Sept. 15, 1925. 1,553,675

H. A. DOUGLAS

MACHINE FOR MAKING JOINTS

Original Filed Jan. 27, 1921 3 Sheets-Sheet 1

Fig. 1.

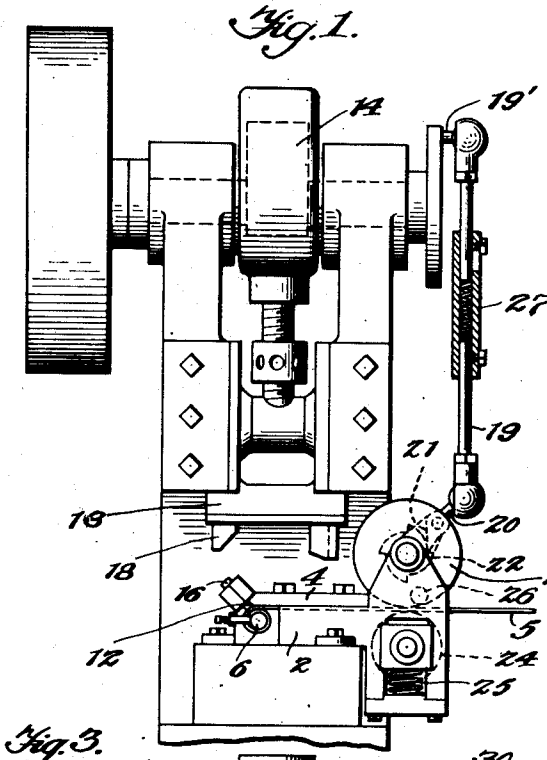


Fig. 2.

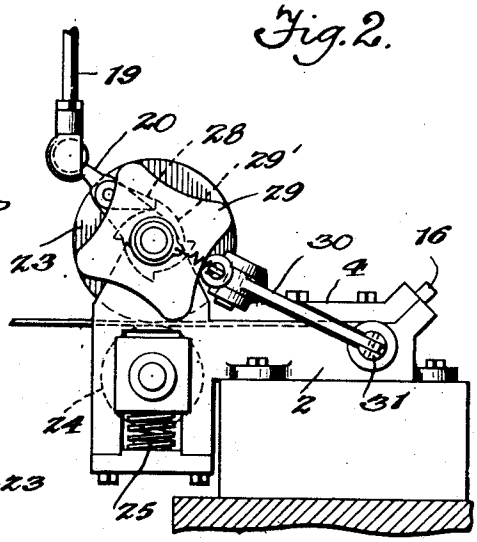
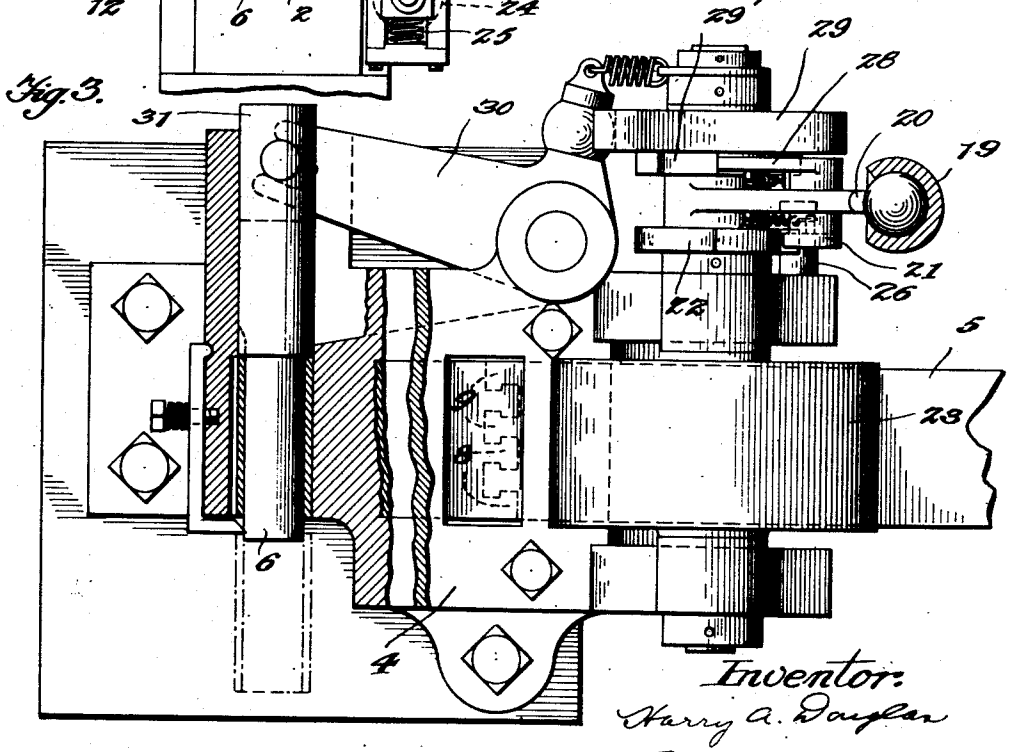


