Oct. 28, 1924. 1,513,100

C. H. FREDERICK

MITERING TUBE

Filed Aug. 10, 1923 2 Sheets-Sheet 1

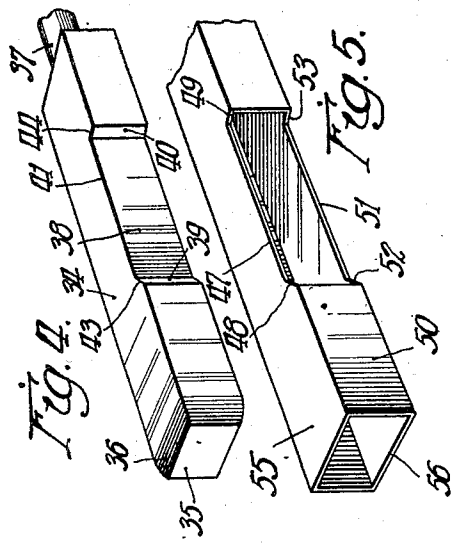


Fig. 4.

Fig. 5.

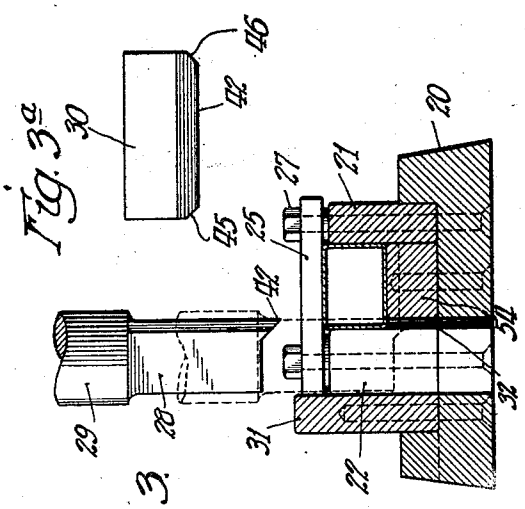


Fig. 3a

Fig. 3.

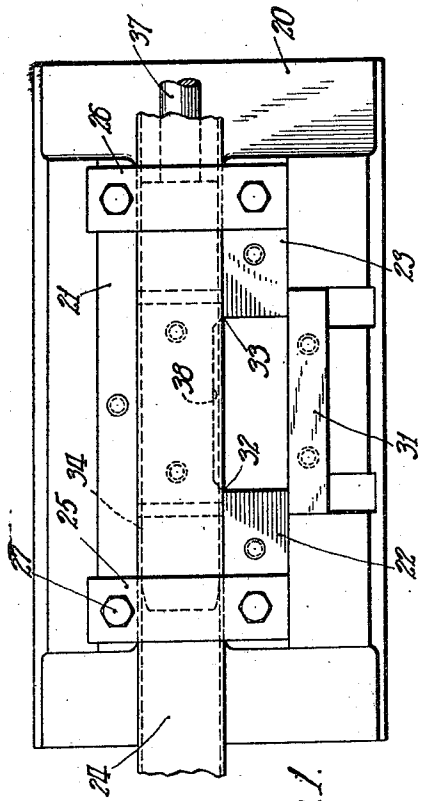


Fig. 1.

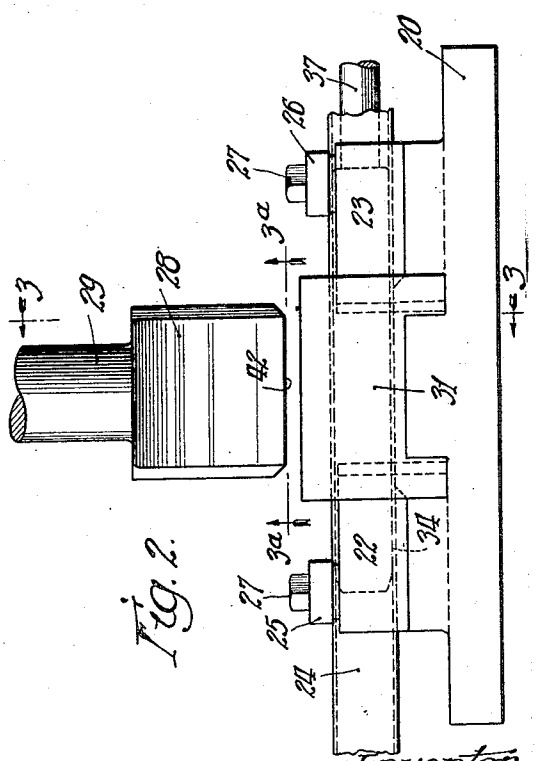


Fig. 2.

