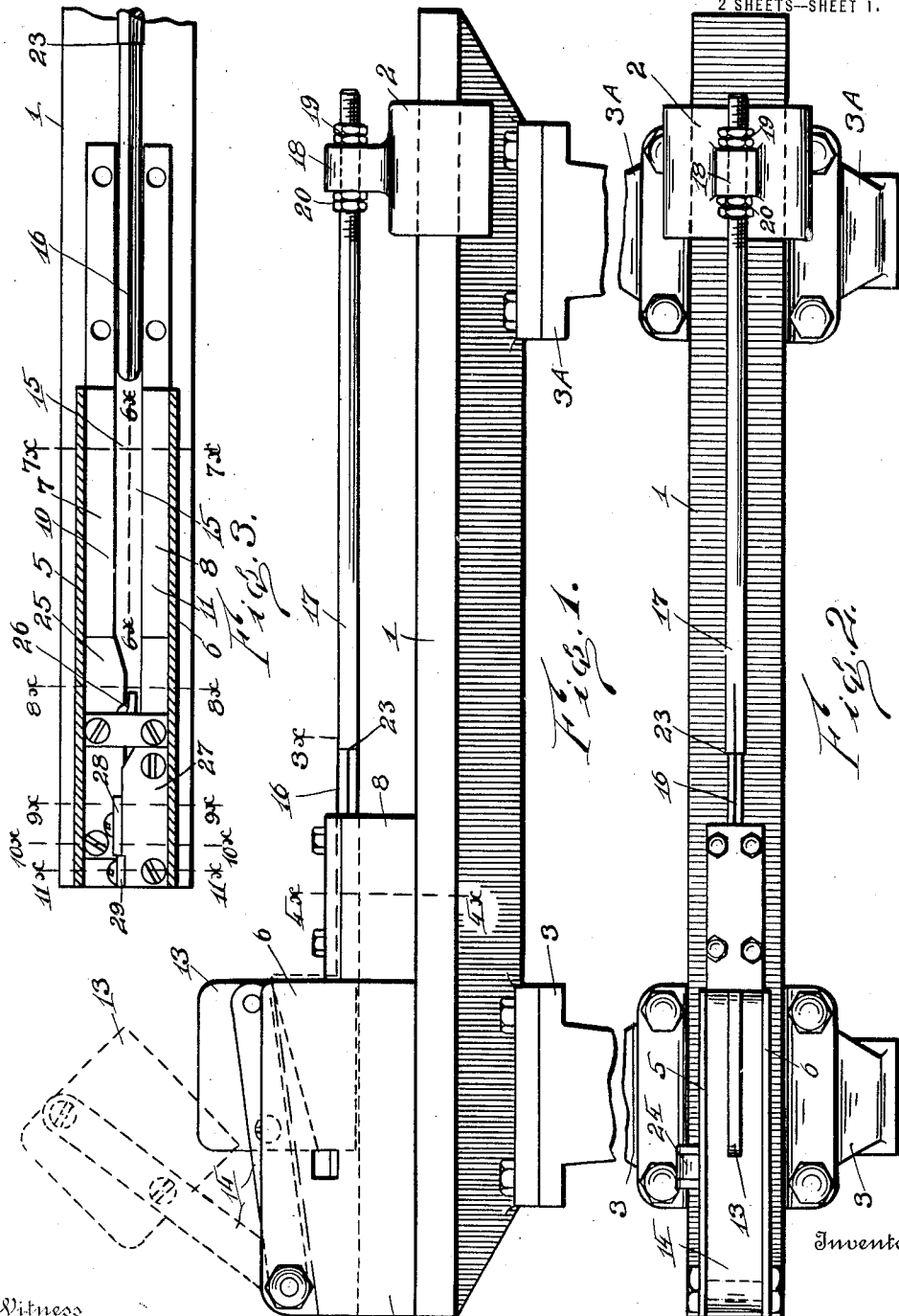


1,327,641.

Patented Jan. 13, 1920.

