(No Model.)

2 Sheets—Sheet 1.

P. KEIL, Jr.

APPARATUS FOR MAKING METAL TUBES.

No. 482,364. Patented Sept. 13, 1892.

FIG. 1.

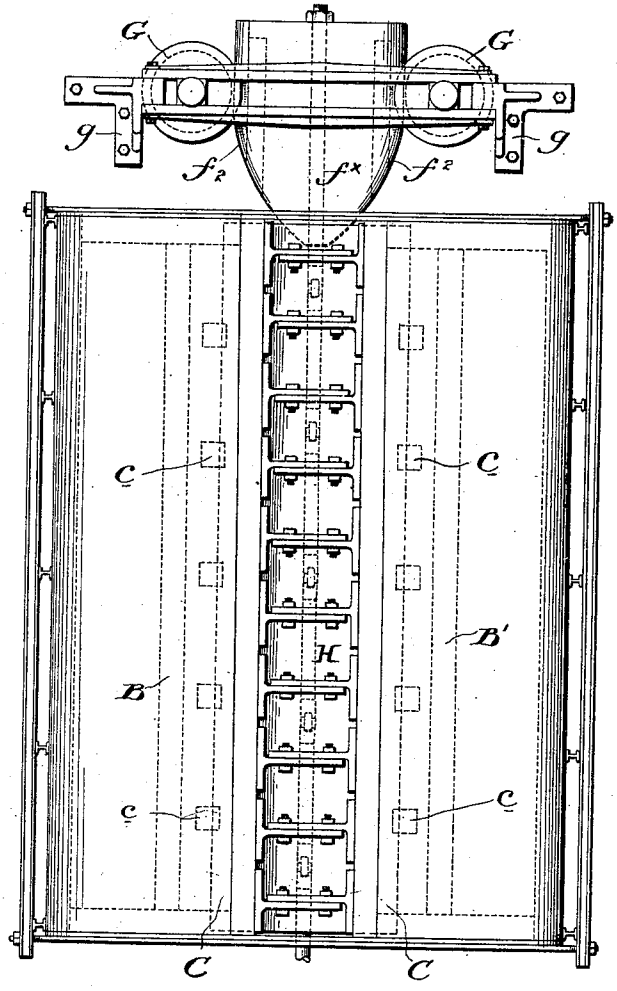
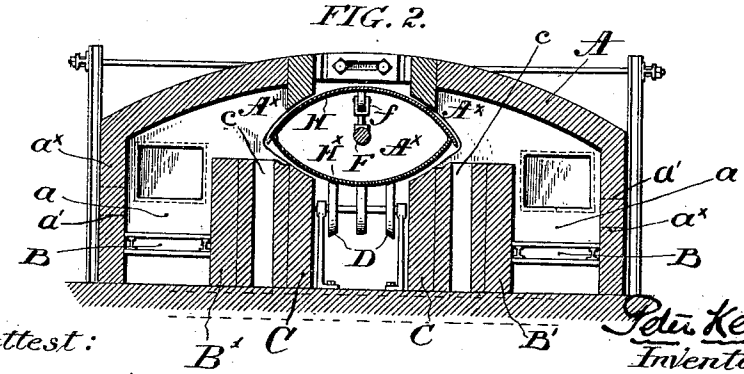


FIG. 2.



Attest:

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Inventor.

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(No Model.) 2 Sheets—Sheet 2.

P. KEIL, Jr.

APPARATUS FOR MAKING METAL TUBES.

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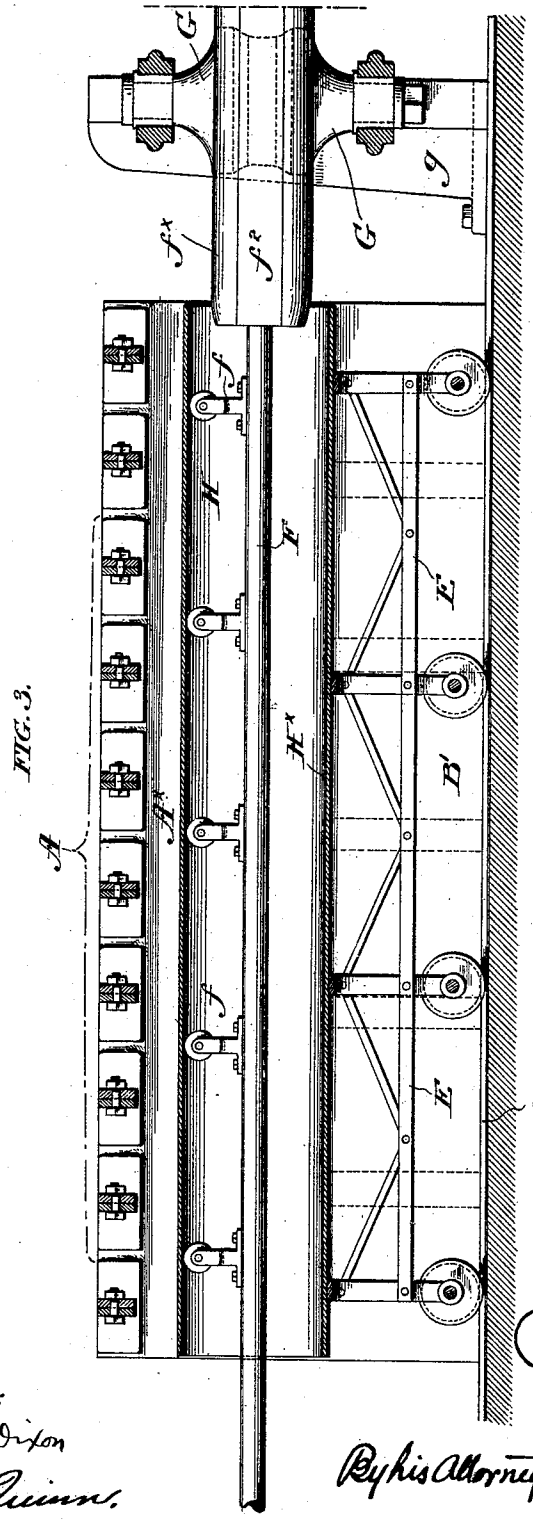

