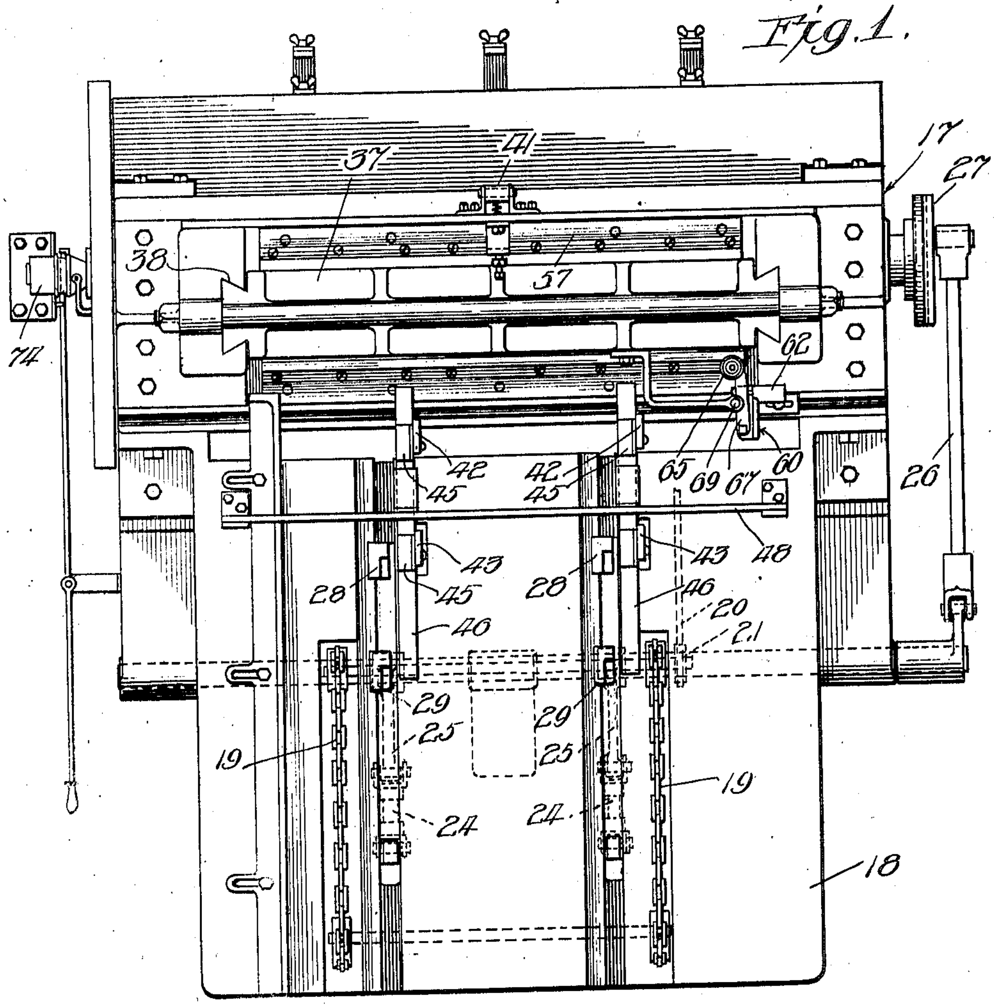
C. D. McDONALD.
METAL SHEARING MACHINE.
APPLICATION FILED FEB. 6, 1914.

1,110,810.

Patented Sept. 15, 1914.
5 SHEETS—SHEET 1.

Fig. 1.



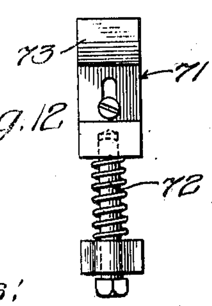




Fig. 12.

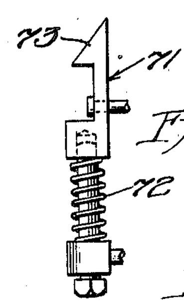



Fig. 13.