2 SHEETS—SHEET 1.



Witness

Eric Schinger

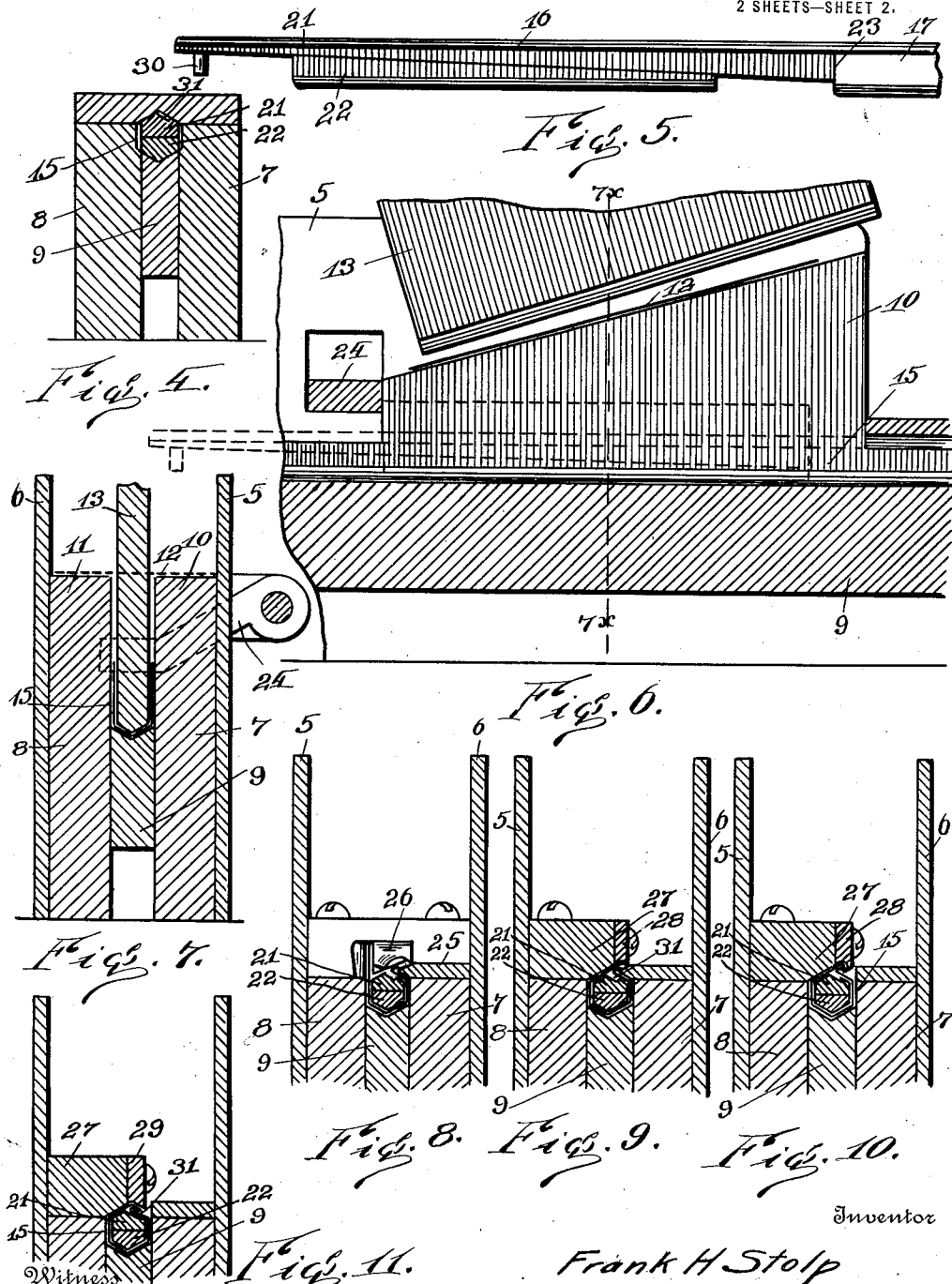
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

FRANK H. STOLP, OF GENEVA, NEW YORK.