FIG. 3.

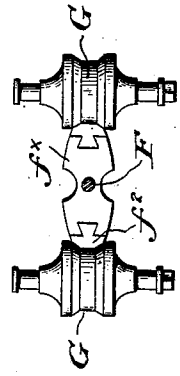

FIG. 4.

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UNITED STATES PATENT OFFICE.

PETER KEIL, JR., OF PHILADELPHIA, PENNSYLVANIA.

APPARATUS FOR MAKING METAL TUBES.

SPECIFICATION forming part of Letters Patent No. 482,364, dated September 13, 1892.

Application filed February 3, 1891. Serial No. 380 102. (No model.)

To all whom it may concern:

Be it known that I, PETER KEIL, Jr., a citizen of the United States, residing at Philadelphia, in the county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Making Metal Tubes, of which the following is a specification.

My invention relates in general to operations of making plate metal tubes from bent skelp by the lap-welding process. In the manufacture of the smaller sizes of tube the old processes are satisfactory, but in the making of the larger sizes they are unsatisfactory because necessitating the employment of skelp of such breadth as to be difficult and costly to make or, if made, to handle and weld with a single seam.

It is the object of my invention to manufacture plate metal tubes of large diameter by the use of two (or more) instead of one skelp, and by the aid of welding machinery adapted to unite said skelp by forming longitudinal seams along their adjacent lapped or butted edges.

My invention comprehends the improvements in apparatus for making tubes of large diameter hereinafter set forth.

Figure 1 is a top plan view, Fig. 2 a transverse sectional elevation, and Fig. 3 a central vertical longitudinal side sectional elevation, through apparatus embodying my improvements. Fig. 4 is a fragmentary end elevational detail of the mandrel and mandrel rolls.

Similar letters of reference indicate corresponding parts.

In the drawings, A is a double heating furnace, being conveniently of quadrangular conformation but provided with an arched roof the longitudinal central portion of which is preferably but not necessarily formed of open-metal framing composed of metal braces bolted together to form the keystone of the arch. The furnace is preferably of the same length as the skelp to be heated in it, and it embodies two lateral and parallel combustion chambers, *a a*, coextensive in length with each other and with the furnace structure. Each combustion chamber contains a grate B extending, if solid fuel be used, from its bridge wall B′ to the side wall $a^{\times}$ of the furnace. In each side wall are provided suitable openings a' to permit of the charging of fuel to the grate.

C C are what may be termed vertical partitions, respectively parallel with each other and coextensive with the length of the furnace. These partitions in connection with the bridge walls may be considered as constituting the respective inner walls of the respective combustion chambers, and between them and the respective bridge walls are formed flues or down-takes *c* communicating with a stack (not shown) through which the products of combustion are drawn.

Intermediate between the two heating chambers of the furnace exists an open space, which may be designated as the skelp-heating chamber $A^{\times}$, through which space, which is of course co-extensive with the length of the furnace structure, the skelp to be heated and welded are caused to pass.

The lower portion of the skelp-heating chamber, which exists between the vertical partitions C C or inner walls of the combustion chambers of the furnace, is provided either with a series of carrying rolls D, as shown in Fig. 2, or with a track *e*, upon which a skelp-carrying truck E, as shown in Fig. 3, may travel, to carry the skelp into the furnace, through it up to the mandrel, and out from it between and beyond the welding rolls. In Fig. 3 of the drawings, the carrying surface of the carrying truck E is gutter shaped the better to support the lower skelp.

F is a mandrel rod extending throughout the skelp-heating chamber, and supported in any usual manner. Upon this rod suitable supports *f* are arranged to support the upper skelp. At its rear end it projects beyond the furnace and is provided with a mandrel head $f^{\times}$ of the form shown in the drawings, that is to say of elliptic cross-section. The lateral edges of the mandrel head are provided with edge pieces f^2 of steel or other metal, which are conveniently removable so as to be replaced when worn out or by others of other sizes.

