J. W. OFFUTT.

APPARATUS FOR MAKING SEAMLESS TUBES.

APPLICATION FILED NOV. 12, 1910.

1,100,695.

Patented June 16, 1914.

3 SHEETS—SHEET 1.

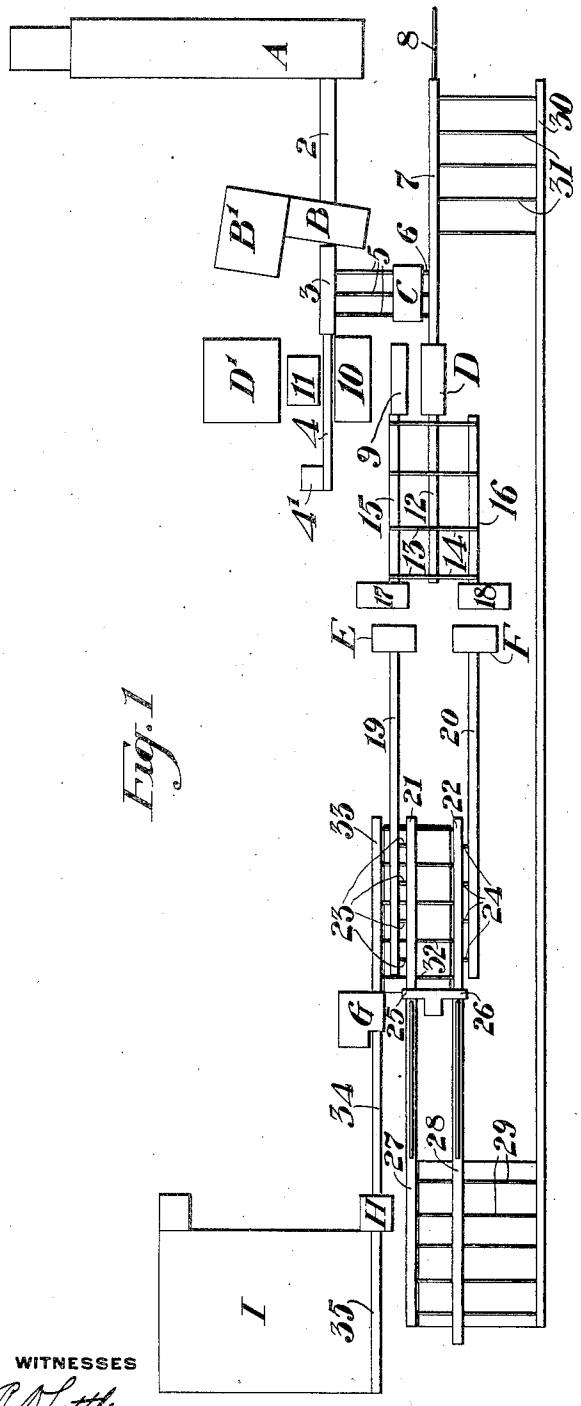


Fig. 1

WITNESSES

R. D. Little

G. L. Winters

INVENTOR

J. W. Offutt

by Lothrop Bell & Fuller

his Attorneys