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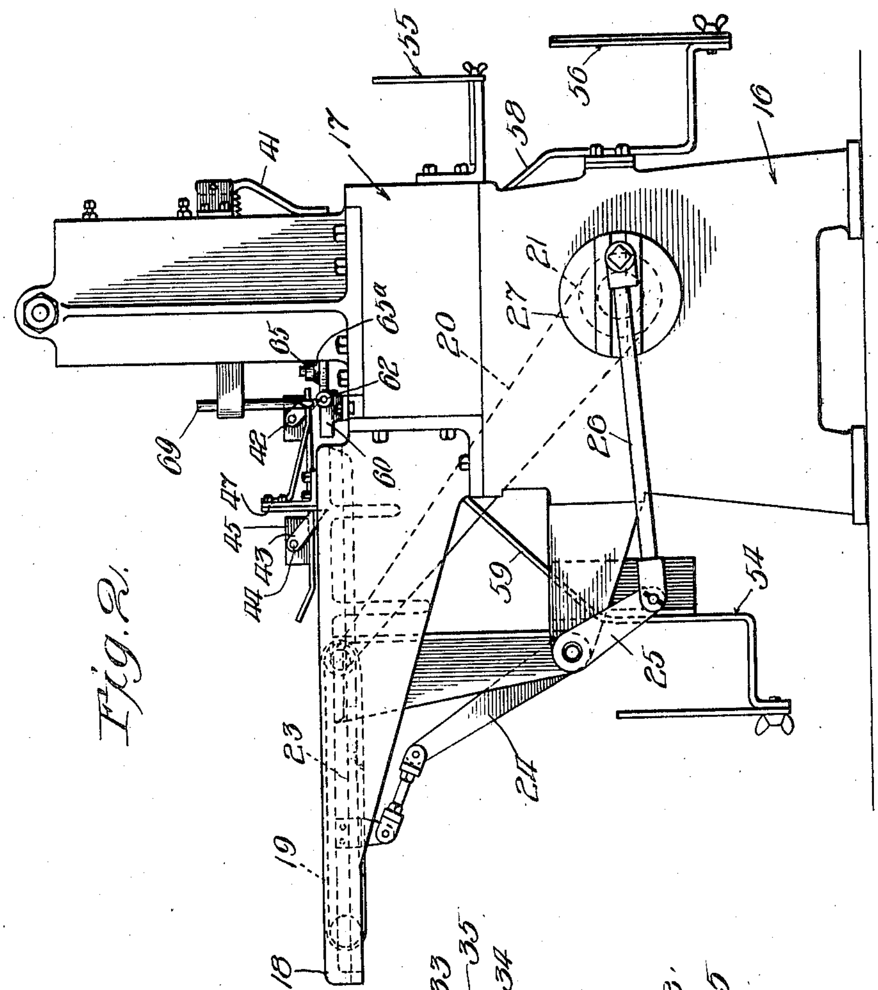

Fig. 2.

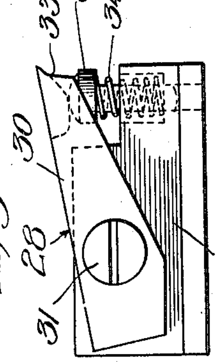

Fig. 8.

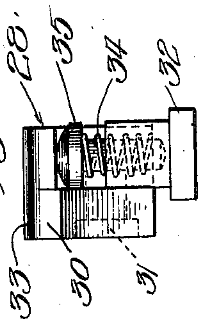

Fig. 9.

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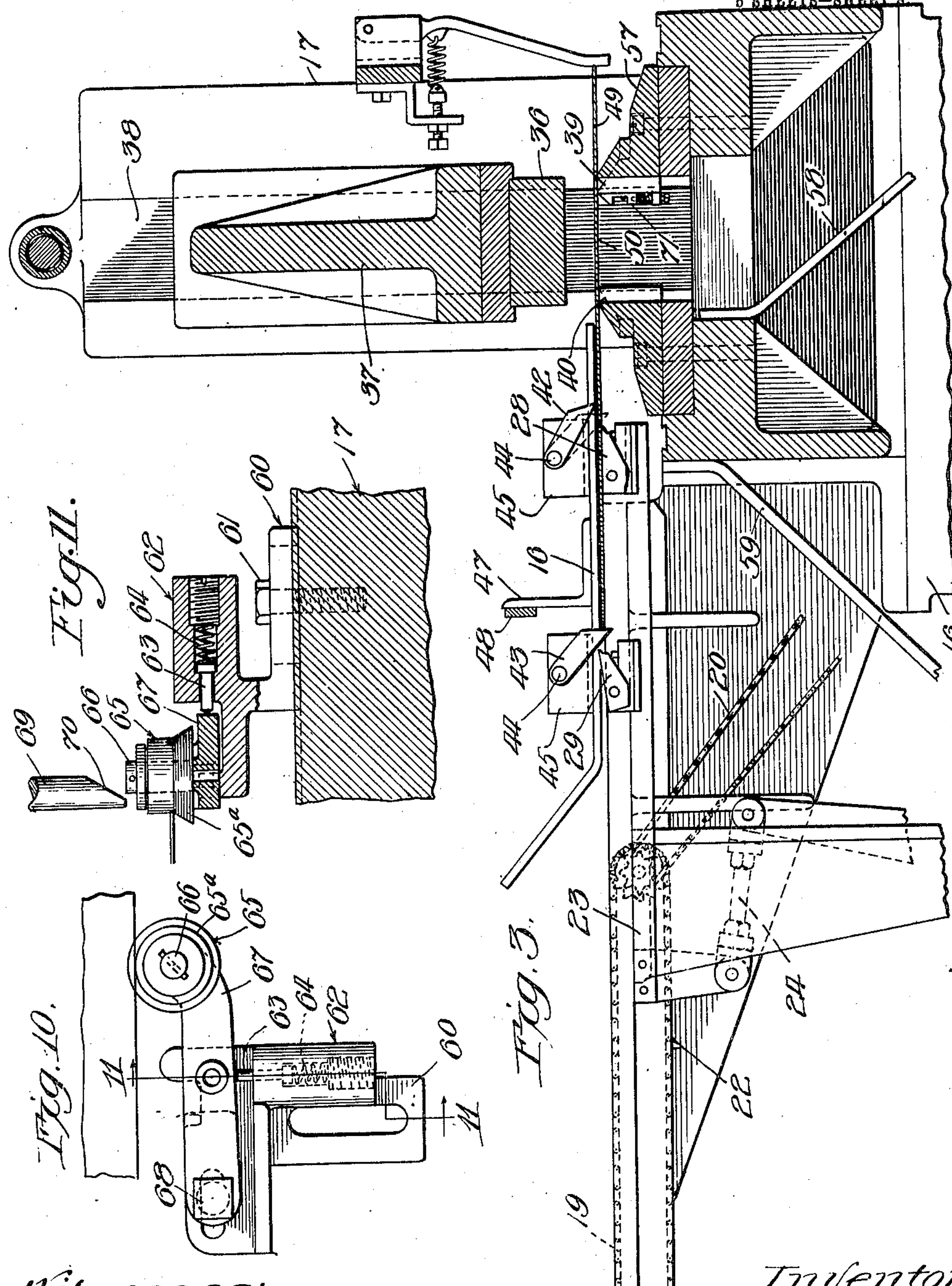