MACHINE FOR FORMING METAL TUBES.

1,327,641.

Specification of Letters Patent.

Patented Jan. 13, 1920.

Application filed May 12, 1917, Serial No. 168,260. Renewed June 18, 1918. Serial No. 240,687.

To all whom it may concern:

Be it known that I, FRANK H. STOLP, a citizen of the United States, residing at Geneva, in the county of Ontario and State of New York, have invented certain new and useful Improvements in Machines for Forming Metal Tubes, of which the following is a specification.

The present invention relates to metal working machinery and it has for its object to provide a simple, efficient and conveniently operable machine for forming strips or blanks of sheet metal into tubular or tube-like structures involving the creasing or bending of opposite lateral edges of the blank with relation to its central portion. The invention contemplates the provision of an improved apparatus for shaping into tube form a sheet metal blank and interlocking the edges of this tube in a tight joint of the character, for instance, known in the art as a lock seam.

This and other objects of this invention will be fully illustrated in the drawings, described in the specification and pointed out in the claims at the end thereof.

In the accompanying drawings,

Figure 1 is a side elevation of the machine.

Fig. 2 is a top plan view of the machine.

Fig. 3 is a horizontal sectional view of the machine, the section being taken on the line 3^x—3^x of Fig. 1.

Fig. 4 is a vertical cross section through the guide channel for guiding the mandrel of the machine, the section being taken on the line 4^x—4^x of Fig. 1.

Fig. 5 is a side elevation of the outer end of the mandrel.

Fig. 6 is a vertical longitudinal section through the initial breaking die and folding plunger therefor, the section being taken on the line 6^x—6^x of Fig. 3.

Fig. 7 is a vertical cross section through the breaking die and folding plunger, the section being taken on the line 7^x—7^x of Figs. 3 and 6.

Figs. 8, 9, 10 and 11 are vertical cross sections through different sections of the finishing dies for lock seaming the tube, the sections being taken on the lines 8^x—8^x, 9^x—9^x, 10^x—10^x and 11^x—11^x respectively of Fig. 3.

In the several figures of the drawings, like reference numerals indicate like parts.

In machines for forming lock seam tubing and similar products such as butt seam tub-

ing and metal moldings, the product is usually delivered by the machine in continuous lengths and it has to be sawed or sheared at the proper intervals where a quantity of relatively short length tubes is desired. This sawing or shearing, if done on the machine, not only slows up its productive capacity but in any event, produces an inferior article because tubing is difficult to cut without mutilation and the ends of the tubes will be found to have burs or other irregularities at their extremities. In the practice of my present invention, the length of the product tube is determined by the length of the prepared blank that is used to make it and the tube is delivered from the machine with ends of the same regularity and smoothness as those of the blanks with which the machine is fed. In the present embodiment of the invention, I have attempted to show, for the sake of clearness, only the principal elements of a tube making machine, but it will be obvious to those skilled in the art that these elements are such as to lend themselves readily to the coordination required in the designing of automatic machinery for producing short length tubing with great smoothness and rapidity. Neither do I claim herein the method of working sheet metal disclosed in connection with the description of the embodiment of the present invention as that invention is reserved for and will be presented in a separate application.

The machine shown in the accompanying drawings comprises the bed plate 1 which forms a run way for the cross-head 2 to slide thereon. The bed plate 1 is supported by suitable legs 3 and 3^a as shown in Figs. 1 and 2. Bolted to the top of the bedplate at the left hand end thereof is the channel frame 4 which is formed by the upright plates 5 and 6, which plates embrace the breaking and bending dies as hereinafter described.

The forming channel 15, into which the sheet metal plate is forced to conform to the outline thereof, comprises the longitudinal bars 7 and 8 with the bar 9 supported between them. All of these bars together with the upright plates 5 and 6 are rigidly held together by suitable bolts and form the channel frame 4 which in turn is fastened to the bedplate 1 as pointed out above.