J. W. OFFUTT.

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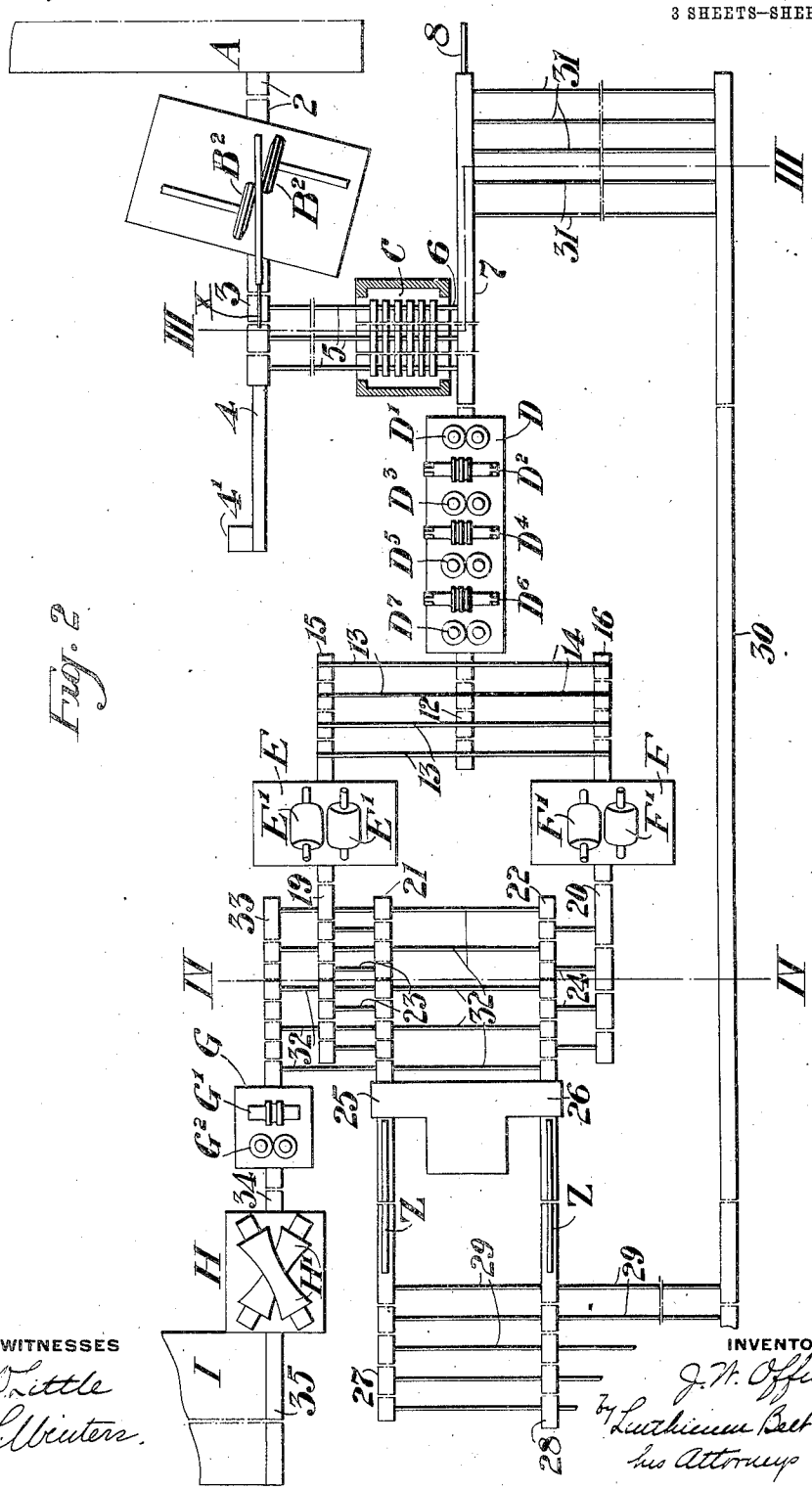


Fig. 2

WITNESSES

R. S. Little

G. L. Winters.

INVENTOR

J. W. Offutt

By Lothrop Bach & Fuller

his Attorneys

J. W. OFFUTT.

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3 SHEETS—SHEET 3.