Fig. 3.

Fig. 10.

Fig. 11.

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5 SHEETS—SHEET 4.

Fig. 4.

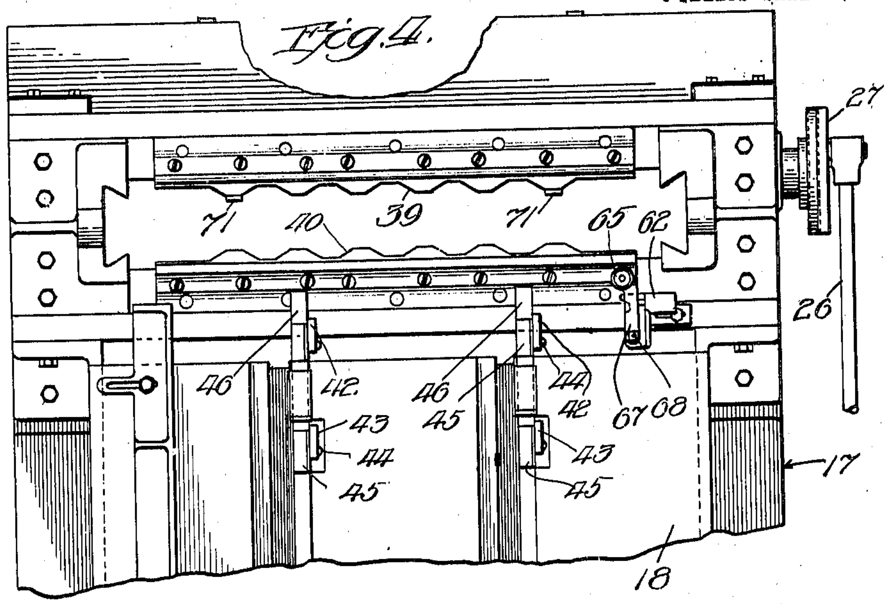



Fig. 14.

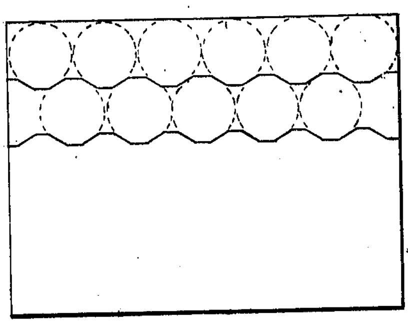
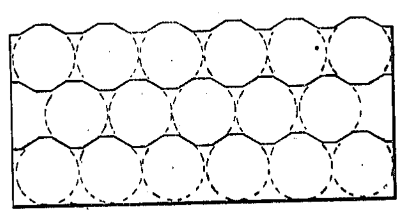


Fig. 15.



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5 SHEETS—SHEET 5.

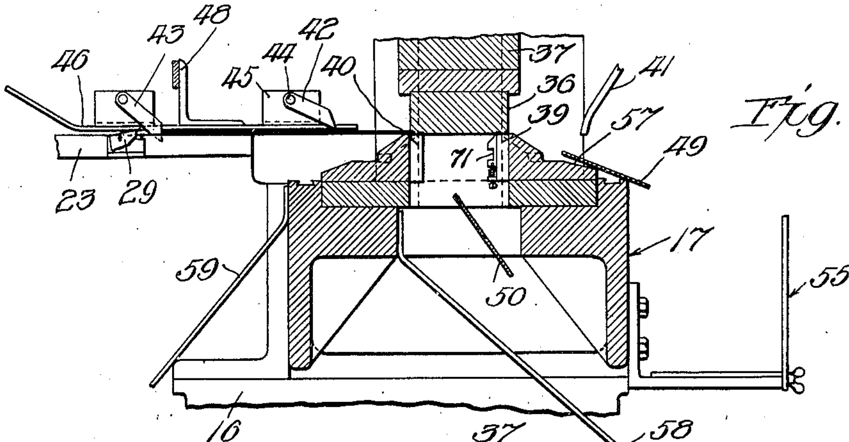


Fig. 5.