Inventor.
Clarence H. Frederick.
Fisher Towle Clapp & Soans Attys

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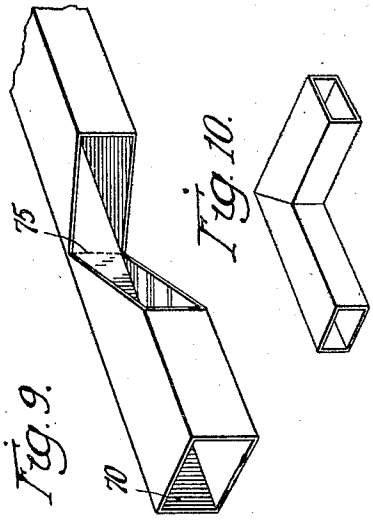


Fig. 9.

Fig. 10.

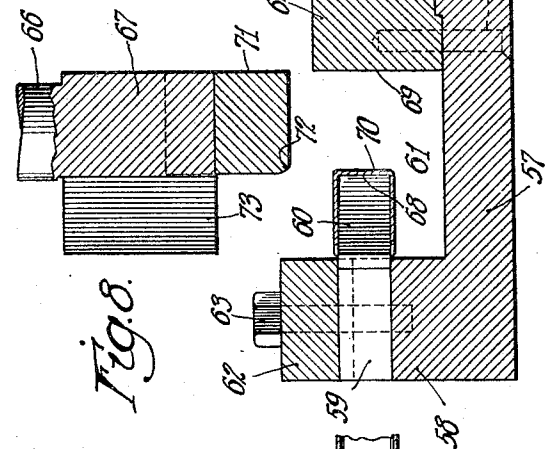


Fig. 8.

