Dec. 11, 1923. 1,476,706

F. M. FURBER

CUTTING OF SHEET MATERIAL

Filed April 26, 1920 2 Sheets-Sheet 1

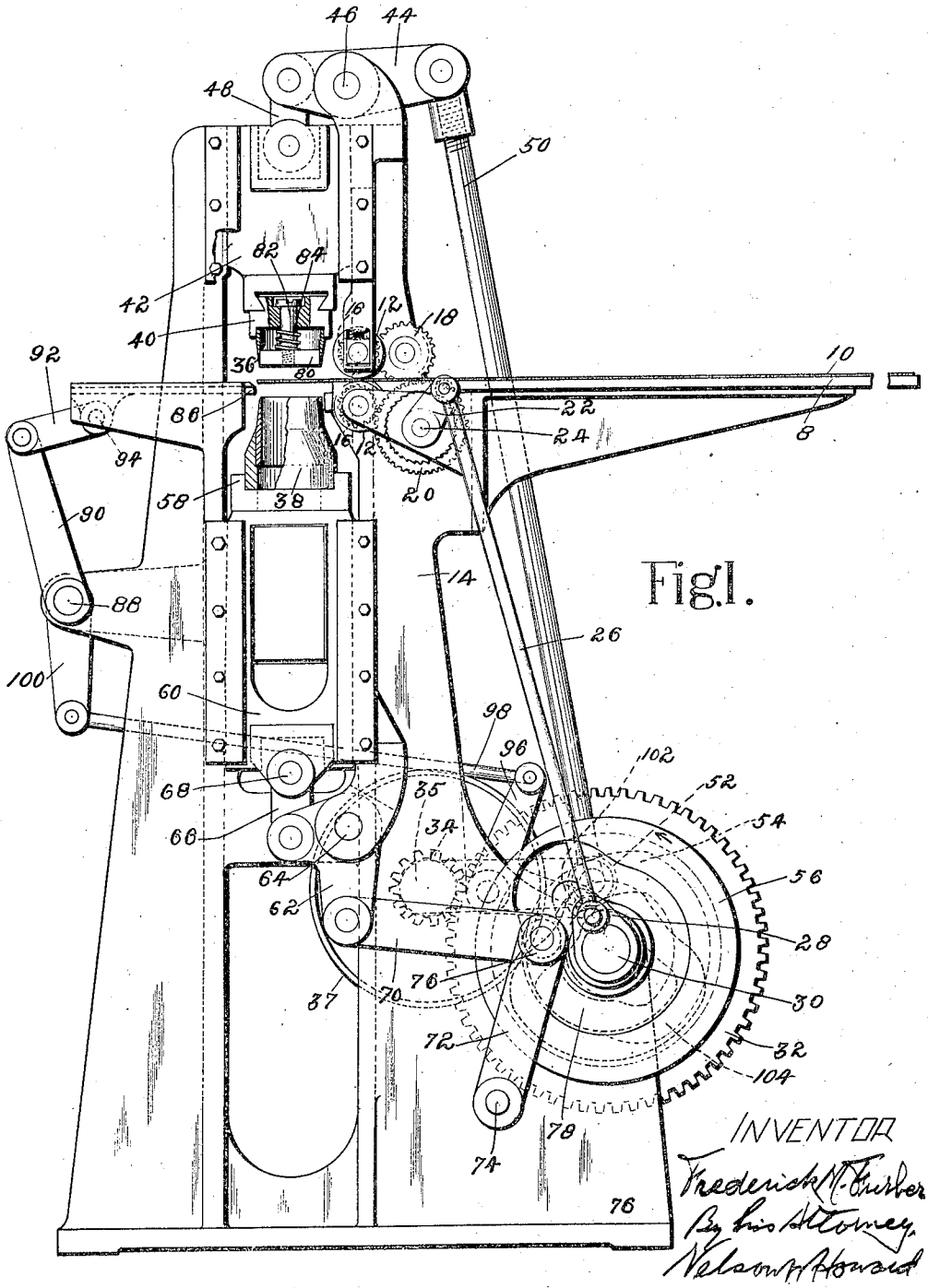


Fig.1.