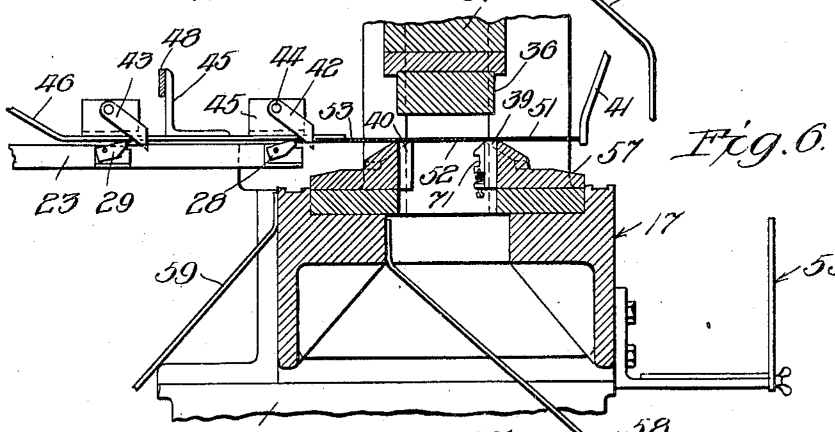


Fig. 6.

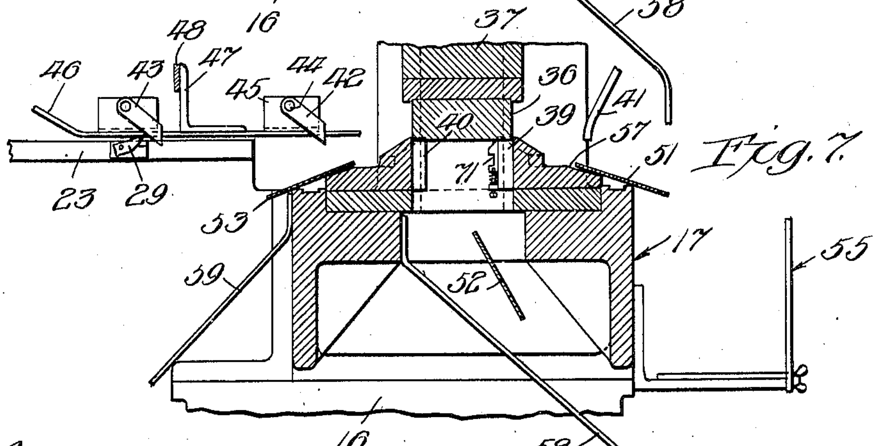


Fig. 7.

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# UNITED STATES PATENT OFFICE.

CHARLES D. McDONALD, OF CHICAGO, ILLINOIS, ASSIGNOR TO McDONALD MACHINE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## METAL-SHEARING MACHINE.

**1,110,810.** Specification of Letters Patent. **Patented Sept. 15, 1914.**

Application filed February 6, 1914. Serial No. 816,919.

*To all whom it may concern:*

Be it known that I, Charles D. McDonald, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Metal-Shearing Machines, of which the following is a specification.

The machine of the present invention relates to the type more particularly adapted and intended for use in severing sheets of metal into blanks, each blank having a scroll or undulating edge.

The objects of the present invention are to provide a mechanism of the class described which will embody two cutting members spaced apart a distance equal to the width of a to-be-cut blank, and to so arrange the feed of the work to these cutting members as to produce a number of blanks at each operation of the mechanism.

A further object of the invention is to provide a primary feed mechanism which will be continuous in its operation and to provide a secondary feed mechanism which will be intermittent in its operation.

A further object of the invention is to provide means for quickly and accurately centering the work with respect to the cutting members.

A further object of the invention is to provide a supplemental or auxiliary gage member adjacent the shearing mechanism and to automatically actuate this auxiliary holding mechanism whereby it will be released from engagement with the work when the shearing mechanism has completed a cutting operation.

A further object of the invention is to provide means arranged adjacent the fixed cutting members of the shearing mechanism whereby the work will be slightly deflected upward when passing over these cutting members, eliminating the possibility of its striking the edges of the cutting mechanism and so buckling during the feed.

The invention further consists in the features of construction and combinations of parts hereinafter described and claimed.

