E. WARNER.

APPARATUS FOR FORMING METALLIC TUBES.

APPLICATION FILED MAR. 21, 1918.

1,343,946. Patented June 22, 1920.

2 SHEETS—SHEET 1.

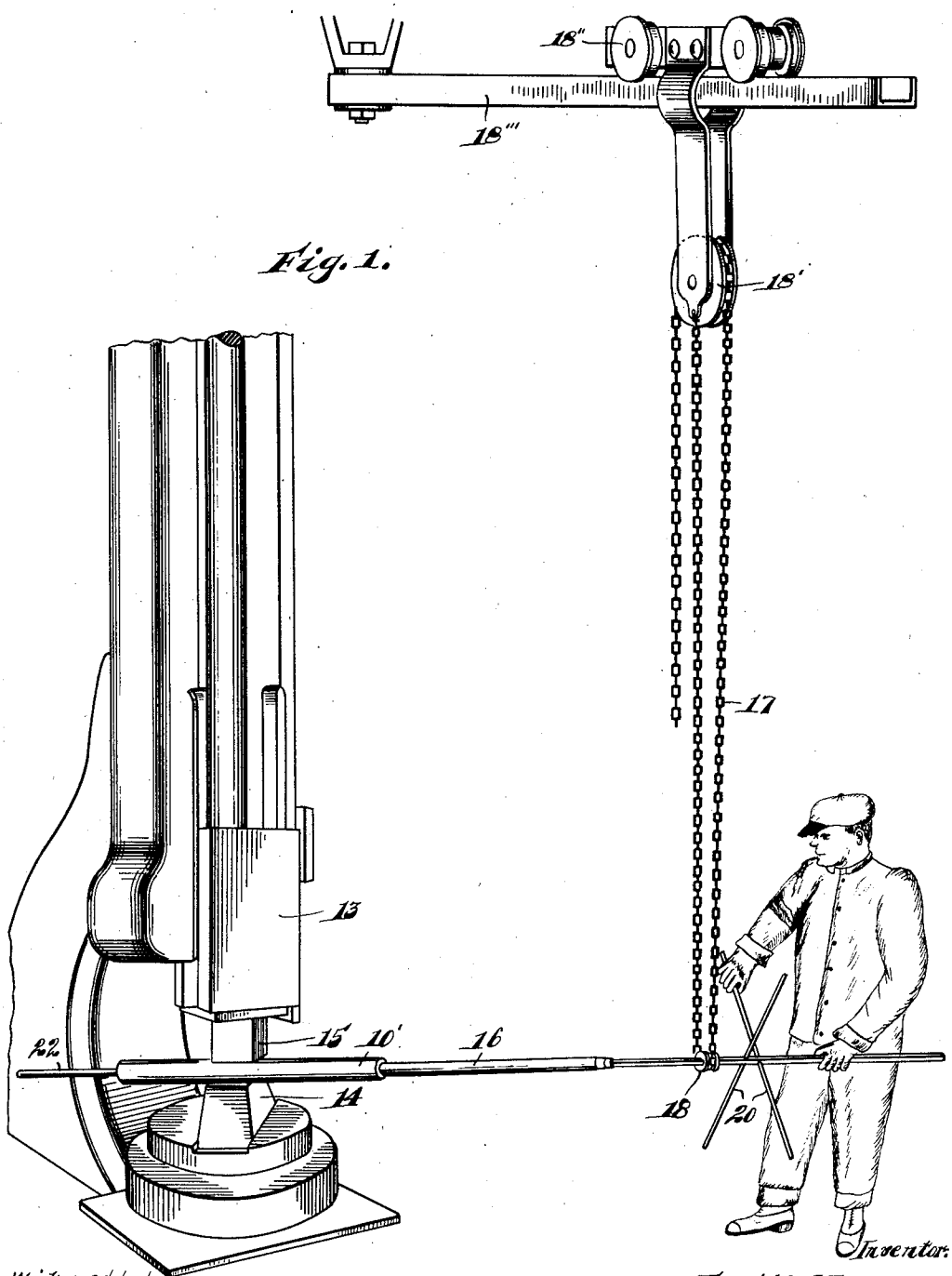



Fig. 1.

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A. A. Olsen

Inventor:
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By. Joshua R. H. Potts
his Attorney

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2 SHEETS—SHEET 2.