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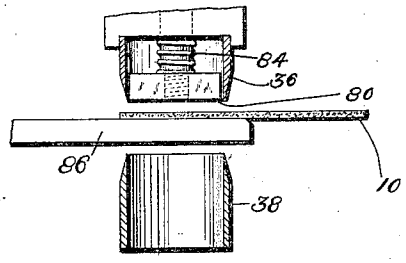


Fig. 2.

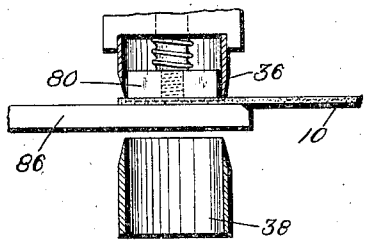


Fig. 3.

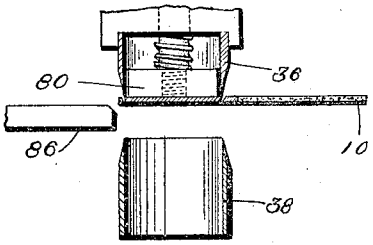


Fig. 4.

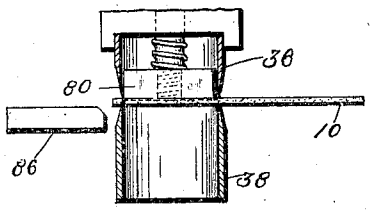


Fig. 5.

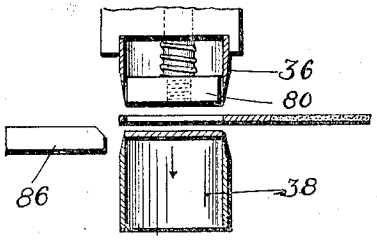


Fig. 6.

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UNITED STATES PATENT OFFICE.

FREDERICK M. FURBER, OF REVERE, MASSACHUSETTS, ASSIGNOR TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

CUTTING OF SHEET MATERIAL.

Application filed April 26, 1920. Serial No. 376,629.

To all whom it may concern:

Be it known that I, FREDERICK M. FURBER, a citizen of the United States, residing at Revere, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in the Cutting of Sheet Material, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to the art of cutting sheet material and more particularly to cutting sheet material into blanks.

Machines heretofore employed in practicing well known methods of cutting sheet material commonly comprise dies or other cutters designed to co-operate with cutting beds or platens or other means for taking the thrust of the cutting means. In those machines in which cutting beds are used to support the work and receive the edge of the cutters during cutting operations, considerable time is lost at regularly recurring intervals in resurfacing the cutting beds, and the arrangement is otherwise unsatisfactory in that the cutting edges of the cutters or dies are worn through contact with the cutting bed and not infrequently broken or otherwise damaged. In various classes of machines provided with platens or other means to co-operate with the cutters or dies there is a considerable initial outlay since the platens or other members which co-operate with the cutters are expensive to manufacture.

It is an object of this invention to devise an improved method of cutting sheet material in the practice of which simple and inexpensive machines may be employed and in which all danger of injury to the cutters will be obviated.

In one aspect the invention resides in a method of cutting sheet material which comprises cutting part way through the material from one side thereof and subsequently without disturbing the location of the material completing the cut from the other side of the material by a cut substantially in alinement with the cut made during the first cutting operation, utilizing an imperforate backing plate for each cutting operation to insure clean cut edges on the material.

In another aspect the invention resides in operating alternately on opposite sides of sheet material to cut blanks therefrom, the sheet material being alternately backed up on opposite sides to support it against the thrust of the cutting means during each cutting operation.

In the illustrative machine two dies of the same size are provided located on opposite sides of the plane of the sheet material and arranged to operate alternately on sheet material to cut blanks therefrom, means being provided for forcing all the blanks cut from the material through one of the dies. As shown a backing plate which takes the thrust of one of the dies is mounted in the other die and is operated automatically to permit a cutting operation by the containing die and subsequently to protect the cutting edge of said die.

Other features of the invention and novel combinations of parts will be described in the following detailed specification and pointed out in the appended claims.