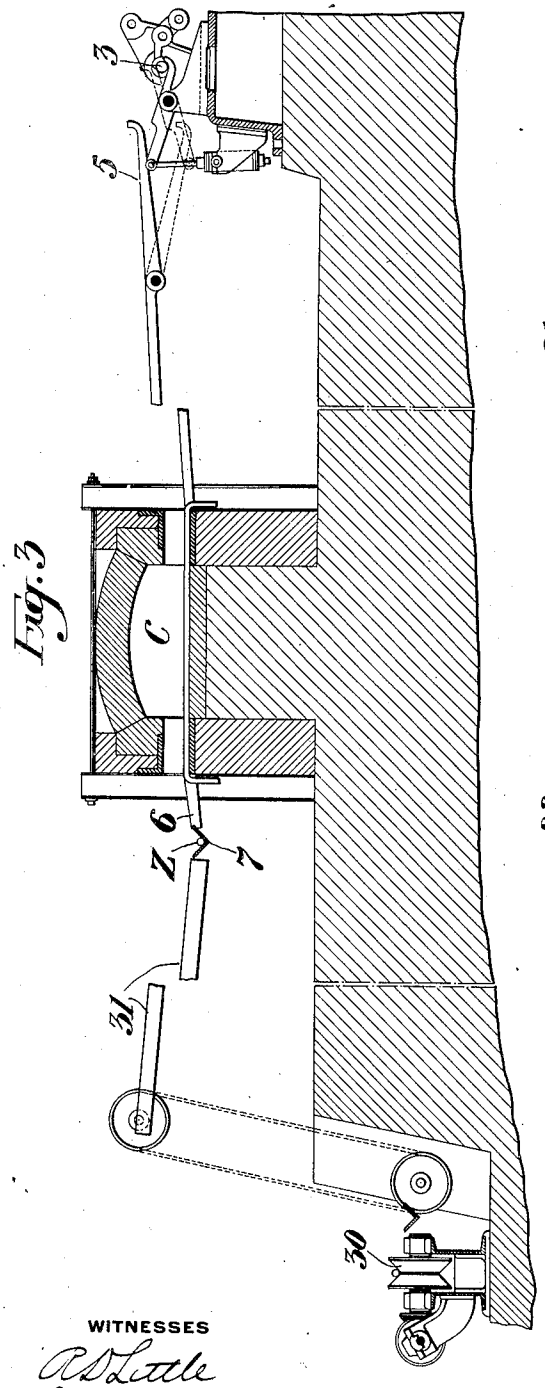


Fig. 3

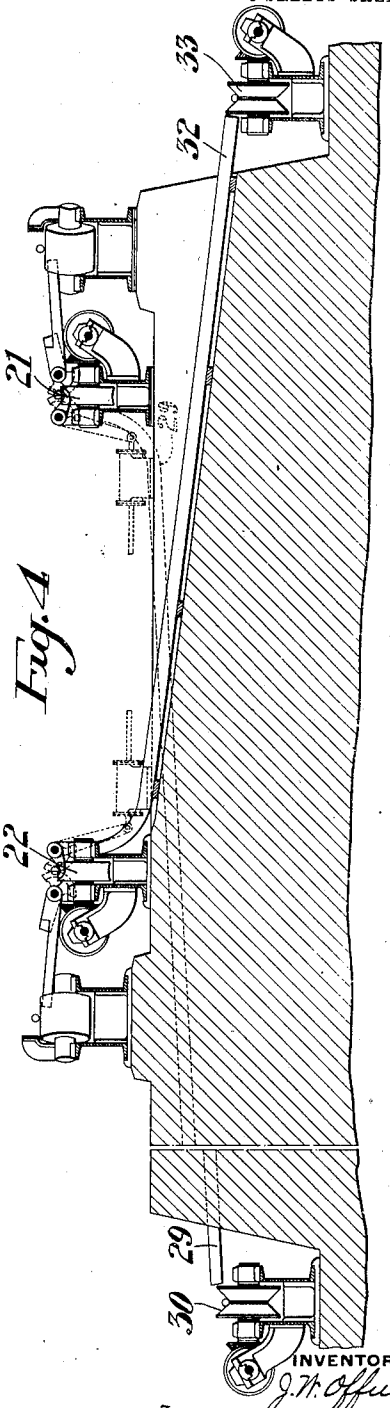


Fig. 4

WITNESSES

R. D. Little

G. L. Winters

INVENTOR

J. W. Offutt

By Linthicum Belt & Fuller

his Attorneys.

UNITED STATES PATENT OFFICE.

JOHN W. OFFUTT, OF ELLWOOD CITY, PENNSYLVANIA, ASSIGNOR TO THE SHELBY STEEL TUBE COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF NEW JERSEY.

APPARATUS FOR MAKING SEAMLESS TUBES.

1,100,695. Specification of Letters Patent. Patented June 16, 1914.

Application filed November 12, 1910. Serial No. 592,072.

To all whom it may concern:

Be it known that I, JOHN W. OFFUTT, of Ellwood City, in the county of Lawrence and State of Pennsylvania, have invented new and useful Improvements in Apparatus for Making Seamless Tubes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to apparatus used in forming seamless tubes and similar annular bodies and more particularly relates to apparatus employed in forming heated metal blanks into hot finished tubes and into hollow blanks or tubes which are afterward subjected to cold drawing operations and finished into cold drawn seamless tubes.

One object of this invention is to provide improved apparatus constructed and arranged for forming the heated blanks, having novel means for piercing and rolling the pierced blanks and for reeling the hollow rolled blanks prior to later sizing or straightening operations, or both sizing and straightening operations, by the use of which delays in the operation of the apparatus are overcome and prevented, the output of the apparatus greatly increased, and the forming operations are greatly simplified.