In the drawings: Figure 1 is a plan view of the mechanism of the present invention; Fig. 2 is a side elevation of such mechanism; Fig. 3 is a longitudinal section through the machine; Fig. 4 is a detail plan view showing the fixed cutting members; Fig. 5 is a detail section showing the first action of the shearing mechanism completed; Fig. 6 is a view similar to Fig. 5 showing the position assumed by the work when it has been subjected to the second feeding operation; Fig. 7 is a view similar to Fig. 5 showing the second action of the shearing mechanism completed; Fig. 8 is a side view of one of the feed fingers of the intermittent feed; Fig. 9 is an edge view of the feed finger of Fig. 8; Fig. 10 is a plan view of the auxiliary gage mechanism for the work; Fig. 11 is a section on line 11—11 of Fig. 10 showing the lower portion of the auxiliary gage member in elevation; Fig. 12 is a face view of the member adjacent the fixed cutting member for deflecting the work over the top of the same; Fig. 13 is a side elevation of the member shown in Fig. 12; Fig. 14 is a view showing the cuts produced and the blanks formed by the first action of the shearing mechanism and showing how the blanks are subsequently cut by the action of the die press; and Fig. 15 is a view showing the cuts produced and the blanks formed by the second action of the shearing mechanism.

As heretofore stated, the present invention deals with a mechanism which is designed and intended to cut blanks from a sheet of metal, which blanks will have a scroll shaped or undulating edge. The object of so configuring these blanks is to enable them to be utilized in die presses for stamping certain articles, therefrom, as for instance can ends. The blanks are so configured as to permit such ends to be stamped therefrom with a very slight waste of material.

One of the primary features of the present invention is to produce these blanks speedily whereby the blanks may be produced by a single shearing machine with sufficient speed to enable a multiplicity of die presses to be kept going, and this is brought about by a novel arrangement of the shearing mechanism and by a novel method of feeding the work to the shearing mechanism.

Referring now to the drawings, and particularly to Fig. 2, the device is supported by an underframe 16 which may be of any suitable construction. This underframe has connected thereto an upper structure 17 which embodies a table 18, (see Figs. 1, 2 and 3) and along the surface of this table operates the means for feeding the work to the shearing mechanism. This feeding means consists as shown of a continuously acting feed mechanism operating in conjunction with an intermittently acting feed mechanism. The continuously acting mechanism consists of two endless belts or chains 19, which are driven by a belt 20 in conjunction with a pulley 21, the belt in turn being driven from the main driving shaft of the machine. Each of the belts 19 is provided, in the construction shown, with a single lug or finger 22 and, as shown, the belt travels approximately flush with the top of the table.

The intermittent feed mechanism consists of a feed bar 23 having a suitable connection 24 with a crank 25 driven by a connecting rod 26 from a slotted disk 27 which is located on the main drive shaft of the machine. The feed bar 23 carries two sets of feed fingers. These may be designated as the forward feed finger 28 and the rear feed finger 29, although these terms are mainly used for descriptive purposes. Each of the feed fingers is of similar construction and are shown more in detail in Figs. 8 and 9, and as will be seen consists of a body portion 30 pivoted at 31 to a carrying or supporting member 32. The forward or acting end 33 of the fingers being held normally in elevated position by means of a spring 34 acting on a headed stem 35. As will be apparent, the above construction permits the acting end of the feed fingers to lower as is necessary during the feeding operation. These feed fingers are intended to make two movements for what may be termed a cycle of feed and the feeding movement may be divided into a first step and into a second step. The continuously acting feed mechanism is so timed as to deliver a blank of work at the proper moment to have it picked up and carried forward by the action of the reciprocating feed mechanism in its initiatory feeding step.

The shearing mechanism consists of movable cutting mechanism 36 and a series of fixed cutters 39 and 40, the movable mechanism being connected to a sliding head 37 actuated up and down within a way 38 in the manner usual in such mechanism. The fixed cutter 39 may be termed the forward fixed cutter and the fixed cutter 40 the rear fixed cutter, although these terms are mainly used for expediting the description. The form of the shearing or cutting members is more clearly shown in Fig. 4 and will be seen to consist of an undulating or scroll formation producing the scroll cut heretofore referred to.

Means are provided for centering the work with respect to the shearing mechanism and the means shown consists of a spring pressed pivoted member 41 lying beyond the shearing mechanism, and the means further consists in fingers 42 and 43 which may be termed gage members. The fingers 42 being referred to as the forward gage member and the fingers 43 as the rear gage member, which terms are used mainly for descriptive purposes. Each of the gage members is similar in construction and is in the form of a finger pivoted as at 44 to a flanged plate 45, which plates are carried upon elongated strips of metal 46 upturned at their forward ends. These plates are held suspended above the table by means of members 47 in the shape of angled plates which are joined to a bar 48 extending crosswise of the machine and suitably anchored thereto. Thus with the exception of the fingers 42 and 43 this entire mechanism is suspended above the surface of the table to permit the work to slide beneath the same. The fingers rest within recesses in the body of the table to permit of the projection of a portion thereof below the surface of the table. This is to insure contact between the work and the gage members during the feeding operation.