The longitudinal bars 7, 8 and 9 form the sides and bottom of the guide channel 15

into which the sheet metal plate is forced vertically by means of a plunger to form the bottom and sides of the tube. After this operation is completed the sheet metal channel formed in this manner is pushed forward by means of a mandrel. On its forward movement with this mandrel, the sides of the sheet metal channel are folded over the top of the mandrel and the ends thereof are gradually locked into each other by means of suitable folding dies until at the end of the forward movement of the mandrel the sheet metal channel has been completely closed at the top with a lock seam so that when the mandrel is withdrawn from the inside thereof, the complete metal tube may be taken off at the end of the machine.

To perform these operations the different parts of the machine and their coöperation is as follows:

Each of the longitudinal bars 7 and 8 is provided with an angular projection 10 and 11 respectively. These projections extend upwardly between the upright plates 5 and 6 and form supports on each side of the guide channel 15 on top of which the sheet metal blanks are placed as shown at 12 in Figs. 6 and 7.

Mounted to slide between the projections 10 and 11 is the plunger plate 13 which is carried on the outer end of the arm 14. This arm is mounted to swing in the channel frame 4 and is pivotally mounted at the upper left-hand corner thereof as shown in Figs. 1 and 2. When the plunger 13 is swung from the dotted line position shown in Fig. 1 to the full line position shown in the same figure, the sheet metal plate 12, placed on top of the supports 10 and 11, as shown in Fig. 6, is bent in the middle thereof and forced down between the projections 10 and 11 and into the guide channel 15 as shown in full lines in Fig. 7. The outline of the lower edge of the plunger 13 conforms to the outline of the bottom of the guide channel 15 formed by the bar 9 so that the sheet metal plate 12 forced into this guide channel is bent into a channel having the same outline at the bottom thereof.

The sheet metal channel formed in this manner snugly adheres to the bottom and sides of the guide channel 15 due to the spring action of the sheet metal. This allows the plunger 13 to be withdrawn from the inside of the channel formed thereby leaving the sheet metal channel in place in the guide channel 15. To withdraw the plunger plate 13 from within the channel, the arm 14 is swung back from the full line position to the dotted line position shown in Fig. 1.

The reduced outer end 16 of the mandrel 17 is then gradually inserted into the sheet metal tube formed by the plunger 13. This mandrel is supported at the right-hand end

thereof by a lug 18 having an opening through the center thereof through which the end of the mandrel 17 passes. Lock nuts 19 and 20 are provided on each side of the lug 18 and are threaded on the end of the mandrel 17 by means of which this end of the mandrel can be rigidly fastened to the lug 18 as shown in Figs. 1 and 2. The lug 18 is carried on top of the crosshead and forms a part thereof.

To move the forward end 16 and the mandrel 17 into the sheet metal channel previously formed by the plunger 13 the crosshead 2 is moved to the left on the bedplate 1. As previously described the outer end 16 of the mandrel 17 is of reduced diameter and is formed out of an upper section 21 and a lower section 22. The dividing line between these sections tapers toward the outer end of the mandrel so that the lower section 22, which is shorter than the upper section 21, can slide in and out thereon, it being understood that the upper section 21 is integral with the mandrel 17 while the lower section 22 is made a separate member thereof. This is for a purpose that will presently appear.

The shoulder 23 formed on the inner end of the reduced end 16 of the mandrel 17 is adapted to engage the outer edge of the sheet metal channel on the forward movement. The outside diameter of the reduced end 16 equals the inside diameter of the sheet metal channel, while the outside diameter of the remainder of the mandrel 17 equals the outside diameter of the sheet metal channel, which in turn equals the inside diameter of the guide channel 15. From this it will be seen that when the outer end of the mandrel has engaged the inside of the sheet metal channel, the sides of the mandrel beginning with the shoulder 23, form a continuation of the sides of the sheet metal channel and completely fill the inside of the guide channel 15.

