C. D. McDONALD.

METAL SHEARING MACHINE.

APPLICATION FILED DEC. 9, 1915.

1,174,747.

Patented Mar. 7, 1916.

4 SHEETS—SHEET 1.

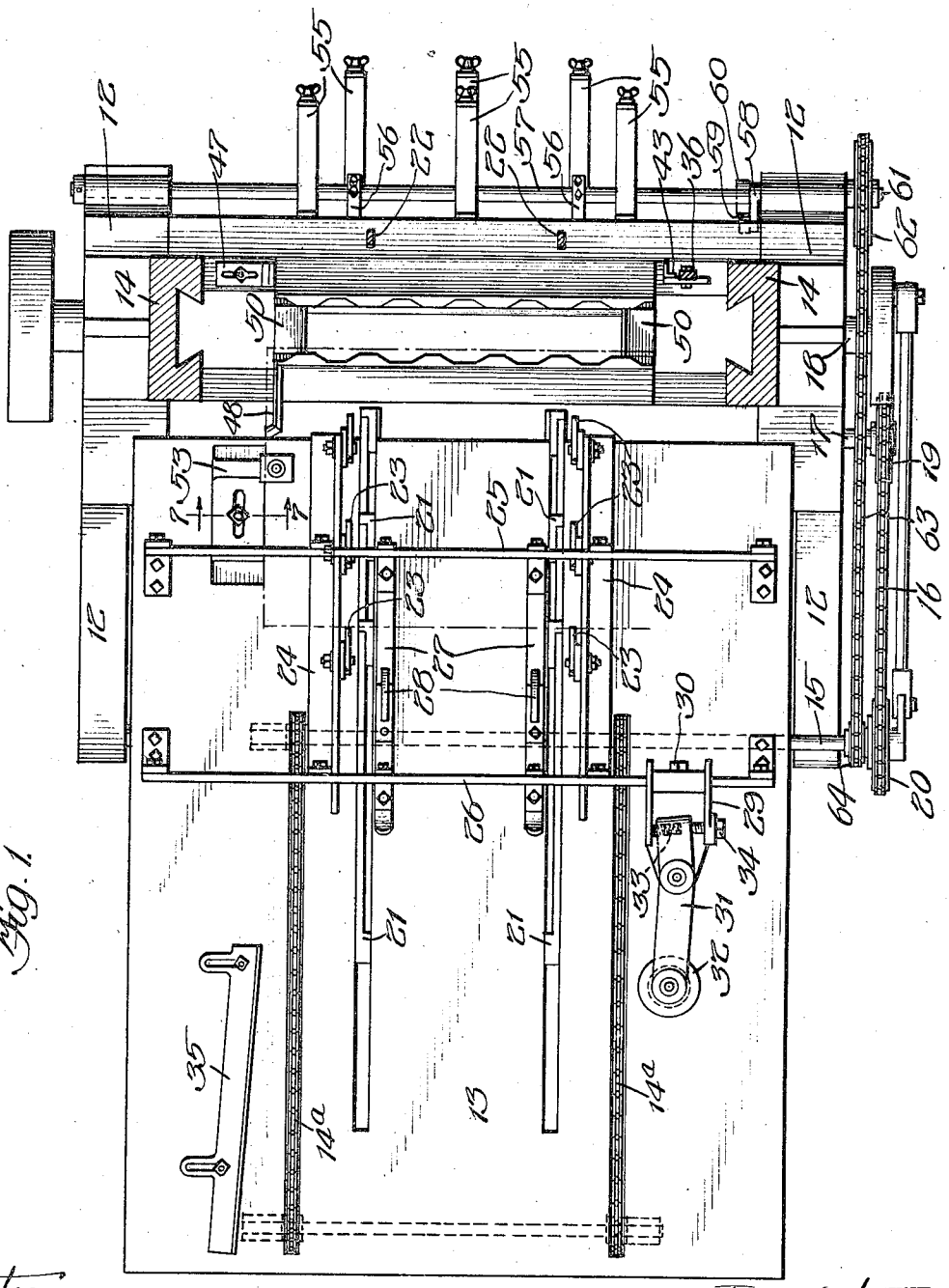

Fig. 1.

Witness

Jno. A. Nelson

Inventor:

Charles D. McDonald.

By Wm. P. Bond Atty.