The method of feeding and centering the work is as follows: Upon the initial feeding step the work is forced forward by the feeding fingers 29 until the rear edge thereof has passed beyond the gage member 43. This will place the forward end of the work beyond the shearing mechanism. The work will be placed beyond the shearing neck a distance whereby it will engage with the member 41 and force this member away from the shearing mechanism. This will place the member 41 under a spring tension and when the feed bar starts on its return movement the member 41 will act to force the work rearward and into engagement with the gage member 43 which has then dropped into the position shown in Fig. 3. When the edge of the work has contacted the gage member 43 the work will be centered accurately with respect to the shearing mechanism.

In forming blanks of the kind intended to be formed by the mechanism of the present invention accuracy in cutting is of primary importance, for if the blanks should fail to be of a certain size they would be useless for the purpose intended, for these blanks must be of the correct size whereby when inserted within the die press mechanism they will permit of the cutting therefrom of can ends or other articles with a minimum waste of material. They are therefore designed so that the cuts produced by the die will come very close to one another and obviously if the blanks are of an incorrect size the article produced by the die press will not be perfect, that is there will not be sufficient material on the blank to enable the cut to be made or there will be an excess of material with a consequent waste. Under these conditions it is extremely important in machines of the type of the present invention to accurately center the work with respect to the shearing mechanism whereby the blanks will be of the exact size intended. This accurate centering could not be satisfactorily accomplished by the use of the feed mechanism alone for there is bound to occur a certain amount of lost motion in the movements thereof which which would be fatal to the production of a correct size blank, and hence auxiliary centering means are necessary to the proper operation of a machine of the character specified.

To return again to the feed when the work is positioned, as in Fig. 3, which is the correct position for the initial shearing operation, a portion of the work indicated by the numeral 49 will project beyond the shearing mechanism, and this section 49 will be of a width equal to the width of a to-be-formed blank. Now as the shearing mechanism makes its first cut two blanks are produced as shown in Fig. 5, one blank being the portion 49 which had been fed beyond the shearing mechanism and the other blank being the portion 50 which lay intermediate the fixed cutting members 39 and 40.

Upon the second step of the feeding mechanism the work is advanced into the position shown in Fig. 6 and is centered in the manner previously described, namely, by forcing outward the member 41 and utilizing the spring tension thus created to force the work back against the gage members 42. In this position there will be a section 51 lying beyond the shearing mechanism, a section 52 lying between the fixed cutting members 39 and 40 and a section 53 lying to the rear of the shearing mechanism each of which sections will be of a width equal to the width of a to-be-formed blank, thus on the second action of the shearing mechanism there will be three blanks formed, one consisting of the section 51, the second consisting of the section 52 and the third of the section 53, so that by two feeding movements and two operations of the shearing mechanism 5 blanks had been produced. This is an extremely important feature of the present invention since by reason of this method of feeding the capacity of the machine can be made large and a single shearing machine can produce sufficient blanks to supply a multiplicity of die presses.

It is preferred to distribute the various blanks into a plurality of receptacles because of the fact that the various blanks are discharged from the machine at different points and hence receptacles should be positioned convenient to each point of discharge, in the structure shown three receptacles are provided, a rear receptacle 54, an upper forward receptacle 55 and a lower forward receptacle 56, these terms, it is understood, are for the purpose of expediting the description. These receptacles may be of any suitable formation adequate to acccommodate the blanks. The receptacle 55 is located in a position whereby the portion of the work extending beyond the shearing mechanism and the portion which engages the member 41 will slide off the sloping surface 57 and into such receptacle as will be obvious from Fig. 5. A rail 58 is provided for guiding the blanks into the receptacle 56, and the blanks deposited in this receptacle are those formed by that portion of the work lying between the fixed cutting members 39 and 40. A rail 59 is provided for guiding the work into the receptacle 54 and the blanks delivered to this receptacle are those formed by that portion of the work which is positioned to the rear of the shearing mechanism. Therefore, means are provided for guiding the various blanks into the respective receptacles intended to receive the same.

An auxiliary gage member is provided which is located adjacent the shearing means for engaging the work at this point. This auxiliary gage member is brought into action as a holder during the last shearing operation, for as will be seen from Fig. 6 the work is then in such position as to receive no support from the table, and hence the necessity of this auxiliary holding or gaging member. This member is shown more in detail in Figs. 10 and 11 and consists of a mounting 60 secured to the body of the machine by suitable fastening means 61. The mounting embodies a chambered portion 62 in which is located a headed stem 63 which rests against a spring 64 so that this stem is spring pressed.

The roller 65 which forms the auxiliary holding or gaging member is rotatably mounted upon a stud 66 secured in an arm 67 pivoted as at 68 and this arm is normally held in the position shown in Fig. 10 by means of a pin 63, and when in this position the roller is held by tension against the edge of the work whereby the same acts as a gage. The roller is flanged as at $65^a$ which flange serves to support the work when the final shearing operation is being performed. A stem 69 is attached to the reciprocating head 37 and this stem has a beveled or cam edge 70 which engages with the arm 67 as will be apparent by referring to Fig. 1 and serves when brought into engagement with the arm 67 to force the said arm outward releasing the roller from engagement from the work. This stem 69 is so arranged as to cause it to act in the manner described when the shearing mechanism shall have completed its cutting operation, thereby allowing the blank to fall into the receptacle 54 as previously described, but the roller furnishes a support for the blank during the shearing operation.