Another object of the invention is to provide improved means for mechanically handling the blanks during the forming operation by which the manual labor necessary in operating the apparatus is reduced and the operations are carried out practically automatically.

A further object of this invention is to provide apparatus having improved means for handling the mandrels upon which the blanks are rolled and reeled when such mandrels are employed.

In the accompanying drawings, Figure 1 is a diagrammatic plan showing one arrangement of apparatus constructed in accordance with my invention. Fig. 2 is a similar plan on a larger scale showing the apparatus more in detail. Fig. 3 is a transverse sectional end elevation on a larger scale, the section being taken on the line III—III of Fig. 2, showing the handling mechanism by which the blanks and mandrels are conveyed from one part of the apparatus to another. Fig. 4 is a similar transverse sectional end elevation taken on the line IV—IV of Fig. 2, showing the improved apparatus employed in handling the mandrels in returning them for further use after being employed in connection with the rolling and reeling apparatus in forming a hollow blank or tube.

In the drawings, A is a continuous heating furnace in which the blanks are heated preparatory to being pierced. The furnace as shown is provided with an end inlet opening and a side discharge opening is located near the opposite end of the furnace. A trough or conveyer 2 is provided between the outlet opening of the heating furnace and the entrance side of the piercing mill B. A similar trough or conveyer 3 is provided on the delivery side of the piercing mill and a draw bench or trough 4 is provided at one end of the conveyer 3 to receive the mandrels or rods by which the plug used in the piercing operation is supported between the piercing rolls during the piercing operations. Skids or transfer arms 5 are employed between the conveyer 3 and the re-heating furnace C which is located between the piercing mill B and the continuous mill D and skids 6 are employed to connect the discharge side of the reheating furnace C with the trough or conveyer 7 which extends rearwardly from the entrance side of the continuous mill D. A pusher 8 is provided on the rear end of the conveyer 7 by which the mandrels are inserted within the hollow or pierced billets.

The piercing mill B is driven by means of a suitable motor B′ and the continuous mill D is provided with pinion housings 9 which are connected to a horizontal gear stand 10 by means of suitable spindles and coupling boxes forming driving connections, the vertical rolls of the continuous mill D being connected by suitable shafting and spur gears with a vertical roll gear stand 11. The gear stands 10 and 11 are both driven by a motor D′.

A motor 4′ is provided on the draw bench 4 at the end of the conveyer 3 for driving the chain by which the mandrels or rods supporting the plugs between the rolls of the piercing mill are withdrawn from the pierced billets after the pierced billets or blanks have emerged from the piercing mill B and preparatory to moving the pierced blanks transversely on the ways or skids 5 into the reheating furnace C.

Located on the delivery side of the con-

tinuous mill D is a conveyer 12 which is connected by means of the skids 13 and 14 to the conveyers 15 and 16 located on either side of the conveyer 12. In line with the conveyers 15 and 16 are the reeling mills E and F, each having a gear stand 17 and 18 by which the reeling machines are driven, and in front of the reeling machines E and F are the conveyers 19 and 20 by which the rolled and reeled tubes or hollow blanks with the mandrels still in place are conveyed to extractor benches 21 and 22. The extractor benches extend alongside the forward end of the conveyers 19 and 20 and are connected with these conveyers by skids 23 and 24. Extractor rolls 25 and 26 are provided at one end of each of the conveyers 21 and 22 by means of which the mandrels are withdrawn from the billets or partly formed tubes when on the extractor benches 21 and 22, extractor chains of the usual construction also being provided on these benches for withdrawing the mandrels from the partly formed tubes. The extractor benches on which the extractor chains are mounted are connected by means of skids 29 with a conveyer 30 on which the mandrels or bars are returned, after being extracted from the partly formed tubes, to the entrance side of the continuous mill D, one end of the conveyer 30 being connected by means of skids 31 with the conveyer 7 which is located on the entrance side of the continuous mill D. The extractor benches 21 and 22 are connected by means of skids 32 with a conveyer 33 which is in front of and in line with the rolls of a sizing mill G. On the discharge side of the sizing mill G is a conveyer 34 which connects this sizing mill with the cross rolling mill H through which the rolled and reeled tubes are passed to be straightened. On the discharge side of the cross rolling mill H is a conveyer 35 which extends alongside a cooling bed or table I, this bed being employed to store the straightened tube while being cooled. The cooling bed may be of any of the well known cooling bed constructions.