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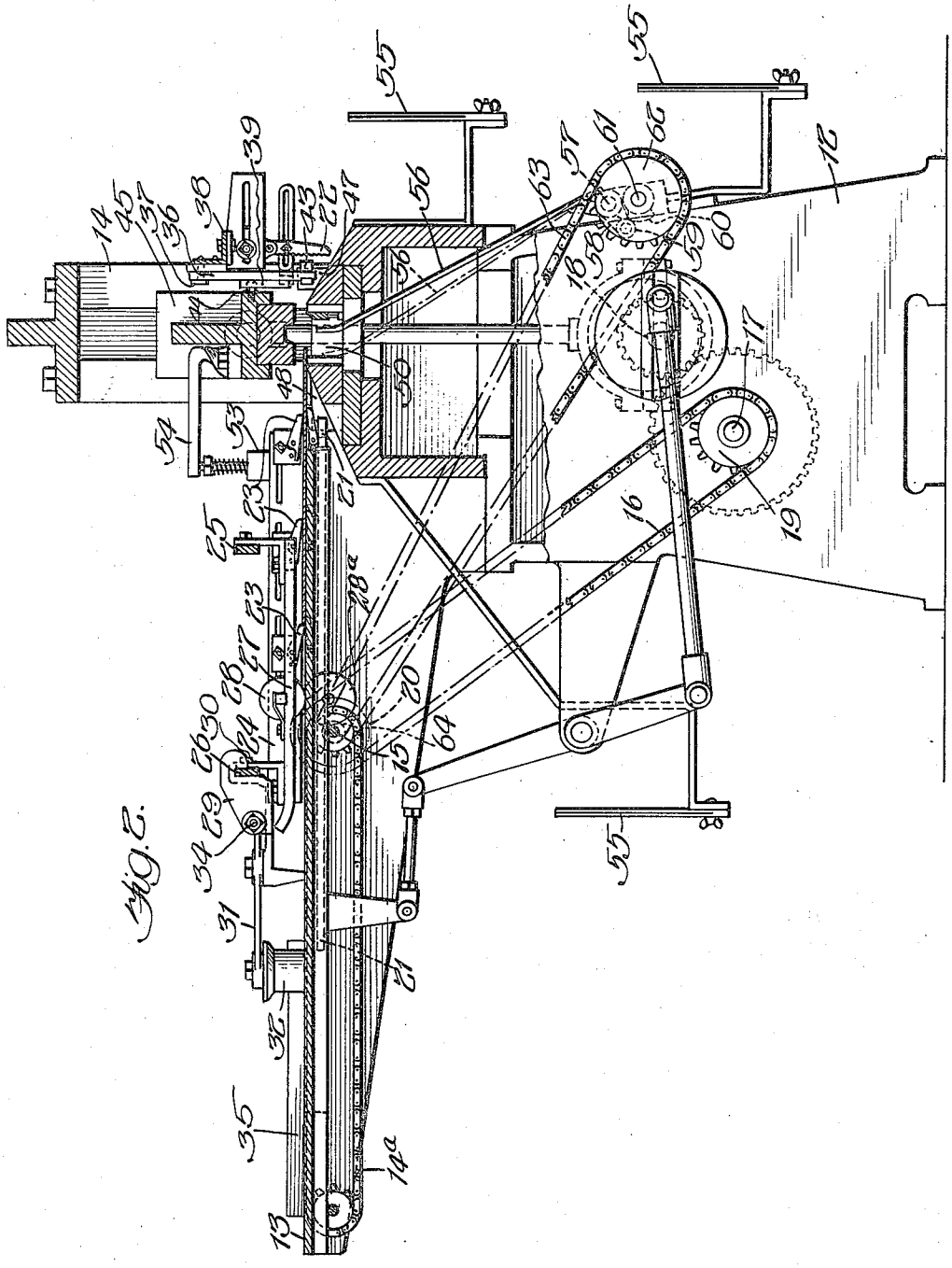