In the drawings:—

Fig. 1 is a view in side elevation and partly in section of the illustrative machine; and

Figs. 2 to 6 inclusive are detailed views of the dies and of the supports for the material illustrating the different positions of the dies during the cutting of a blank from sheet material.

In the illustrative embodiment of the invention there is a supporting table 8 for the sheet material 10, means being preferably provided for moving the sheet along the table and into the field of operation of the cutting means. As shown, the feeding means comprises upper and lower feed rolls 12 mounted in the frame 14 of the machine in close juxtaposition to the cutting means and operated through a train of gears in any well known manner, that shown consisting of gears 16 mounted on the axes of the rolls 12 and arranged to be constantly in mesh with other gears 18 and 20 respectively, the latter two gears being in mesh with each other and the gear 20 being intermittently driven through the operation of a pawl (not shown) carried by the arm 22 loosely pivoted on the shaft 24 and operated through the rod connection 26 with the crank arm 28 on the counter shaft 30. In the illustrative construction, the shaft 30 carries

a gear 32 which is in mesh with a gear 34 on the main shaft 35, the latter being driven from the power pulley 37.

As shown the feeding means is intermittently operated to position the work between cutting means designed to operate upon the sheet material from opposite sides thereof. Where blanks are to be cut from the material the cutting means will comprise two dies 36 and 38, the upper die 36 being mounted in a plate 40 designed to be detachably secured to the reciprocable plunger 42 so that dies of various sizes may be readily removed and substituted by others for use in the machine. As shown the plunger 42 is reciprocable in guideways in the upper portion of the frame 14, power means being preferably provided for operating the plunger and in the illustrative machine this means comprises a lever 44 pivoted at 46 on a stationary part of the machine and attached at one end to the plunger by means of a link 48. To the other end of the lever 44 there is adjustably secured a pitman 50 having at its lower end a roll 52 engaged in the cam groove 54 in the cam member 56, the arrangement being such that the plunger 42 is operated in properly timed relation with respect to the lower die and to the feeding means for the sheet material as will be hereinafter more fully set forth. The lower die 38 is similarly mounted in a plate 58 detachably secured to a plunger 60 so that it may be removed and replaced by a die of a size corresponding to the upper die when the latter is changed to cut a different sized blank. For operating the lower die there is provided power means comprising a bell crank lever 62 pivoted at 64 on the frame of the machine and having attached to one of its arms a link 66 connected by a pivot 68 to the plunger 60. To the other arm of the bell crank 62 there is pivoted a link 70 which forms part of a toggle, of which the other link 72 is pivoted at 74 to the frame of the machine, the knee of the toggle being provided with a roll 76 for movement along the cam groove 78 in the cam member 56. The timing of the reciprocable plunger 60 will be explained in connection with the description of the cutting of blanks from the sheet material.

One of the dies, in the present embodiment of the machine the lower die, is so mounted as to provide a passageway clear through the same for the blanks as they are successively cut from the sheet material and the plate 58 and the plunger 60 which support the die are also constructed to provide an extension of the passageway through the die so that the blanks may pass through and be discharged into a receptacle (not shown). Mounted in the other die, that is in the die 36, there is a plate 80 which is of a size to fit snugly within the die and which is supported in such a way as to have its lower surface in the plane of the cuting edge of the containing die. In the preferred construction, the support for the plate 80 comprises a bolt 82 adjustably secured to the plate 80 and slidably mounted in the plate 40, a spring 84 surrounding the bolt and pressing upon both of the plates 40 and 80 and operative to hold the plate 80, as stated, in the plane of the cutting edge of the die. When the die is thrust into the work the plate 80 moves into the die under pressure of the blank being cut but progressively moves back to its position in the plane of the cutting edge of the die as the latter rises after a cutting operation, thus leaving the blank in the plane of the sheet of material being operated on.