Fig. 2.

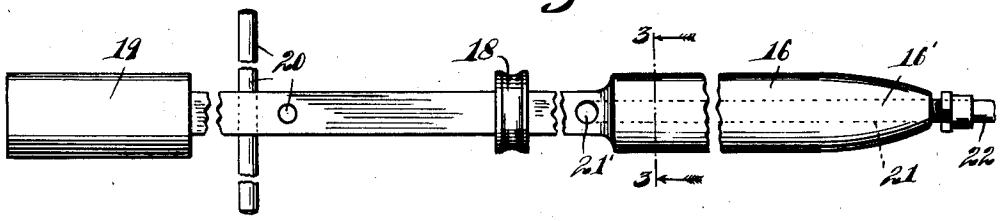



Fig. 5.

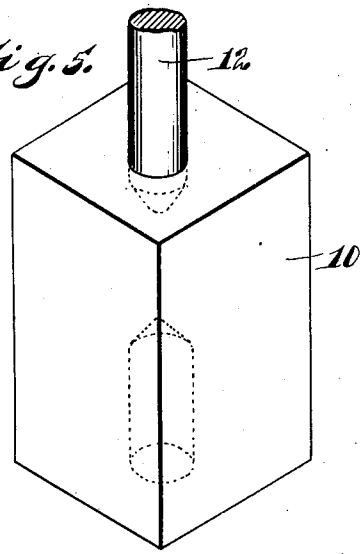
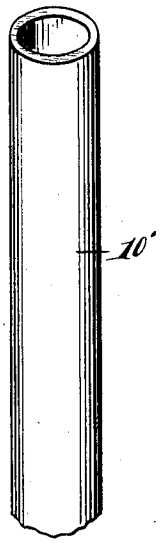



Fig. 6.



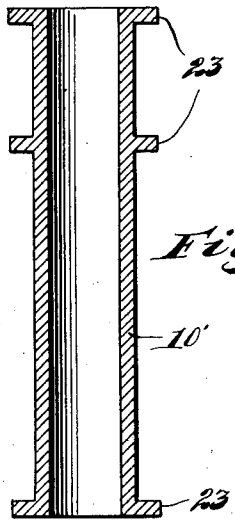




Fig. 7.

Fig. 4.

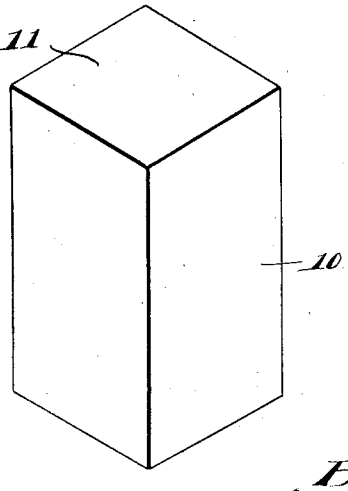
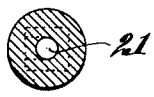



Fig. 3.




Witnesses:
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# UNITED STATES PATENT OFFICE.

EMILL WARNER, OF CHICAGO, ILLINOIS.

## APPARATUS FOR FORMING METALLIC TUBES.

1,343,946. Specification of Letters Patent. Patented June 22, 1920.

Original application filed June 26, 1917, Serial No. 176,956. Divided and this application filed March 21, 1918. Serial No. 223,799.

*To all whom it may concern:*

Be it known that I, EMILL WARNER, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Apparatus for Forming Metallic Tubes, of which the following is a specification.

My invention relates to an apparatus for forming a tube out of a solid piece of metal, the method employed in using the apparatus being covered in a pending application Serial #176,956, filed June 26, 1917. This applicatiotn is a division of said pending application.

The object of this invention is the production of an apparatus whereby metallic tubes, particularly those of comparatively great weight, may be readily, easily and accurately formed. Other objects will appear hereinafter.

The invention consists in the combinations and arrangements of parts hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings forming a part of this specification, and in which

Figure 1 is a perspective view illustrating the method and apparatus embodying the invention,

Fig. 2, a side elevation of the mandrel employed in the invention, portions of the same being broken away,

Fig. 3, a section taken on line 3—3 of Fig. 2,

Fig. 4, a perspective view of the solid block of metal from which the tube is formed in the employment of the method and apparatus,

Fig. 5, a view similar to Fig. 4 showing an advanced step in carrying out the method,

Fig. 6, a perspective view of a tube formed through employment of the invention, and

Fig. 7, a central section of a flanged tube such as may be formed through the use of the method and apparatus.