In the operation of my improved apparatus the blanks are inserted in the receiving end of the continuous heating furnace A and pass through this furnace, being gradually heated during such passage through the furnace to the necessary temperature for the piercing operation. The heated billets are then withdrawn singly from the discharge end of the furnace A and are caused to pass over the conveyer 2 into the rolls B^2 of the piercing mill B. A mandrel X is employed to support or hold a plug in proper position between the rolls B^2 while the heated billet or blank is being pierced over the plug. The pierced billet is delivered onto the conveyer 3 and the mandrel or rod X is then removed from the pierced billet. The billet is then moved transversely of its length from the conveyer 3 over the skids 5 into the re-heating furnace C, this re-heating furnace C providing a place of storage in which appreciable loss of heat is prevented or the temperature is increased in the pierced blanks or billets while waiting to be passed into the rolls of the continuous rolling mill D, the furnace being of such size that a number of the billets are always being held therein. The pierced billets are removed from the re-heating furnace C as required and are transferred sidewise to the conveyer 7 which extends in line with a pass of the continuous mill D. While the pierced billets are held upon the conveyer a cylindrical mandrel Z is inserted in the opening in the pierced billets by means of the pusher 8 and the billet with the inserted mandrel is passed into the bite of the first stand of rolls in the continuous rolling mill. The billet and its mandrel move successively through vertical and horizontal rolls D^1, D^2, D^3, D^4, D^5, D^6, finally emerging from the last stand of rolls D^7 and passing to the conveyer 12.

Heretofore in the operation of forming seamless tubes, the capacity of the reeling mill has determined the capacity of the mill, this being the slowest part of the operation of forming the tubes. To prevent delays in completing the blanks and to increase the capacity of such mills, I have provided two reeling mills E and F on the discharge side of the rolling mill, each being capable of reeling the rolled tubes or hollow blanks. The rolled blanks are transferred transversely from the conveyer 12 in front of the continuous mill D to either of the conveyers 15 or 16 on the entrance side of the reeling mills E or F. The rolled blank, with its mandrel, which is held in close contact with the blank by reason of the reducing action of the rolling mill is then passed through the rolls of either of the reeling mills E or F and the blank is made more truly cylindrical, its surface smoothed and the diameter of the opening in the blank increased slightly so as to loosen the mandrel held within the blank sufficiently to permit of its being readily removed after passing through the reeling mill. The reeled blanks are delivered from the reeling mills E and F to the conveyers 19 and 20 which are located on the discharge side of these mills. The blanks are transferred sidewise from the conveyers 19 and 20 to the extractor benches 21 and 22. The extractor rolls or extractor chains are then employed to remove the mandrels from the rolled and reeled blanks. After the mandrels are removed, the blanks are transferred sidewise by means of skids 32 to the conveyer 33 which is located on the entrance side of the sizing mill G. The sizing mill, as shown, comprises a stand of horizontal rolls G′ and

vertical rolls G^2 through which the blanks are passed and are reduced to the desired diameter and made more truly cylindrical. The sized blanks pass from the rolls G^2 over the conveyer 34 into the cross rolls H' of the cross rolling mill H and are straightened therein. The straightened blanks are then delivered from the cross rolling mill H to the conveyer 35 which is alongside the cooling bed I and the straightened tubes are delivered therefrom to the cooling bed or table I, and, in passing across the width of this bed, gradually become cooled. The cooled tubes are then removed from the cooling table as desired to a place of storage or when to be subjected to later cold drawing operations, to the pickling room in which they are pickled preparatory to cold drawing. The mandrels or bars Z as they are withdrawn from the tubes while the tubes are on the extractor benches 21 and 22, are transferred endwise on the conveyers 27 and 28 and are transferred from these to the skids 29 by which they are delivered to the return conveyer 30. The mandrels are then delivered endwise by the conveyer 30 to the entrance side of the continuous mill D and are lifted from the conveyer 30 to the skids 31 and then transferred to the conveyer 7 in position in line with and on the entrance side of the continuous mill D in readiness to be again inserted within a hollow or pierced blank or billet preparatory to the next rolling operation. The above described operations are then repeated as required in the regular operation of the mill.