G G are a pair of rolls, one of which is located at each side of the mandrel as shown. The axes of these rolls are vertical and their grooved peripheries are conformed to the lat-

eral curvature of the mandrel. They are suitably supported in any preferred housing *g* and are adapted to be adjusted to any desired set laterally and vertically with respect to the mandrel. They are positively driven by suitable known means, and in conjunction with the mandrel they form a welding device adapted to weld together the respective meeting longitudinal edges of the two skelp which I employ. If desired the rolls may be idlers, and the skelp be drawn through them over the mandrel by suitable appliances, from the delivery side of the rolls.

In the drawings the two skelp represented are designated H $H^{\times}$. They are preferably counterpart in dimensions, and each before being introduced into the furnace is by any preferred method bent to a semi-ellipical or gutter-shaped form such substantially as that shown. When the under skelp $H^{\times}$ has been placed upon the carriage or rolls, the upper skelp H is in reversed position placed upon it so that their edges meet or lap, and the two in such temporary relationship are then introduced within the skelp-heating chamber of the furnace, the skelp supports on the mandrel rod aiding to maintain the upper skelp. When in the furnace their respective lateral edges, as is apparent, are presented in the path of the flame from the respective combustion chambers, so that both sets or pairs of meeting edges to be welded are contemporaneously heated in the common and single skelp-heating chamber. It is also apparent that this operation of heating the meeting edges of the skelp is one confined to such edges only, and that the open top and open lower portion of the skelp-heating chamber permit of such access of air to the intermediate bellied portions of the respective skelp as precludes the possibility of the heating of such portions, thereby insures to them the retention of their curvature, and prevents the possibility of such collapse as might, notwithstanding the supports, ensue, did said portions likewise become heated to a welding heat. So soon as the edges have been sufficiently heated the skelp on the rolls or carriage are advanced to the mandrel and into bite with the welding rolls, which being, as stated, preferably, positively driven, draw the skelp over the mandrel. As the skelp pass through the rolls both seams are simultaneously welded. The tube formed by the welding union of two bent skelp in the manner above set forth, is elliptical and not cylindric in cross-section, and must thereafter be made cylindric by being passed through suitable truing-up-rolls or kindred devices.

It will be understood that by the practice of my invention the necessity for making and handling the large sized skelp heretofore necessary in the manufacture of plate metal tubes of large diameters, is obviated; that the size of the skelp-heating chamber of the furnace is reduced; and that, the heating and welding of the two seams being accomplished at the same time, my process is not more expensive than the earlier processes already referred to. It is also to be understood that, without departure from the invention, the skelp which I employ may be each formed to semi-cylindric instead of to semi-elliptical shape, before being heated and welded; that other constructions of furnace, other devices for carrying the skelp to and through the furnace, and other welding devices *per se*, may be substituted for those represented in the drawings and already described. The devices represented are, however, suitable for the purpose and comprehend a typical embodiment of my invention. It is proper also to remark that, while I prefer to employ but two counterpart skelp, it is also within the scope of my invention, with suitable modifications in the number and arrangement of the welding rolls, to employ a plurality in excess of two.

Having thus described my invention, I claim and desire to secure by Letters Patent:

1. An apparatus for the manufacture of metallic tubes from a plurality of skelp, in which are combined the following elements:—a double skelp-heating furnace embodying a central vertically extending skelp-heating chamber co-extensive with the length of the furnace structure, and also embodying two lateral combustion chambers respectively in connection with the upper portion of said skelp-heating chamber;—welding rolls at the delivery end of said furnace;—a mandrel rod extending through the upper portion of said skelp-heating chamber, and provided with a mandrel head in suitable relation to the pass of the rolls, and also with supports for sustaining an upper skelp;—and skelp-carrying devices arranged within the lower portion of said skelp-heating chamber, and adapted to support and carry a lower skelp;—substantially as and for the purpose as set forth.

2. A double skelp-heating furnace, embodying a central skelp-heating chamber, two lateral combustion chambers connecting with said skelp-heating chamber, and down-takes formed in partitions which form the inner walls of said combustion chambers and the walls of the lower portion of said skelp-heating chamber, substantially as set forth.

3. In combination with a furnace embodying a central skelp-heating chamber and lateral combustion chambers,—a rolling mill composed of welding rolls located at the delivery end of the furnace in alignment with its skelp-heating chamber and provided with a mandrel head,—and a mandrel rod supporting said mandrel head, extending completely through said skelp-heating chamber of the furnace, and provided with skelp supports,—substantially as set forth.

4. A double skelp-heating furnace comprising two lateral combustion chambers embodying suitable outlets for the products of combustion, and a skelp-heating chamber situated

between and as to its respective sides in communication with said combustion chambers, and as to its intermediate portion in communication with the atmosphere through a longitudinal top opening, substantially as set forth.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 30th day of December, A. D. 1890.

PETER KEIL, JR.

In presence of—
WM. C. STRAWBRIDGE,
F. NORMAN DIXON.