In carrying out the process of forming a tube, a solid block 10 of metal, preferably rectangular in form, is employed, said block being of sufficient size, that is, the same containing metal of the same quantity or a little more than that of the finished tube which it is desired to make. The block 10 is first heated to a cherry red, and in each end 11 thereof is placed a centrally positioned center punch mark. With said marks as guides, a central passage is formed through the block through the employment of a properly formed tool 12 which is driven half way through the block from each end, as seen in Fig. 5. A power driven trip hammer 13 is employed in this operation, the block being placed upon the table or stationary jaw 14 of the hammer and the tool 12, which will be held by a suitable guide or holder, will be struck by the hammer or vibratory element 15 of the machine.

After the passage is thus formed through the block a mandrel 16, of proper size, is inserted therein, and with said mandrel as a holder for the work, the same is placed horizontally on the trip hammer table 14 and pounded by means of the element 15 into cylindrical form, as clearly seen in Figs. 1 and 6. In this pounding operation, the mandrel is rotatably and longitudinally shifted, this treatment being resorted to until the tube is of the desired thickness, it being clear that in the pounding of the tube the thickness thereof will be reduced and the length increased. By skilful manipulation of the mandrel by the operator, the tube may be readily and quickly formed into perfect cylindrical form and of any size desired. The finished tube is designated 10′.

The mandrel is supported intermediate its ends by means of a supporting element 17 in the form of a chain or cable which passes around a channel pulley 18 provided upon the mandrel, the upper end of said chain passing around a pulley 18′ of a carriage 18″ movably mounted on a swinging beam 18‴. At the rearward end of the mandrel is provided a counter-balance weight 19, the arrangement being such that the mandrel will be practically balanced in the supporting element 17, relieving the operator of any work in supporting the same, the work of the operator being only that of properly shifting the tool to properly present the work to the action of the trip hammer. Such manipulation of the mandrel is readily effected through engagement with handles 20 which are provided adjacent the point of support of the mandrel.

To facilitate withdrawal of the mandrel

from the finished tube, the former is formed at the forward end thereof with a central passage 21 which is adapted for connection with a pipe 22 through which a suitable cooling medium such as cold air or water may be supplied in order to effect sudden cooling and hence sudden contraction of the tube. This sudden contraction of course will loosen the tool from the tube, permitting of ready withdrawal of the same. The passage 21 opens laterally as at 21′ for the discharge of the cooling medium. The forward end of the mandrel is preferably rounded as at 16′ to facilitate insertion of the same into the opening through the block at the commencement of the operation.

With this method and apparatus, a tube having practically any interior form, such as circular, square, hexagonal or tapering, may be formed, the form desired being produced by simply providing a mandrel of the form desired, it being clear that the interior form of the tube will be governed by that of the mandrel. Also with this process, flanges, as seen at 23, may be formed upon the tube produced, as seen in Fig. 7, by simply avoiding to strike the work at the places where it is desired to form the flanges, it being clear that by omitting to strike circumferential portions of the work, circumferential flanges will be produced at these points.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. Apparatus for forming a metallic tube from a solid piece of metal comprising a mandrel for holding the work; means for pounding the sides of the work on said mandrel; and means for adjustably supporting said mandrel, comprising a flexible supporting element having a loop at its lower end, there being an annular groove surrounding said mandrel for engagement with said loop, substantially as described.

2. Apparatus for forming a metallic tube from a solid piece of metal comprising a mandrel for holding the work; means for pounding the sides of the work on said mandrel; means for adjustably supporting said mandrel intermediate its ends, so as to balance the mandrel in said support; and means on said mandrel adapted for manual engagement to rotate said mandrel, substantially as described.

3. Apparatus for forming a metallic tube from a solid piece of metal comprising a mandrel for holding the work; means for pounding the sides of the work on said mandrel; means for adjustably supporting said mandrel intermediate its ends, so as to balance the mandrel in said support; and radially extending elongated handles on said mandrel, whereby said mandrel may be manually rotated, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EMILL WARNER.

Witnesses:
JOSHUA R. H. POTTS,
ARTHUR A. OLSON.