pipe it is not necessary to vary the transverse distance between the edge guides or the two sides of the retort, but such adjustment may be provided for, either to take care of different pipe sizes, or to meet other conditions that may be encountered. For such purposes the mating portions of the retort bodies may be provided with slots 55 extending in the

transverse direction, through which slots securing screws 54 are passed into the base.

The forward ends of the retort guide bodies, that is to say the ends nearest the furnace, are formed with flaring entrances 57 for the skelp.

The retort sections have cooling passages 71, through which water is passed from and to pipes 58. The retort may be made of cast-iron, but with bronze castings the water cooling is more effective and the retort is more durable. The burner blocks are provided with cooling passages 72, and water is conducted to and from these passages by pipes 73.

Each of the retort chambers 41 is open on the side through which the burner block enters the chamber and there is sufficient space around the burner blocks of these chambers to permit the air to reach the envelope gases, which are released from the flame cones, and burn these gases in the region of the skelp edges. It is sufficient to draw in this atmospheric air, but the air may be supplied under slight pressure.

When the retort is used with oxy-fuel flames giving off envelope gases which are actively reducing, as is the envelope of the oxyacetylene flame, these gases react, at the high temperature to which the edges are heated, with detrimental oxides present on the portions to be welded and completely deoxidize them. The burning envelope gases or products of combustion pass inward from the edges across the upper and lower surfaces of the skelp and heat the metal to reduce conduction losses from the edge faces. In order to apply the burning envelope gases more effectively, the surfaces 49, 50 of the retort sections which overlap the lateral portions of the skelp may be grooved to provide channels 60 in line with the jet orifices 34. The jet orifices and the channels may be perpendicular to the skelp edges, as shown in Fig. 4, or the forward and rearward groups of orifices and channels may be inclined against and with the direction of movement of the skelps, respectively, in order to elongate the distance over which the superheating and purifying is effected, as shown in Fig. 7.

Fig. 6 shows the orifice face of a block 33 having forty-four small jet orifices arranged in pairs so as to cover the width of the edge faces, as shown in Fig. 8. With this kind of block close vertical confinement of the edges is not necessary. However, a single line of jets may be employed, the jets may be staggered at slightly higher and lower levels, or ribbon flame slots may be used.

The retort has been described in connection with bell-welding but it is not limited to that field and can be employed, with or without preheating of the skelp, in connection with idle forming and welding rolls used as rotating dies instead of a bell die, or in connection with driven rolls for driving, forming and welding the skelp without a draw-bench.

I claim:

1. Apparatus for making welded pipe or tubing comprising a retort having portions adapted to accommodate the edges of a skelp while the skelp is drawn through the retort with continuous longitudinal motion, surfaces on the retort in positions to guide the edges of said skelp to limit its transverse movement in the retort, other guide surfaces above and below the skelp to prevent any substantial vertical variation in the positions of the skelp edges, and means for directing jets of gas against the edge faces of the skelp as it passes through the retort in the transverse and vertical ranges imposed by the guiding surfaces.

2. Apparatus for the manufacture of welded tubes including a retort for heating the edges of the metal before the metal is bent into tubular form, said retort including spaced channels on opposite sides of the metal stock in position to receive the stock edges, said channels having surfaces for supporting and transversely guiding the metal stock as it is moved through the retort with continuous motion, chambers into which the channels open along a portion of their length, said chambers being in such relation to the channels that the edges of the metal stock extend into the chambers while moving through the retort, and means for increasing the temperature of said edges while they pass through the chambers.

3. A skelp heating retort having a chamber in position to receive each of the edges of the skelp while said skelp is moved through the retort with continuous motion, guide surfaces on the retort for confining the skelp against any substantial displacement normal to its direction of movement through the retort so that the edges are held within a limited range of vertical movement and the extent of the edges into the chambers remains substantially constant, a block with a perforate face extending along the length of the edge face of the skelp in each chamber and generally parallel to said edge face, and means for delivering gas through the perforations in the face of each block and against the edge face of the skelp.

4. Apparatus for preparing skelp for welding by the application of gas to the edges, including guiding surfaces above and below the skelp and spaced by a distance slightly greater than the thickness of the skelp, said guidng surfaces extending for a susbtantial distance in the direction in which the skelp travels, and extending inward from each edge of the skelp for a short distance, chambers to which the edge faces of the skelp are exposed for applying gas to said edge faces, and walls closing the ends of the chambers and having guide surfaces for limiting movement of the skelp transversely of its direction of travel through the retort.