For supporting the sheet material during the operation of the die 36, there is provided a plate or cutting bed 86 shown in operative position in Fig. 2 of the drawings. In order that the cutting bed 86 may be removed after the cutting operation of the die 36, power means is preferably provided for reciprocating the bed or plate comprising a rock shaft 88 mounted in the frame of the machine and provided with an arm 90 attached to the plate at its upper end by means of a link 92 which is pivoted to the plate as indicated at 94. For rocking the shaft 88 connections are provided to a bell crank lever 96 pivoted to the frame of the machine and connected by means of a rod 98 to an arm 100 fixedly attached to said rock shaft. Preferably the bell crank lever 96 is operated from the cam member 56 by means of a roll 102 engaging in a cam groove 104 in said cam member so as to operate the plate or cutting bed 86 in properly timed relation to the cutting instrumentalities as will be hereinafter explained.

For an understanding of the operation of the machine reference should be had to Figs. 2 to 6, inclusive, which show the dies and their co-operating cutting blocks at various stages of the cutting operations. Through the operation of the feeding means for the sheet material the forward end of the sheet is fed into position beneath the die 36 where it is supported for the first part of the cutting operation by the plate or cutting bed 86, Fig. 2 showing the sheet material in place on said cutting bed just prior to the downward movement of the die 36. During the operative stroke of the die 36 it descends toward the cutting plate 86 and enters the sheet material 10 passing part way only through the thickness of the material so that there is no possibility of injury to the cutting edge of the die. Preferably the cutting edge of the die passes more than half way through the thickness of the sheet and during the entrance of the cutting edge into the material, the plate 80 is forced back into the die against the ten-

sion of the spring 84 as indicated clearly in Fig. 3 of the drawings. While the cutting die 36 is moving upwardly the block 80 remains in contact with the work on the cutting bed 86, the upward movement of the plunger 42 continuing until pressure on the sheet material is relieved whereupon the cutting bed is removed from between the two dies, this step of the operation being illustrated in Fig. 4 of the drawings. Subsequent to the removal of the plate 86 and while the die 36 is moving upwardly the die 38 moves upwardly to complete the cutting of the blank, the sheet material being backed during this operation by the cutting block 80 which is supported by its spring 84 to such an extent that it acts as a cutting bed while the die 38 is severing the blank by completing the cut through the material begun and almost completed by the die 36. In other words, the amount of material to be cut by the die 38 in completing the severance of the blank is such that the plate 80 with its backing spring 84 serves efficiently to withstand the thrust of the die 38 which moves up almost into contact with the edge of the upper die and receives the blank thus severed from the sheet material. The cutting of the blank by the die 38 is illustrated in Fig. 5 wherein the blank is shown completely severed from the sheet material. The dies then separate and as the die 38 descends, it carries the completely severed blank with it as indicated in Fig. 6 of the drawings. Since the die 38 moves downwardly to a position in a plane below the lower surface of the cutting bed 86 there is no danger of the recently severed blank being displaced from the die so that when the latter rises again to complete the cutting of another blank, the previously severed blank is forced further downwardly into the die 38 and finally drops through the die into the passageway in the die plunger and then into a receptacle provided for the purpose of receiving the blanks. From the above description it will be clear that a method is disclosed and a means provided for cutting sheet material without danger of injury to the cutting edges of dies or other cutters, and that the novel method may be practiced by the use of a relatively simple and inexpensive mechanism.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent of the United States is:—

1. In a machine of the class described, a plurality of cutting means each having spaced cutting edges and arranged to operate alternately on opposite sides of sheet material to cut blanks therefrom, and means for forcing all the blanks cut from the material into the space between the cutting edges of one of the cutting means.

2. In a machine of the class described, a die for cutting part way only through sheet material to form a blank therefrom, a die of the same size as the first mentioned die and operative subsequently to the operation of the first die to complete the cutting of the blank, and a member for supporting the material against the thrust of the second die and for forcing the severed blank into this die.

3. In a machine of the class described, two dies arranged with their cutting edges adjacent and in alinement with each other so that they may act upon opposite sides of the sheet material to cut blanks therefrom, and imperforate means for supporting the sheet material against the thrust of the cutting edges of the dies.

4. In a machine of the class described, a die for operating on one side of sheet material to cut part way therethrough in a blank forming operation, imperforate means for supporting the material against the thrust of the cutting edge of the die, means for withdrawing said supporting means, and a second die operative, after the withdrawal of the supporting means, to complete the cutting of the blank from the opposite side of the sheet.