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

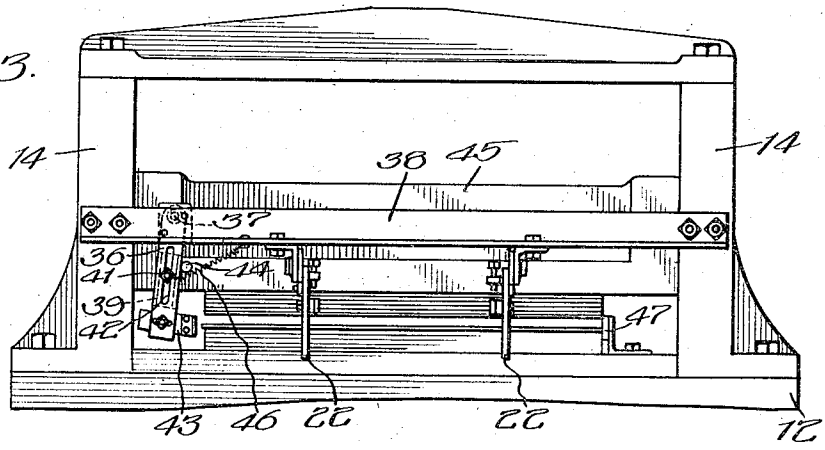


Fig. 4.

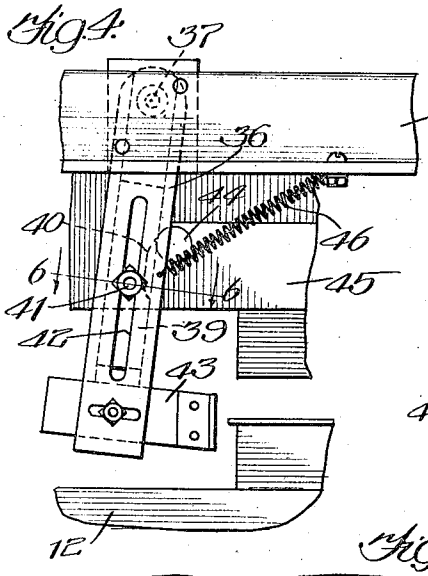


Fig. 6.

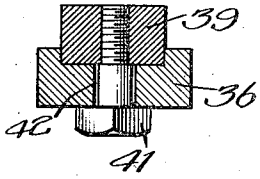


Fig. 5.

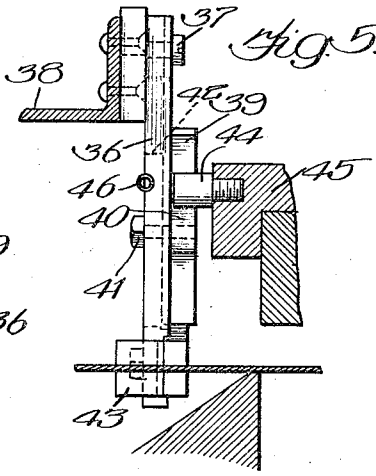


Fig. 7.

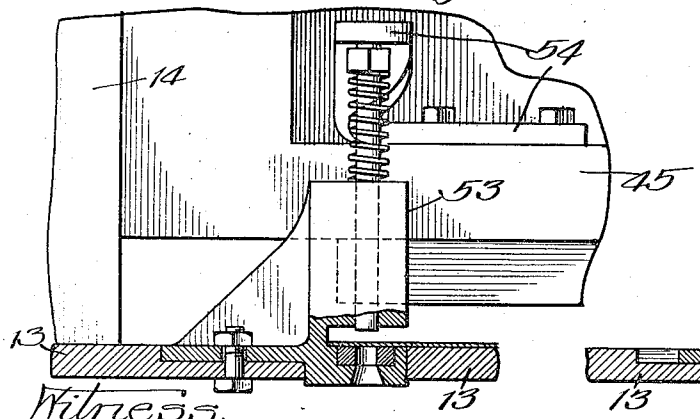
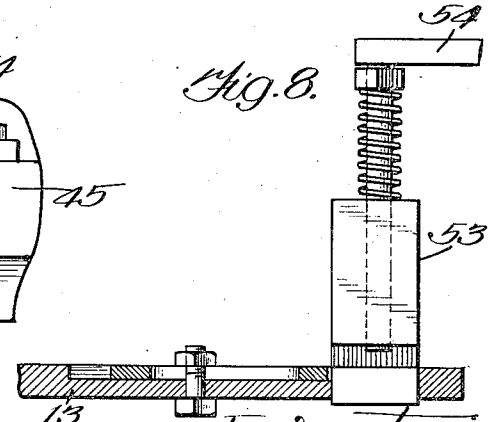


Fig. 8.



Witness.

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4 SHEETS—SHEET 4.

Fig. 9.