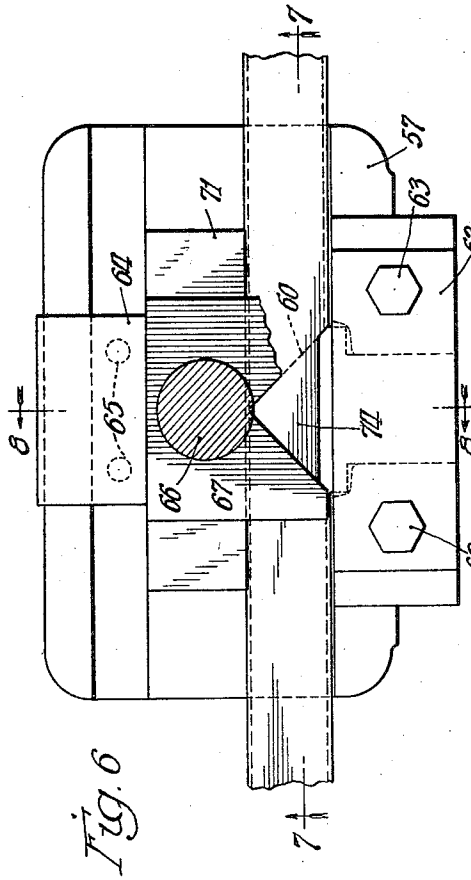


Fig. 6

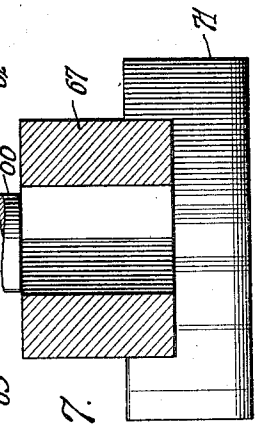
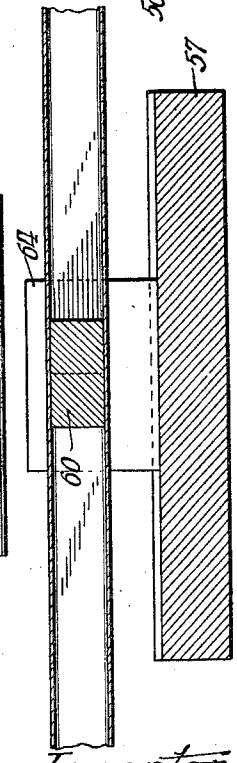


Fig. 7.



Inventor.
Clarence H. Frederick.
Fisher Towle Clapp & Soans Attys.

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UNITED STATES PATENT OFFICE.

CLARENCE H. FREDERICK, OF KENOSHA, WISCONSIN, ASSIGNOR TO SIMMONS COMPANY, OF KENOSHA, WISCONSIN, A CORPORATION OF DELAWARE.

MITERING TUBE.

Application filed August 10, 1923. Serial No. 656,688.

To all whom it may concern:

Be it known that I, CLARENCE H. FREDERICK, a citizen of the United States, residing at Kenosha, in the county of Kenosha and State of Wisconsin, have invented certain new and useful Improvements in Mitering Tubes, of which the following is a specification.

My invention relates to improvements in mitering tubes and has particular reference to the method of cutting a V-shaped notch in the side of a length of tubing in order to permit same to be bent at an angle, thereby producing in effect a miter joint.

The principal objects of the invention are to provide an improved method of cutting such V-shaped notches which shall be specially applicable to tubing, the cross section of which is substantially rectangular and particularly in connection with tubing made of relatively thin sheet metal; to provide an improved process of the character referred to involving a minimum number of operative steps; to provide a process which may be conveniently practiced by the use of comparatively simple and inexpensive cutting devices or dies; to provide a process which can be depended upon to turn out accurate work and which will not buckle or distort the tubing subjected to said process; to provide an improved apparatus for carrying out said process and in general to provide a simple, economical and efficient process and apparatus of the character referred to.

Referring to the drawings which illustrate my invention as applied to the cutting of a V-shaped notch in the side of a length of light weight steel tubing of rectangular cross section,

Fig. 1 is a plan view of the lower die equipment for performing the first operative step.

Fig. 2 is a front elevation of the parts shown in Fig. 1 and also showing the punch.

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

Fig. 3^a is a view of the punch looking in the direction of the arrows 3^a—3^a of Fig. 2.

Fig. 4 is a perspective view of the interior die block which cooperates with the punch shown in Figs. 2 and 3.

Fig. 5 is a perspective view of a length of tubing after it has been subjected to the first operation.

Fig. 6 is a plan view of the punch and die equipment for performing the second and third operations.

Fig. 7 is a section taken on the line 7—7 of Fig. 6.

Fig. 8 is a section taken on the line 8—8 of Fig. 6.

Fig. 9 is a perspective view of the length of tubing after all of the cutting operations have been performed thereon, and

Fig. 10 is a perspective view showing the tube after it has been bent to bring the mitered edges together, forming an angular corner or bend therein.

Heretofore, so far as I am aware, it has been the usual practice when forming miters in tubing, to use separate independent lengths of tubing, the ends of which have been suitably beveled by sawing or otherwise, to make them fit the adjacent correspondingly cut end of the adjoining tube section. It will be manifest that this method, although it can be carried out with great speed and with comparatively simple sawing equipment, involves considerable difficulty when the mating ends of the tube sections are joined together. In the first place, it is often difficult to hold the tube lengths at the proper angle, and in the same common plane when they are being united together by welding brazing or otherwise and in the second place, unless extraordinary care be taken to saw the several parts of the finished miter structure from the same length or the same batch of tubing, there is a possibility that variations in the size of the tubing may cause badly fitting corners or corners which require special operations after union in order to bring them to the desired state of fit and finish.