Fig. 3.



Inventor:
Harry A. Douglas
By R. L. Bragg
Attorney

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H. A. DOUGLAS

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Fig. 4.

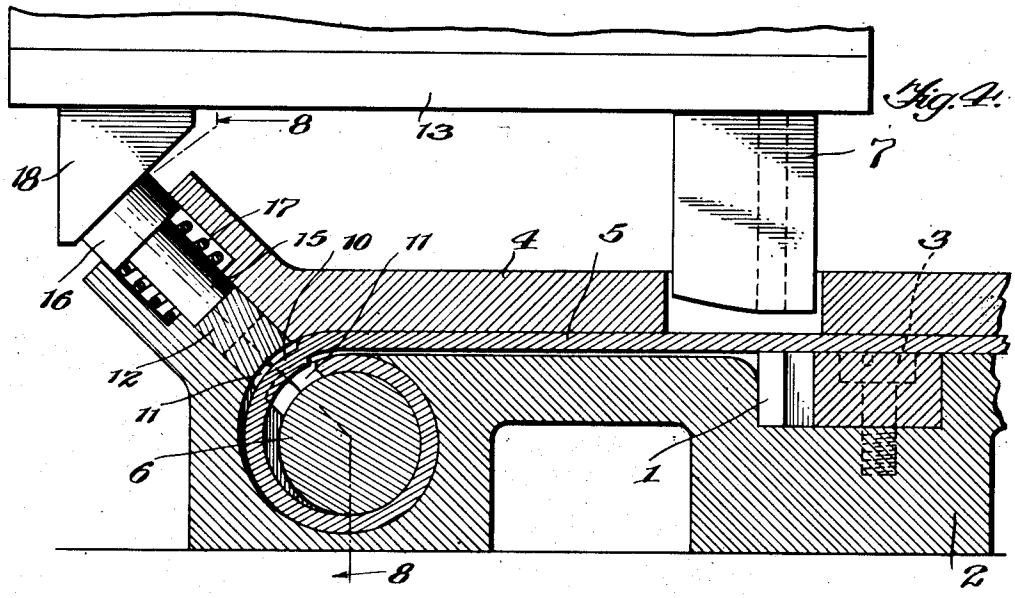


Fig. 5.