5. In a machine of the class described, cutting means operating alternately on opposite sides of sheet material to cut blanks therefrom, the operation of one cutting means being completed before the other begins, and a plurality of means movable alternately into operative position for backing the sheet material to support it against the thrust of the cutting means during each cutting operation.

6. In a machine of the class described, a die for cutting part way through sheet material from one side thereof, a support for taking the thrust of the die, means for withdrawing said support after said die has operated, a second die arranged to operate after the withdrawal of the support to complete the cutting of the blank from the opposite side of the sheet material before it has moved laterally with respect to the first mentioned die, and means for taking the thrust of the second die during the cutting operation which completes the severance of the blank from the material.

7. In a machine of the class described, a die for operating upon sheet material partially to sever a blank therefrom, a second die of the same size as the first die for completing the cutting of the blank from the opposite side of the sheet material, and means for forcing the blank out from the material into one of the dies.

8. In a machine of the class described, a support for the sheet material to be cut, a die co-operating with the support for cutting part way only through the thickness of the material as a step in the formation

of a blank, a second die in alinement with the first mentioned die and operative after the completion of the cutting operation of the first die to cut through the sheet material from the opposite side to complete the formation of the blank, and means for moving said support and the dies relatively to each other in a lateral direction so that the support is displaced from between the dies so that the second mentioned die may operate on the work.

9. In a machine of the class described, a support for sheet material, a die arranged to co-operate with the support to cut part way through the sheet material partially to form a blank, a second die of the same size as the first mentioned die and arranged in alinement therewith on the opposite side of the sheet material, means for moving the support and the two dies relatively to each other in a lateral direction so as to displace the support from between the dies, and means for operating the second die to complete the cutting of the blank.

10. In a machine of the class described, a die for operating on one side of sheet material to cut part way through the thickness of the material partially to form a blank therefrom, and a second die of the same size as the first die and arranged in exact alinement with the first die to operate upon the opposite side of the sheet material, and means for operating the first die and subsequently the second die to complete the formation of the blank and leave it in the second die.

11. In a machine of the class described, a support for the work, a die, means for operating the die to cause it to cut part way through the thickness of the sheet material partially to form a blank therefrom, means for withdrawing the support, a second die of the same size as the first mentioned die and arranged in alinement therewith so as to operate upon the opposite side of the sheet material, means for causing the second die to complete the cutting of the blank, and means for forcing the blank into the second die.

12. In a machine of the class described, a cutter for cutting part way only through the thickness of sheet material from one side thereof, a second cutter arranged with its cutting edge in alinement with that of the first mentioned cutter to operate upon the opposite side of the sheet material, means for operating the cutters alternately to complete the cut through the sheet material, and imperforate means for supporting the material against the thrust of the cutters.

13. In a machine of the class described, a support for sheet material, a pair of dies arranged on opposite sides of the support and in alinement with each other to operate upon opposite sides of sheet material on the support, means for moving one of the dies to co-operate with the support to cut part way only through the thickness of the sheet material, means for moving the support and the pair of dies relatively to each other to displace the support from between the dies, means for moving the second die to complete the severance of the blank from the sheet material, and means in the first mentioned die for taking the thrust of the second die and for co-operating with said second die to force the blank therethrough.

14. In a machine of the class described, a support for sheet material, a die for co-operation with the support to cut part way only through the thickness of the sheet material in the blank forming operation, a block within the die mounted to yield into the die during the cutting operation, means for withdrawing the support whereupon the block returns to the plane of the cutting edge of the die, a second die of the same size as the first die and arranged in alinement therewith, and means for moving the second die to cooperate with said block in completeing the formation of the blank.

15. In a machine of the class described, a plurality of backing supports for sheet material, a pair of cutters, and means for moving the supports and the cutters alternately to perform cutting operations on opposite sides of the sheet material to cut blanks therefrom.

16. In a machine of the class described, a pair of cutters arranged in alinement with each other to perform cutting operations upon opposite sides of sheet material and to co-operate with each other in cutting each blank from the sheet material, and two members, one for each cutter, movable into position to co-operate with the cutter to take the thrust of the cutter during its operation on the sheet material.