5. A retort for heating the edges of a moving skelp, including parallel channels in which the opposite edges of the skelp are guided vertically and transversely, each of said channels comprising upper and lower surfaces extending inward across the upper and lower sides of the skelp, for a short distance from either edge of the skelp, and spaced by a distance slightly greater than the thickness of the skelp whereby the surfaces smooth out undulations in the skelp, chambers communicating with the channels adjacent the edge faces of the skelp, and means associated with said chambers for applying gas to the edges to raise their temperature as they travel through the channels.

6. Apparatus for heating the edges of a moving skelp, including gas torches for directing longitudinally extending systems of flame against the edges of the skelp, guides for maintaining the edge faces of the skelp at a substantially constant spacing from the torches, and means confining the products of combustion close to the surface of the skelp to heat the metal back of the edge faces as said products of combustion flow inward from the edges and over the surface of the skelp.

7. A skelp heating retort having two chambers, a torch in each chamber, parallel channels in the retort for receiving the edges of the skelp, each of said channels opening into one of the chambers adjacent the torch so that the edge of the

skelp in the channel is exposed to the heat of flame jets issuing from the torch, guide surfaces on the retort for maintaining the edge faces of the skelp at a substantially constant spacing from the torches, and passages opening into the chambers for the admission of air to burn envelope gases from the torch flames in the region of the skelp edges.

8. A retort for heating the edges of a moving skelp including means for supporting the skelp, guide members including a block overlying the top surface of the skelp for a distance back from one edge and another block overlying the top surface of the skelp for a distance back from the other edge, the blocks being spaced so that they do not cover the center portion of the strip but leave an open space for tongs to pass between them, and torches for directing flame jets against the edge faces of the moving skelp confined between said supporting means and overlying blocks.

9. A skelp heating retort comprising right and left retort bodies, each of which has a surface which extends under the skelp for a distance back from the edge face of said skelp and another surface which extends over the top side of the skelp for a short distance back from the edge face, said surfaces being spaced by a distance slightly greater than the thickness of the skelp so that they do not confine the movement of flat skelp but serve to smooth out waves of substantial amplitude, a common frame on which said retort bodies are slidably mounted, means holding them fixed in a set relation on the frame with space between them for the passage of skelp tongs, and means for heating the edges of the skelp while it passes between said surfaces of the retort bodies.

10. A retort comprising a channeled body for heating each edge of the skelp, the channel in each body having guiding surfaces which extend over and under the adjacent edge portion of the skelp, grooves in the surface which extend under the skelp for conducting gas, which is directed against the edge face, across the under side of the skelp inward from said edge face, the guiding surfaces above and below the skelp being spaced by a distance slightly greater than the thickness of the skelp so that any substantial undulations in the skelp are smoothed out by said channel but when the skelp rests on the retort surface beneath it there is a space for the flow of gas between the top side of the skelp and the surface of the retort which extends over the skelp, and torches for directing flame jets against the edge faces of the skelp as it moves through said channels.

11. Apparatus for heating the edge faces of a moving skelp including a retort having channels through which the edge portions of the skelp travel, each channel having a surface extending over a portion of the top side of the skelp and a supporting surface extending under the edge portion of the skelp, a chamber in each side of the retort opening into the adjacent channel along a substantial length of the channel in position to expose the edge face of the skelp in the channel to the flames of a torch located in said chamber, and grooves in said surfaces above and below the skelp, and disposed in position to conduct the products of combustion away from the torch and over the upper and lower surfaces of the skelp.

12. Apparatus for heating the edge faces of a moving skelp, comprising a base, two retort bodies each comprising upper and lower blocks, means in the retort bodies for raising the temperature of the skelp edges, means connecting the blocks of each retort body to each other and to the base but adjustable to change the spacing between the retort bodies in accordance with the width of the skelp to be heated, and channels in the confronting faces of the retort bodies for supporting and guiding the edge portions of the skelp, said channels being of a width to cover a relatively narrow part of each edge portion of the skelp and being located at a substantial distance above the base so that there is ample space between the retort bodies and between the channel level and the base for the passage of tongs when pulling the front part of a skelp through the retort.

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