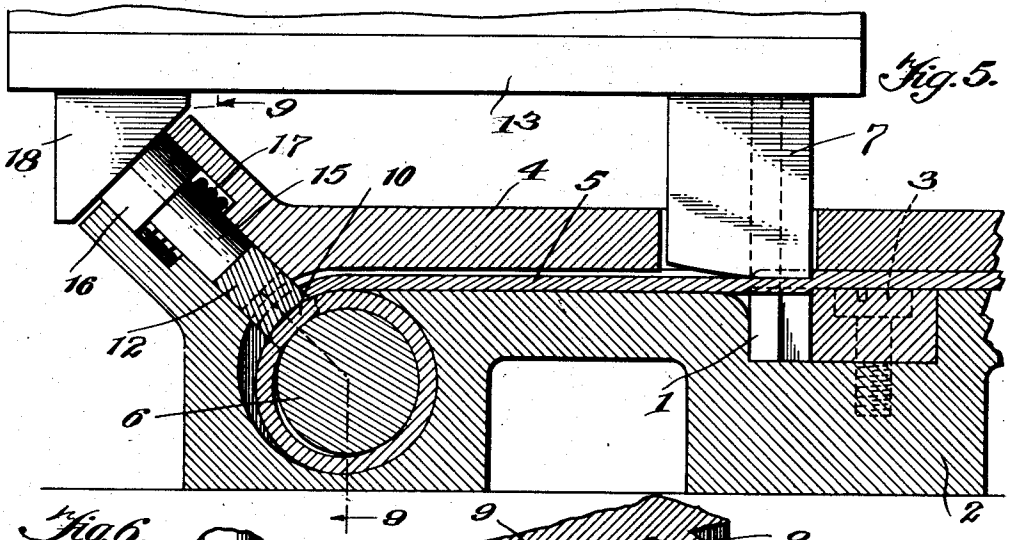


Fig. 6.

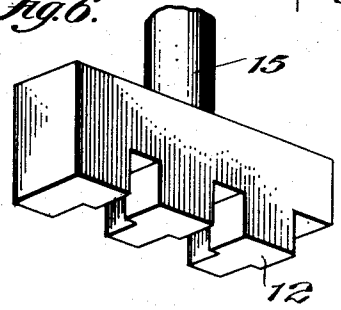
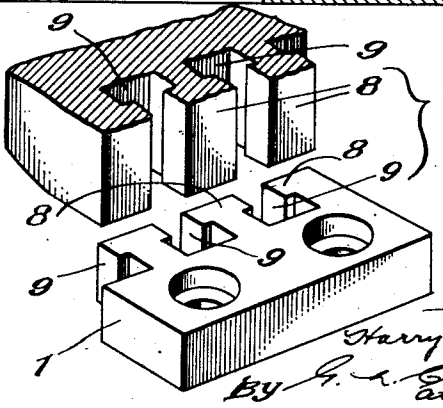


Fig. 7.



Inventor:
Harry A. Douglas
By G. A. Gragg
Attorney

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H. A. DOUGLAS

MACHINE FOR MAKING JOINTS

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Fig. 8.

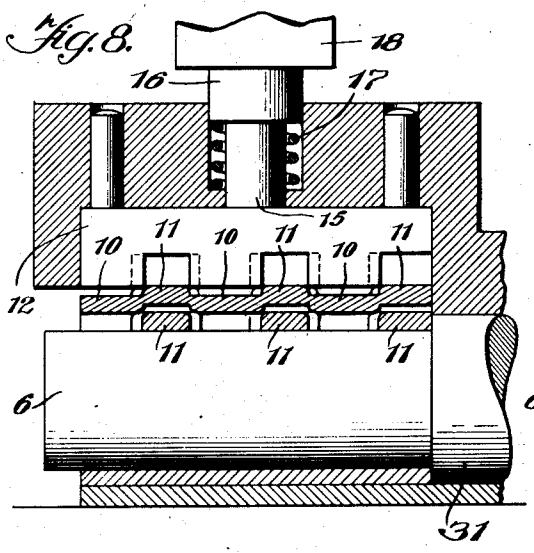


Fig. 9.