I am aware that attempts have been made to remove V-shaped portions of metal from the sides of metal lengths in order that they may be bent to form such mitered joints, but so far as I am advised, no one has attempted or been able to cut such notches simply and economically by means of punch and die equipment.

In order to secure maximum simplicity of operation and equipment, I prefer to divide my improved process into three steps. The first step of the process involves the cutting of an opening, usually rectangular, in one of the side walls of the tubing, said side wall being preferably removed for a distance equal to the length of the base of the V-

shaped notch desired. (See Fig. 5). There is then inserted into the tube one or more die members, which, cooperating with a relatively movable external die member in the second step of the operation, serve to remove or to complete the removal of a V-shaped section of metal from one of the face walls of the tube. The third step in the process involves the removal of the V-shaped section of metal from the opposite face wall, the finish of this operation leaving the tubing in the condition shown in Fig. 9.

Referring to the drawings in which Figs. 1, 2, 3 and 4 show the equipment for performing the first operation, 20 indicates the base or shoe upon which the lower die equipment is mounted. Said equipment includes a guide strip 21 on one side, and spaced guide blocks 22 and 23 on the other side forming a groove or slot for receiving the tube length 24. Cross strips 25 and 26 held down by means such as cap screws 27, serve to hold down the tube against the upward drag of the punch 28. Said punch 28 is carried on the lower end of the usual stem or shank 29 which is clamped in the reciprocating member or head of the press and is made with a substantially rectangular back portion 30 arranged to slide behind and be sustained by an abutment 31 secured to the upper surface of shoe 20.

The blocks 22 and 23 which, beside serving as guides, also participate in the cutting operation, are made with vertically extending cutting edges 32 and 33 and are spaced apart to slidably receive the punch 28.

In Fig. 4, I have illustrated the plug die 34 which comprises a length of steel of rectangular cross section of suitable dimensions to fit snugly the interior of the tube length 24, the free end 35 of said plug die 34 being beveled as indicated at 36 so that the end of the tube 24 will freely slip over the end of said plug. Said plug 34 is supported at its fixed end by means of a stem comprising a stout rod 37 secured or fixed against longitudinal movement in any suitable manner and upon any suitable stationary portion of the press bed.

Said plug die 34 has its side cut away to correspond with the shape of the opening desired in the side of the tube as indicated in Fig. 4. This involves the milling off or shaping of the side of the die block 34 to form a shallow notch the bottom of which is formed by a vertical wall 38, the sides of the notch being also vertical but beveled as indicated at 39 and 40, the angle of bevel corresponding to the angular position of the sides of the V-shaped notch desired.

The upper edge 41 of the notch 38 cooperates with the lower edge or point 42 of the punch while the upper edges 43 and 44 of the beveled sides of said notch 38 cooperate respectively with the beveled edges 45 and 46 of said punch. It will be manifest that when the punch 28 is depressed, the initial portion of the first step of the operation will result in the shearing of the edge 47 immediately followed by the cutting of the short beveled edges 48 and 49, and as the punch continues to descend, the side wall 50 of the tube will be sheared away by reason of the side edges of the punch cooperating with the cutting edges 32 and 33, previously referred to.

The shearing of the lower edge 51 of the notch and the short beveled edges 52 and 53 is performed by the cutting edges 42, 45 and 46 of the punch cooperating with a lower die member indicated best at 54 in Fig. 3, upon which the bottom face wall of the tube 24 is supported and which is notched out in a manner similar to the interior plug die 34. Thus, when the punch has completed its downward stroke, there has been removed from the side wall of the tube 24 a complete section of its length and there are also removed from the upper face wall 55 and lower face wall 56, sections of metal of shape substantially the same as that of the notch 38 in the plug die 34. This leaves the tubing in condition for the next two or final steps of the process.

For completing the notch in the opposite face walls 55 and 56 of the tube, comparatively simple die equipment is employed. Referring to Figs. 6, 7 and 8, 57 is the base or shoe which carries the lower die means, and, as shown best in Fig. 8, is somewhat L-shaped in vertical cross section so as to provide an upstanding ledge part 58. On said ledge part there is clamped a horizontally extending die member having a rectangular shank 59 and a cutting portion 60 which is V-shaped in plan and extends inwardly of the extension 58 so as to project into the channel portion 61 of the lower die member.