In feeding the work forward it must be passed over the top of the fixed cutting members 39 and 40, and in so feeding it there is a possible danger of the work engaging the edge of one or the other of these cutting members and buckling. In order to eliminate this difficulty, I have provided fingers 71 shown more clearly in Figs. 12 and 13, which fingers are slidable and are normally held upward by a spring 72. Each of the fingers is provided with a beveled upper end 73 permitting the work to easily slide up and over the same. These fingers normally project slightly beyond the top of the cutting members, whereby when the work is fed forward it is deflected slightly upward and over the top of the cutting members, thus eliminating any danger of the buckling heretofore referred to. The fingers being slidable and spring pressed of course readily assume a position whereby they do not interfere with the cutting action of the shearing mechanism. A suitable clutch mechanism 74 is provided for controlling the operation of the shearing mechanism.

I claim:

1. In a machine of the class described, the combination of shearing mechanism, a primary feed mechanism moving continuously in one direction, a secondary feed mechanism having a reciprocating movement, said secondary feeding mechanism acting to carry the work from the point of delivery by the first feeding mechanism, into position to be acted upon by the shearing mechanism, substantially as described.

2. In a machine of the class described, the combination of shearing means, feeding means, said feeding means acting in each instance to carry the work beyond the shearing means a distance equal to the width of a blank, said means including a spring pressed member beyond the shearing means engaged and moved by the work, gage members, said spring pressed member acting to force the work back against the gage member after the work has been fully fed forward whereby it is centered with respect to the shearing means, substantially as described.

3. In a machine of the class described the combination of companion cutting means spaced apart a distance equal to the width of a blank, feeding means, said feeding means acting to place the work beyond the shearing mechanism a distance equal to the width of a blank whereby a plurality of blanks are formed at the single action of the shearing mechanism, substantially as described.

4. In a machine of the class described, the combination of companion cutting means spaced apart a distance equal to the width of a blank, feeding means, said feeding means acting to feed the work beyond the shearing mechanism a distance equal to the width of a blank whereby a plurality of blanks are formed at a single action of the shearing mechanism, said feeding means including a spring pressed member beyond the shearing means arranged to be engaged and moved by the work, gage members, said work being forced against the gage members by the spring pressed member after the feeding movement is completed whereby it is centered with respect to the shearing mechanism, substantially as described.

5. In a machine of the class described, the combination of companion cutting means spaced apart a distance equal to the width of a blank, means for feeding the work forward in the order of a first feeding step and a second feeding step, the first feeding step placing the work a distance beyond the shearing mechanism equal to the width of a blank whereby two blanks are cut by the first shearing operation, the second step carrying the remainder of the work a distance whereby a strip is placed on each side of the shearing mechanism each equal in width to the width of a blank whereby three blanks are produced by the second shearing operation, substantially as described.

6. In a machine of the class described, the combination of companion cutting means spaced apart a distance equal to the width of a blank, means for feeding the work forward in the order of a first feeding step and a second feeding step, the first feeding step carrying the work a distance beyond the shearing mechanism equal to the width of a blank whereby two blanks are formed by the first shearing operation, the second step carrying the remainder of the work a distance whereby a strip of work is placed on each side of the shearing mechanism equal in width to the width of the blank whereby three blanks are produced by the second shearing operation, said feeding means including a spring pressed member beyond the shearing mechanism, said member being engaged and moved by the work as the work is fed forward, gage members, said work being forced against the gage members by the spring pressed member after the completion of the feeding movement whereby it is centered with respect to the shearing mechanism, substantially as described.

7. In a machine of the class described, the combination of a plurality of shearing members spaced apart a distance equal to the width of a blank, feeding means, said feeding means acting in each instance to place the work beyond the shearing means a distance equal to the width of a blank whereby a plurality of blanks are formed at each operation of the shearing mechanism, a plu-

rality of blank receptacles each arranged to receive a portion of the cut blanks, substantially as described.

8. In a machine of the class described, the combination of a plurality of shearing members spaced apart a distance equal to the width of a blank, feeding means, said feeding means acting to feed the work beyond the shearing mechanism a distance equal to the width of a blank whereby a plurality of blanks are formed at a single action of the shearing mechanism, said feeding means including a spring pressed member beyond the shearing mechanism arranged to be engaged and moved by the work, gage members, and said spring pressed member acting to force the work back against the gage members after the completion of the feeding movement whereby the work is centered with respect to the shearing mechanism, a plurality of blank receptacles each arranged to receive a portion of the cut blanks, substantially as described.