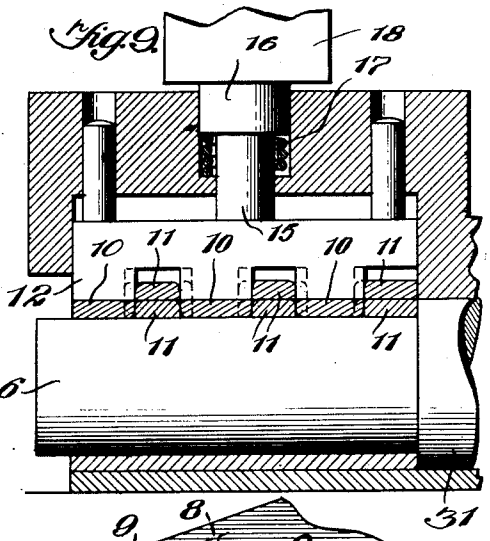


Fig. 10

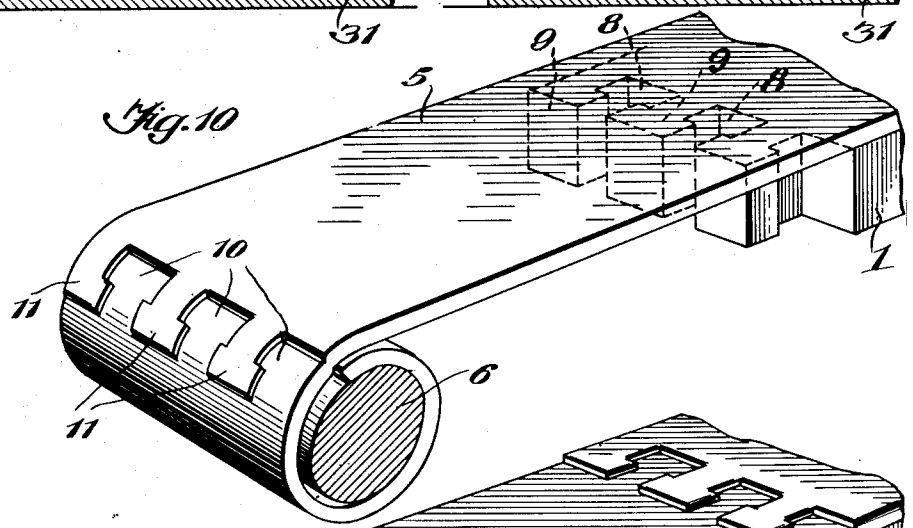


Fig. 11.

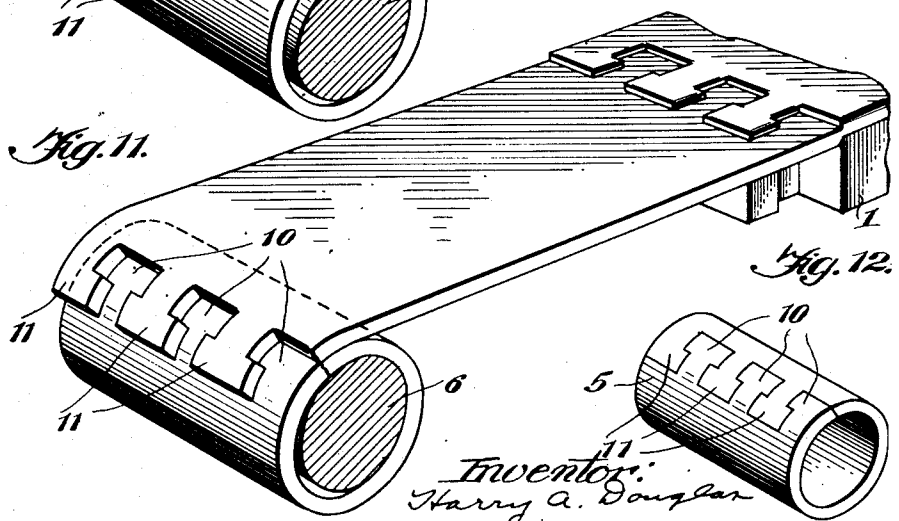


Fig. 12.

Inventor:
Harry A. Douglas
By G. L. Craig
Attorney

Patented Sept. 15, 1925. 1,553,675

UNITED STATES PATENT OFFICE.

HARRY A. DOUGLAS, OF BRONSON, MICHIGAN.

MACHINE FOR MAKING JOINTS.

Original application filed January 27, 1921, Serial No. 440,483. Divided and this application filed December 3, 1923. Serial No. 678,209.

To all whom it may concern:

Be it known that I, HARRY A. DOUGLAS, a citizen of the United States, residing at Bronson, in the county of Branch and State of Michigan, have invented a certain new and useful Improvement in a Machine for Making Joints, of which the following is a full, clear, concise, and exact description.

My invention relates to a machine for uniting edge portions of sheet material by mortises and tenons and is of particular utility when employed in forming a plurality of hollow bodies out of a sheet of suitable material such as brass. This application is a division of my original application Serial No. 440,483, filed January 27, 1921 which resulted in Patent 1,504,464, dated Aug. 12, 1924.