During the forward movement of the mandrel the sheet metal channel remains stationary in the guide channel 15 until the shoulder 23 engages the right-hand end of the sheet metal channel. In order to prevent any accidental forward movement of the sheet metal channel before the outer section 16 of the mandrel has completely filled the inside thereof and before the shoulder 23 has come in contact therewith a latch 24 is provided which projects into the inside of the channel frame 4 and across the path of the upper edge of the sheet metal channel as shown in Fig. 7. This latch prevents the forward end of the sheet metal channel to move in the guide channel 15 beyond the projections 10 and 11 until the opposite end thereof has been engaged by the shoulder 23 of the mandrel 17. When the shoulder 23 has engaged the sheet metal channel on the forward movement of the mandrel the latch

24 is lifted to allow the mandrel 16 to carry the sheet metal channel with it and force it between the finishing dies as will presently appear.

5 Mounted on top of the longitudinal bars 7 and 8 and overlapping the guide channel 15 are suitable finishing dies which gradually bend the upper portions of the sides of the sheet metal channel toward each other and also lock the ends thereof together to
10 convert the sheet metal channel into a tube. These finishing dies comprise several members which are illustrated in Figs. 3, 8, 9, 10 and 11.

15 The member 25 which is mounted on top of the bar 7 partially overlaps the guide channel 15 and is shaped on the under side thereof to bend the upper portion of the right-hand side of the sheet metal channel
20 toward the left and over the top of the mandrel 16. The outer edge of this same side of the sheet metal channel is then bent back over the top of the member 25 by means of the member 26 as shown in Fig. 8. At the
25 same time the upper portion of the left-hand side of the sheet metal channel is bent toward the right and over the top of the mandrel 16 by means of the member 27 which member is mounted on top of the bar
30 8 and overlaps the guide channel 15 from the left.

The member 28 carried on the outside of the member 27 then gradually bends the
35 outer edge of the left-hand side of the sheet metal channel over the edge of the outer end of the right-hand side of the sheet metal channel until the outer end of the left-hand side of the sheet metal channel completely embraces the extreme outer end of the right-hand side of the sheet metal channel as
40 shown in Figs. 9 and 10.

After successively passing each of these members the finishing member 29 forces the joint thus made by the previous members
45 down upon the top of the tube and partially into the groove 31 formed in the top of the upper section 21 of the mandrel 16.

The mandrel and sheet metal tube emerges, after passing underneath all of
50 these members, from the left-hand side of the machine and moves out thereof until the whole of the sheet metal channel is formed into a tube. It will be understood that during the forward movement of the mandrel
55 16 the upper section 21 thereof has moved over the top of the lower section 22 until the diameter of the combined mandrel was large enough to completely fill out the inside of the tube which is gradually formed thereon, and when the mandrel 16 is withdrawn, the tube formed thereon is released therefrom as follows:

The upper section 21 on its rearward travel slides over the lower section 22 there-
65 of until the pin 30 comes in contact there-

with. This movement of the upper section 22 over the lower section 21 reduces the diameter of the mandrel 16 because of the inclined surface of each of the sections. The reduction of the diameter of the mandrel 70 in turn releases the inside of the finished tube from the mandrel 16 and allows it to be taken off therefrom. After the tube is released from the mandrel the pin 30 carries the lower section 22 with the upper section 21 to the rear and brings it into position for the forming of a new tube.

While the drawings show this machine adapted to form a hexagonal metal tube, it is understood that any other form such as
80 a round or oval tube may be formed with the same machine by simply changing the outline of the bottom of the guide channel and using a mandrel having a cross section corresponding to the outline of the tube to
85 be formed thereon.

Similarly, and as heretofore indicated, metal moldings or butt seam tubing may be produced. In fact, the precise nature of the manipulations imparted to the lateral edges
90 of the blank depends upon the nature of the creasing or folding dies used and others having different characteristics and functions than the ones shown may obviously be substituted for the production of a modified
95 article, all within the spirit of my invention.

I claim:

1. In a machine for forming metal tubes, the combination of a forming die, a plunger adapted to force a sheet metal blank into
100 said forming die, a mandrel passing through said die and being adapted to carry with it the sheet metal blank forced into said forming die, a series of folding dies in line with said forming die, said mandrel being adapted
105 to force the sheet metal blank from said forming die into said folding dies.