17. In a machine of the class described, a pair of cutters to operate on opposite sides of sheet material in cutting each blank therefrom, a backing member for each cutter to take the thrust of the cutting edge of the cutter, and means for positioning the backing members alternately in co-operative relation to the respective cutters.

18. In a machine of the class described, a pair of cutters arranged in alinement with each other to co-operate in the cutting of blanks from sheet material so arranged that each cutter cuts only part way through the thickness of the sheet material, separate backing means for supporting the sheet material during the cutting operation by each cutter, and means for moving the backing means to retracted inoperative position after the completion of the cutting operation by each cutter.

19. In a machine of the class described, a support for sheet material to be cut, a pair

of dies of the same size arranged in vertical alinement with each other, means for operating the upper die to cause it to cut part way through the sheet material on the support, means for withdrawing the support, a block in the upper die for moving the sheet material out of the die and holding it against movement into the die during the cutting operation by the lower die, and means for moving the lower die to complete the cutting of the blank in co-operation with the block, the construction and arrangement being such that the blank is forced into the lower cutter.

20. That improvement in methods of cutting blanks from sheet material which comprises operating alternately on opposite sides of sheet material to cut blanks therefrom and backing up the sheet material alternately on opposite sides with an imperforate backing member to support the material against the thrust of the cutting means and thus insure perfect cutting during each cutting operation.

21. That improvement in methods of cutting blanks from sheet material which comprises cutting part way through the thickness of the sheet material from one side by means of a die, subsequently cutting through the remaining portion of the thickness of the material from the other side of the sheet by means of another die of the same size as the first mentioned die, and simultaneously with the second cutting operation supporting the material with an imperforate backing member to insure clean cutting of the blanks.

22. That improvement in methods of cutting blanks from sheet material which comprises cutting almost through the thickness of the sheet by means of a die while the material is supported to take the thrust of the die, removing the support and substituting another therefor on the opposite side of the sheet without disturbing the location of the material, and completing the cut from the other side of the sheet material while the latter remains in the location it possessed during the first cutting operation.

23. That improvement in methods of cutting blanks from sheet material which comprises cutting part way through the material from one side thereof by means of a die, completing the cut by means of a die of the same size as the first mentioned die and operated form the other side of the sheet material, and forcing the blank thus formed into one of the dies.

24. In a machine of the class described, a cutter for operating on one side of a sheet of material to cut part-way therethrough, a second cutter having its cutting edge in exact alignment with the cutting edge of the first cutter and arranged to perform a cutting operation upon the opposite side of the sheet material to complete the cut through the material, a backing member for supporting the material against the thrust of each cutter, and power means for alternately reciprocating the cutters and the backing members for operating on the material.

25. In a machine of the class described, a pair of cutters having their cutting edges in exact alignment with each other to perform cutting operations upon opposite sides of sheet material so that through the cooperation of the cutters the material is cut completely through, and members having supporting surfaces relatively large as compared with the cutting edges of the cutters for taking the thrust of the cutters during the operation of each on the sheet material, one of said members being movable laterally into and out of the space between the cutters.

26. In a machine of the class described, a cutter for operating on a piece of material to cut part-way therethrough, a second cutter having its cutting edge in exact alignment with the cutting edge of the first cutter and arranged to perform a cutting operation upon the material to complete the cut therethrough, imperforate backing members for supporting the material against the thrust of the cutters, and means for moving the cutters and backing members alternately to operate upon the material.

27. In a machine of the class described, a plurality of cutters having their cutting edges in exact alignment with each other and arranged to perform cutting operations upon opposite sides of sheet material so that through the co-operation of the cutters the material is cut completely through, and a plurality of members alternately movable to serve as backing supports for the material in the line of thrust of the cutters during the operation of each on the sheet material.

28. That improvement in methods of cutting blanks from sheet material which comprises cutting a piece of material part way through the thickness thereof from one side of the piece subsequently cutting completely through the piece by a cut which is in exact alignment with the cut first made, and simultaneously with the second cutting operation supporting the material against the thrust of the cutter to ensure perfect cutting of the material and to force the severed blank into the second cutter.

In testimony whereof I have signed my name to this specification.

FREDERICK M. FURBER.