My invention has been employed for forming metallic shells which are used in the construction of circuit connectors or sockets but the product of the invention is not to be limited to any particular use to which it may be put.

In accordance with my invention, the portions of the sheet material that are to be removed to form the mortises are first merely depressed, preferably to a point where their slight further depression would effect the removal of these portions. Tenons which conform in configuration to these mortises and which are to be fitted therein are placed in registry with the depressed material whereafter these tenons are forced into the mortise spaces to remove the depressed material to complete the formation of the mortises and effect the location of the tenons therein.

My invention is of particular service in forming a plurality of hollow bodies out of a sheet of suitable material and the machine for practicing the preferred method of my invention itself preferably includes male and female dies between which the sheet may be passed and co-operating to depress areas of the sheet that conform to rows of mortises, alternated with tenons, that are to be produced, a mandrel about which the sheet may be bent to bring previously completed tenons between the mandrel and sheet and into registry with the incomplete mortises, a female die opposite the mandrel and positioned to be in registry with the aforesaid completed tenons and partially completed mortises, and means for forcing movement of this latter die toward the mandrel and against portions of the sheet material that margin the aforesaid depressed portions thereof whereby said complete tenons complete the removal of the depressed material and are entered within the resulting mortises, the latter die severing the tenons formed because of these mortises from the part of the sheet that is bent about the mandrel.

I will explain my invention more fully by reference to the accompanying drawings in which Fig. 1 is an end view of one form of machine that may be employed; Fig. 2 is a view of a part of the mechanism shown in Fig. 1 taken from the other side; Fig. 3 is a plan view, with parts broken away, of the machine shown in Figs. 1 and 2; Fig. 4 is an end view, partially in section, of a portion of the mechanism with the dies thereof adjusted preparatory to operating upon the sheet metal; Fig. 5 illustrates the parts shown in Fig. 4 after the dies have operated; Fig. 6 is a perspective view of the female die that finally operates to complete the formation of the hollow body or shell; Fig. 7 is a perspective view illustrating the female die and partially illustrating the male die in separated relation; Fig. 8 is a view on line 8—8 of Fig. 4; Fig. 9 is a view on line 9—9 of Fig. 5; Fig. 10 is a perspective view illustrating the sheet curled about the mandrel and before the dies have been brought into operation; Fig. 11 is a view similar to Fig. 10 and showing the sheet after the dies have been brought into operation; and Fig. 12 is a perspective view of one form of product of the method of the machine.

Like parts are indicated by similar characters of reference throughout the different figures.

The female die 1 is normally held in fixed relation with the bed 2 by means of screws 3. A cap plate 4 is mounted upon the bed, there being spacing between this cap plate and bed for the passage of the sheet 5 of metal or other suitable material and for the reception of the mandrel 6 about which the sheet is curled preparatory to the final die operation and the ejection of the product. The male die 7 is in register with the female die 1, these dies being formed with complemental T-shaped or other suitable dovetailed projections 8 and recesses 9. The

male dies are forced into the female dies to an extent which will almost break down the areas of metal that conform to the mortises, the depressed metal indicated at 10 being therefore easily removed by the application of sufficient pressure exerted thereon through the intermediation of tenons, previously completed at the mandrel as will later appear. Tenons are partially formed because of the mortises, as indicated at 11. After the mortises and tenons have thus been partially formed by the co-operation of the dies 1 and 7, as indicated at 10, 11, the sheet is advanced toward and curled about the mandrel to bring the partially completed mortises, indicated at 10, in register with previously completed tenons 11 that are disposed between the depressions 10 and the mandrel. These completed tenons 11 and the partially completed mortises at 10, in addition to being in register with each other, are also in register with the female die 12 that is opposite the mandrel and aligned with a radius thereof, there being means for forcing the die 12 toward the mandrel and against portions of the sheet material that margin the aforesaid depressed portions 11 whereby these margining portions are forced against the mandrel and the completed tenons underlying the depressed portions to force such portions outwardly to complete the formation of the mortises that are to receive said completed tenons and to complete a fresh set of tenons (Fig. 11) to be employed in a similar manner in the formation of a succeeding shell. The die 12, obviously, severs the tenons 11 last to be completed from the part of the sheet that is bent about the mandrel, these newly formed tenons 11 in turn occupying the position of the previous set of completed tenons that are employed in forming the new set of tenons as is understood from the previous description. The completed shell (Fig. 12) is ejected from the mandrel following the formation of a new set of tenons.