The advantages of my invention will be apparent to those skilled in the art. By its use the billets or blanks are quickly pierced and are successively subjected to the operations of the piercing mill, the rolling mill, the reeling mill, and when employed, the sizing mill, and straightening mill. By the use of the two reeling mills in connection with the continuous rolling mill, the delays heretofore met with in waiting the completion of one reeling operation before another reeling operation can be started is overcome and prevented and instead of a delay in the reeling of each blank occasioned by the slowness of the reeling operation, one rolled tube can be delivered to the reeling mill E and the next tube to the reeling mill F, and by so alternating the delivery of the tubes from the rolls of the rolling mill, the operations are hastened.

As by the use of my improved apparatus the reeling operations can be performed as rapidly as the tubes are delivered from the rolling mill, the rapidity of the tube making operations is limited only by the speed of the continuous mill. By providing the reheating furnace between the piercing mill and the rolling mill, a place of storage for the hot pierced billets is had which prevents loss of heat by radiation in the pierced billets after being pierced and while waiting to be fed into the rolling mill, while when found necessary the temperature of the pierced billet can be increased after being pierced and preparatory to being rolled.

Modifications in the construction and arrangement of the parts may be made within the scope of the appended claims. Instead of employing a continuous mill having horizontal and vertical rolls, any desired type of rolling mill may be employed. The apparatus for handling the billets and tubes may be modified and the apparatus for handling the mandrel bars and for extracting the mandrels may be changed within the scope of my invention as defined in the claims.

I claim:—

1. Apparatus for making seamless tubes comprising in combination means for inserting mandrels within hollow heated tubes, a rolling mill wherein the heated tubes are elongated and reduced in wall thickness by rolling upon a mandrel, and a plurality of reeling machines on the delivery side of said rolling mill for reeling the rolled tubes to increase the internal diameter of the rolled tubes and free the mandrels upon which the tubes are rolled.

2. Apparatus for making seamless tubes comprising in combination means for inserting mandrels within hollow heated tubes, a rolling mill wherein the heated tubes are elongated and reduced in wall thickness by rolling upon a mandrel, a plurality of reeling machines on the delivery side of said rolling mill for reeling the rolled tubes to increase the internal diameter of the rolled tubes and free the mandrels upon which the tubes are rolled and means for mechanically withdrawing the loosened mandrels from the tube blanks.

3. Apparatus for making seamless tubes comprising in combination a furnace in which hollow seamless tubes are heated and stored, means for inserting mandrels within heated tubes from said furnace, a rolling mill wherein the heated tubes are elongated and reduced in wall thickness by rolling upon the mandrels inserted therein, a plurality of reeling machines on the delivery side of the rolling mill for reeling the rolled tubes to increase the internal diameter thereof and free the mandrels therein, and means for transferring the rolled blanks from the rolling mill to either of said reeling machines.

4. Apparatus for making seamless tubes comprising in combination means for forming hollow metal tube blanks, means for heating and storing the hollow blanks preparatory to rolling said blanks, means for inserting mandrels within the heated hollow blanks, a rolling mill for rolling the heated

blanks into tubes upon the mandrels, a plurality of reeling machines on the delivery side of the rolling mill for reeling the rolled tubes to increase the internal diameter thereof and free the mandrels therein and means for transferring the rolled tubes from the rolling mill to either of said reeling machines.

5. Apparatus for making seamless tubes comprising in combination means for forming hollow metal tube blanks, means for heating and storing the hollow blanks preparatory to rolling said blanks, means for inserting mandrels within the heated hollow blanks, a rolling mill for rolling the heated blanks into tubes upon the mandrels, a plurality of reeling machines on the delivery side of the rolling mill for reeling the rolled tubes to increase the internal diameter thereof and free the mandrels therein, means for transferring the rolled tubes from the rolling mill to either of said reeling machines, and cross rolling means for straightening the reeled blanks.

6. Apparatus for making seamless tubes comprising in combination means for forming hollow metal tube blanks, means for heating and storing the hollow blanks preparatory to rolling said blanks, means for inserting mandrels within the heated hollow blanks, a rolling mill for rolling the heated blanks into tubes upon the mandrels, a plurality of reeling machines on the delivery side of the rolling mill for reeling the rolled tubes to increase the internal diameter thereof and free the mandrels therein, means for transferring the rolled tubes from the rolling mill to either of said reeling machines, means for successively sizing the rolled blanks from the reeling machines, and cross rolling means for straightening the reeled and sized blanks.

In testimony whereof, I have hereunto set my hand.

JOHN W. OFFUTT.

Witnesses:
B. F. GOODRICH,
M. E. NOLAN.