The shank 59 is clamped in position by a suitable block 62 and bolts or screws 63, and the other wall of the channel 61 is formed by an abutment member 64 which takes the form of a rectangular block interlocked with the base 57 and secured thereto by means of screws as at 65. The upper die member is mounted upon the usual shank 66 which carries a cutting member 67 made in the form of a rectangular block having formed in one side thereof a V-shaped cutting edge adapted to cooperate with the V-shaped cutting edge of the stationary die 60.

When the upper or reciprocating die is elevated into its normal position, the tube may be introduced into the channel 61 between the point 68 of the stationary die

60 and the vertical wall 69 of abutment 64, whereupon the tube is then moved transversely so as to cause the point of stationary die member 60 to enter the rectangular notch or opening in the side wall 50 of the tube. The dimensions and angle of said V-shaped die member 60 are such that, as indicated in Fig. 6, the sides of the die will engage the vertical edges of said opening while leaving the actual point 68 of the die barely in contact with the opposite or outer side wall 70 of the tube, the edges of the V constituting in effect continuations of the beveled edges 48 and 49 (see Fig. 5). It will be understood that the vertical depth of the die block 60 is slightly less than the interior vertical dimension of the tube so that the die 60 will enter said tube freely. By further reference to Fig. 8, it will be seen that in the lower end of the die block 67 there is bolted or otherwise secured a depending extension 71 which is of the proper distance to fit between the outer wall 70 of the tube and the vertical wall 69 of abutment 64. The inner edge 72 of said extension 71 is preferably rounded or beveled slightly as shown in Fig. 8 so as to crowd the tube toward the shank 59 of die 60 and thereby insure accuracy in the cutting operation when the cutting edge 73 of die 67 later engages the face wall of the tube.

It will be manifest that when the press is tripped the die 67 will engage the face wall 55 of the tube and in cooperation with the cutting die 60 which supports the V-shaped portion 74, will effect severance of said last named section of metal completing the formation of the V-shaped notch in the upper face wall 55 of the tube. Upon return of the head of the press to its normal elevated position, the tube is turned end for end and replaced on die 60 so that when the press is tripped a second time a similar V-shaped portion of metal will be removed from the lower face wall 56 of the tube. Said tube is then in the condition shown in Fig. 9 and the process of cutting the V-shaped notch therein is hence complete. Said tube may then be bent along dotted lines 75 by any suitable means so as to complete the formation of the miter joint, as indicated in Fig. 10, said joint being subsequently welded or brazed together to fill up the same and unite the edges thereof securely together.

The described details of the process and equipment being illustrative of merely one phase of my invention, the scope of same should be determined by reference to the appended claims, said claims being construed as broadly as possible, consistent with the state of the art.

I claim as my invention:

1. The method of forming a V-shaped notch at a point intermediate the length of a tube having a rectangular cross section preparatory to bending same to form an angle or miter therein, which consists in first cutting away one of the side walls of the tube to form a rectangular opening therein, then inserting die means into the tube and then effecting relative movement of said means and external cooperating die means to remove V-shaped sections of metal from the opposite walls of the tube adjoining said opening.

2. The method of forming a V-shaped notch at a point intermediate the length of a tube having a rectangular cross section preparatory to bending same to form an angle or miter therein, which consists in first cutting away one of the side walls of the tube to form a rectangular opening therein, then inserting a V-shaped die block through said opening and then effecting relative movement of said block and a cooperating V-shaped cutting die to remove V-shaped sections of metal from the opposite walls of the tube adjoining said opening.

3. Apparatus for the purpose described comprising in general a horizontally extending self-supporting die member of V-shaped cross section, a vertically reciprocating die member cooperating with said first mentioned die member, and means on the lower end of said second die member for cooperating with a tubular member supported by the first die member for holding a tube in position on said first mentioned die member.

CLARENCE H. FREDERICK.