By means of the machine and method of my invention, trimming dies do not need to be employed to remove the improperly sloping edges of the mortises and tenons that hitherto resulted in the manufacture of tubular shells out of sheet metal having edge portions jointed together by dovetailed joints produced by dies that operated to form mortises and tenons without the aid of previously formed tenons which I employ somewhat in the capacity of punching dies. The machine and method of my invention also have other characteristics as will be apparent to those skilled in the art.

Any suitable mechanism may be employed for operating the various dies, which have been described, in orderly sequence and also for timely feeding the sheet material between the dies and about the mandrel, suitable mechanism being shown in Figs. 1, 2 and 3. The dies 7 may be directly mounted upon a reciprocating carrier 13 that may be vertically reciprocated by the powerful eccentric 14 connected with the carrier 13. The die 12 may be mounted to reciprocate in an oblique direction and in radial alignment with the mandrel. This die is provided with a stem 15 formed with a shoulder 16. A heavy spring 17 serves to remove the die out of the path of the sheet 5 when this sheet is to be curled about the mandrel.

When the die 7 is depressed to perform its function, the cam 18, also mounted upon the carrier 13, engages the shoulder portion 16 of the stem 15 to press the die 12 inwardly to cause it to perform its function. After the carrier 13 is withdrawn to remove the die 7 from the plane of the sheet 5 and to permit the spring 17 to remove the die 12 from the path followed by this sheet in being curled about the mandrel, the pitman 19 is operated by the crank 19′ and operates a crank 20, free of connection at its mounted end, that carries a pawl 21 that turns a ratchet wheel 22 a quarter of a revolution each time the pitman 19 is moved downwardly. This ratchet wheel is in fixed relation with the friction feeding disk 23 against which the sheet 5 is pressed by a friction idler wheel 24 that in turn is pressed upon by springs 25. One quarter of the circumference of the feeding disk 23 corresponds to the length of the sheet 5 that is required to form the shell. The extent to which the disk is turned is limited by a stop 26 that engages the loosely mounted crank 20 to hold this crank stationary and to prevent further feeding operation during any further downward movement of the crank 19′, there being a spring 27 between sections of the pitman 19 that permits the upper pitman section to approach the lower pitman section when the latter is held from movement. A pawl 28 operates upon a star wheel 29′ fixed with respect to the cam 29, this cam 29 operating upon a bell-crank lever 30 to cause this lever to move an ejector sleeve 31 against each finished shell to discharge this shell from the mandrel, this operation occurring when the die 12 has performed its function and is withdrawn.

While I have herein shown and particularly described the preferred embodiment of my invention, I do not wish to be limited to the precise details of construction shown, as changes may readily be made without departing from the spirit of my invention; but having thus described my invention I claim as new and desire to secure by Letters Patent the following:—

1. A machine of the character set forth including male and female dies conforming in shape to a row of alternated mortises and tenons and cooperating to depress sheet ma-

terial interposed therebetween to partially form the alternated mortises and tenons; means for registering partially completed mortises with tenons, and a die conforming in shape to these mortises and tenons and cooperating with these tenons in completing the mortises.

2. A machine of the character set forth including male and female dies conforming in shape to a row of alternated mortises and tenons and cooperating to depress sheet material interposed therebetween to partially form the alternated mortises and tenons; a mandrel, means for curling the sheet material about the mandrel with tenons in registry with partially completed mortises, and a die disposed radially of the mandrel and conforming in shape to these mortises and tenons and cooperating with these tenons in completing the mortises.

3. In a machine of the character set forth, the combination with means for positioning tenons in registry with partially completed complemental mortises, of a die conforming in shape to these mortises and tenons and disposed with reference to said positioning means so as to cooperate with the positioned tenons in completing the mortises.

In witness whereof, I hereunto subscribe my name this 24th day of August A. D., 1922.

HARRY A. DOUGLAS.