9. In a machine of the class described, the combination of shearing mechanism comprising cutting members spaced apart a distance equal to the width of a blank, means for feeding the work forward in the order of a first feeding step and a second feeding step, the first step placing a strip of work beyond the shearing mechanism equal to the width of a blank whereby two blanks are cut by the first shearing operation, the second step carrying the remainder of the work a distance to place a strip of material on each side of the shearing mechanism each equal in width to the width of a blank whereby three blanks are produced by the next shearing operation, and a plurality of blank receptacles each arranged to receive a portion of the cut blanks, substantially as described.

10. In a machine of the class described the combination of shearing mechanism comprising members spaced apart a distance equal to the width of a blank, means for feeding the work to the shearing mechanism, said feeding means acting in each instance to place the work beyond the shearing mechanism a distance equal to the width of a blank, the last feeding movement placing a strip of material on each side of the shearing members equal in width to the width of a blank, substantially as described.

11. In a machine of the class described, the combination of a shearing mechanism, means for feeding the work to the shearing mechanism, shiftable holding means for the work located adjacent the shearing mechanism and means for releasing said holding means from engagement with the work after the cutting operation of the shearing mechanism, substantially as described.

12. In a machine of the class described, the combination of shearing mechanism, feeding means, said feeding means acting in each instance to place the work beyond the shearing means a distance equal to the width of a blank, means for centering the work with respect to the shearing mechanism, shiftable holding means for the work located adjacent the shearing means, and means for releasing said holding means from engagement with the work after the cutting operation of the shearing mechanism, substantially as described.

13. In a machine of the class described, the combination of shearing mechanism embodying shearing members spaced apart a distance equal to the width of a blank, feeding means, said feeding means acting to place the work beyond the shearing means a distance equal to the width of a blank whereby a plurality of blanks are formed at a single shearing operation, shiftable holding means for the work located adjacent the shearing means and means for releasing said holding means from engagement with the work after the cutting operation of the shearing mechanism, substantially as described.

14. In a machine of the class described, the combination of shearing members spaced apart a distance equal to the width of a blank, means for feeding the work forward in the order of a first feeding step and a second feeding step the first feeding step placing the work a distance beyond the shearing means equal to the width of a blank, the second feeding step placing a strip of work each side of the shearing means each equal in width to the width of a blank, shiftable holding means for the work located adjacent the shearing means and means for releasing said holding means from engagement with the work after the cutting operation of the shearing mechanism, substantially as described.

15. In a machine of the class described, the combination of shearing members spaced apart a distance equal to the width of a blank, feeding means, said feeding means acting to place the work beyond the shearing means a distance equal to the width of a blank, a plurality of blank receptacles each arranged to receive a portion of the cut blanks, shiftable holding means for the work located adjacent the shearing means and means for releasing said holding means from engagement with the work after the cutting operation of the shearing mechanism, substantially as described.

16. In a machine of the class described, the combination of shearing mechanism, means for feeding the work to the shearing mechanism, a shiftable spring pressed roller adjacent the shearing mechanism for holding the work in position and means for shifting said roller to release it from engagement with the work after the cutting operation of the shearing mechanism, substantially as described.

17. In a machine of the class described, the combination of shearing mechanism, means for feeding the work to the shearing mechanism, a shiftable spring pressed roller adjacent the shearing mechanism for holding the work in position and means carried by the shearing mechanism for moving said roller to release it from engagement with the work after the cutting operation of the shearing mechanism, substantially as described.

18. In a machine of the class described, the combination of shearing mechanism including a fixed cutting surface, means for feeding the work, and a spring pressed finger adjacent said fixed cutting surface for deflecting the work over the top of said surface during the feeding operation, substantially as described.

19. In a machine of the class described, the combination of shearing mechanism including a fixed cutting surface, means for feeding the work, a series of spring pressed fingers adjacent the fixed cutting surface, each of said fingers being provided with a beveled upper end to deflect the work over the top of the fixed cutting member during the feeding operation, substantially as described.

20. In a machine of the class described, the combination of shearing mechanism, means for feeding the work to the shearing mechanism, and means for centering the work with respect to the shearing mechanism comprising shiftable tension actuated means arranged to be moved by engagement with the work and during the feeding thereof, whereby said means are placed under a spring tension, and coöperating means against which the work is forced by the shiftable means after the feeding means is released from the work, substantially as described.

21. In a machine of the class described, the combination of shearing mechanism, means for feeding the work to the shearing mechanism, means for centering the work with respect to the shearing means comprising tension actuated shiftable means located beyond the shearing means and adapted to be engaged and moved by the forward end of the work during the feeding thereof, whereby the said means are placed under tension, and coöperating means in front of the shearing means against which the rear edge of the work is forced by the shiftable means after the work is released by the feeding mechanism, substantially as described.

22. In a machine of the class described, the combination of shearing mechanism, means for feeding the work to the shearing mechanism, and means for centering the work with respect to the shearing mechanism comprising shiftable means arranged to be engaged and moved by the work during the feeding thereof, and coöperating means against which the work is forced by the shiftable means after the feeding mechanism is released from the work, substantially as described.

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