2. In a machine for forming metal tubes, the combination of a runway, a crosshead mounted to slide on said runway, a forming
110 die mounted on one end of said runway, folding dies in line with said forming die, a mandrel mounted on said crosshead, said mandrel being adapted to be moved through said forming die and underneath said fold-
115 ing dies by said crosshead.

3. In a machine for forming metal tubes, the combination of a frame, a guide channel in said frame, a mandrel mounted to slide in said guide channel, means for forcing a
120 sheet metal blank into said guide channel, and means on said mandrel to engage the sheet metal blank and move it along said guide channel.

4. In a machine for forming metal tubes, the combination of a frame, a forming die located in said frame, a guide channel lead-
125 ing in and out of said forming die, a mandrel adapted to pass through said guide channel, a series of folding dies overlapping
130

said guide channel at the end of said forming die, a plunger adapted to force a sheet metal blank into said forming die, said mandrel being adapted to force the sheet metal blank from said forming die and underneath said folding dies means operating said mandrel.

5. In a machine for forming metal tubes, the combination of a frame, a runway formed on said frame, a crosshead mounted to slide on said runway, a mandrel carried by said crosshead, a guide channel mounted on said frame and in line with said mandrel, a portion of said guide channel being adapted to form a die into which a sheet metal blank may be forced to form a sheet metal channel, a series of folding dies overhanging said die, said mandrel being adapted to force the sheet metal channel out of said die and underneath said folding dies, said folding dies being adapted to fold the open ends of the sheet metal channel toward each other and form a tube out of it.

6. In a machine for forming sheet metal tubes, the combination of a forming die, a guide channel leading into and out of said die, a mandrel adapted to slide in said guide channel and through said forming die, said mandrel comprising an upper and a lower member, said lower member being adapted to slide on said upper section to increase or decrease the diameter of said mandrel, a shoulder on the inner end of said mandrel, said shoulder being adapted to force the sheet metal channel formed in said forming die into said guide channel, folding dies in line with said forming die to convert the sheet metal channel into a tube.

7. In a machine for forming metal tubes, a former composed of a series of folding dies, a movable mandrel having a shoulder provided thereon to force a sheet metal blank forwardly on the forward movement of said mandrel to move the metal blank through the former and form it into a tube around said mandrel.

8. In a machine for forming metal tubes, the combination of a frame, a series of folding dies mounted on said frame, an expanding mandrel mounted to slide on said frame

and passing underneath said folding dies, said mandrel being adapted to carry a metal blank during its forward movement underneath said folding dies, said mandrel being also adapted to release this metal blank after it has been formed and folded around said mandrel at the end of its travel.

9. In a machine for forming metal tubes, a former composed of a bending die, a series of folding dies and a movable mandrel, said movable mandrel having a shoulder provided thereon to force a flat sheet of metal through said dies and form it into a tube with a seam.

10. In a machine for forming sheet metal, the combination with a guideway and a mandrel longitudinally movable therein and provided with a shoulder adapted to abut the rear edges of a blank to force it through the guideway, of dies arranged laterally of and adjacent to the guideway to receive and shape the lateral edges of the moving blank while the blank is supported by the guideway.

11. In a machine for forming sheet metal, the combination with a guideway and a mandrel longitudinally movable therein, a forward portion of said mandrel being separated from the walls of the guideway a distance equal to the thickness of the material to be worked and a rearward portion being closely fitted to the guideway forming a shoulder adapted to abut the rear edge of a blank to force it through the guideway, of dies arranged laterally of and adjacent to the guideway to receive and shape the lateral edges of the moving blank while the blank is supported by the guideway.

12. In a machine for forming sheet metal, the combination with a guideway and a mandrel longitudinally movable therein and provided with a shoulder adapted to abut the rear edge of a blank to force it through the guideway, of a plurality of laterally arranged folding dies fixed relatively to the guideway to successively receive and form the lateral edges of the blank while the blank is supported by the guideway.

In testimony whereof I affix my signature.

FRANK H. STOLP.