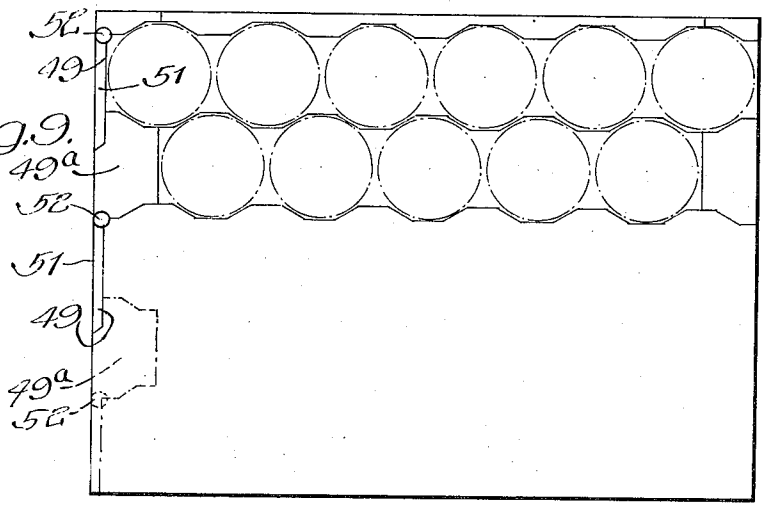


Fig. 10.

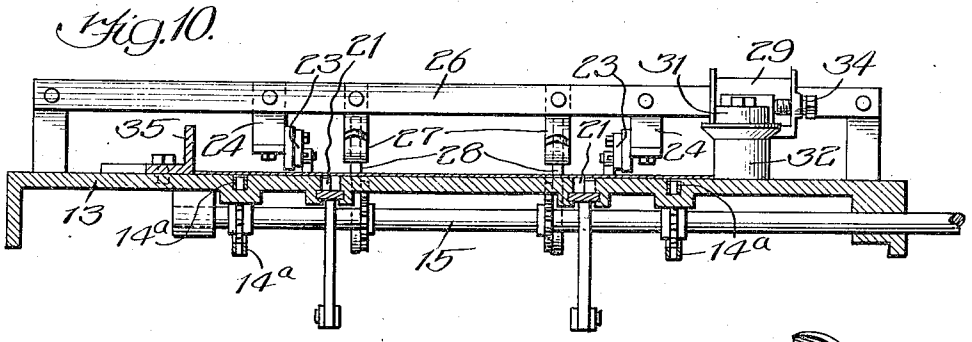
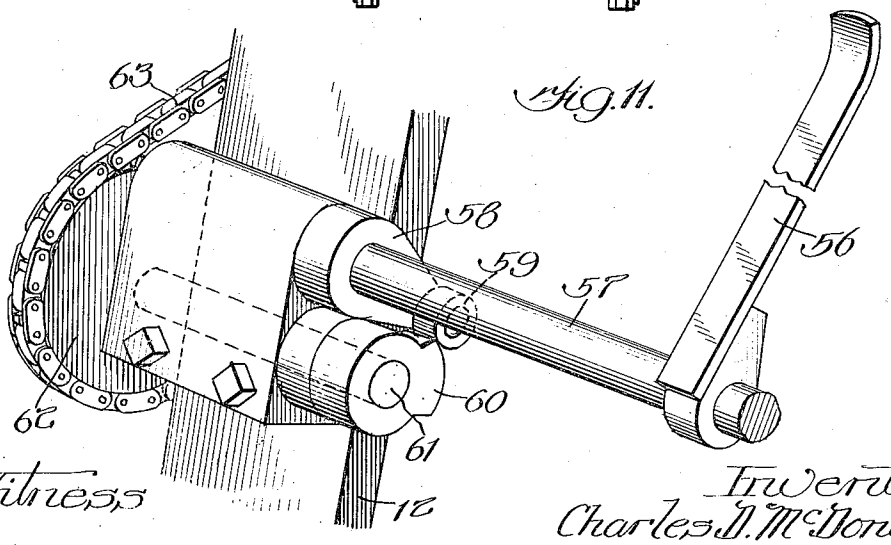


Fig. 11.



Witness:

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Inventor:

Charles D. McDonald.

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UNITED STATES PATENT OFFICE.

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

METAL-SHEARING MACHINE.

1,174,747. Specification of Letters Patent. Patented Mar. 7, 1916.

Application filed December 9, 1915. Serial No. 65,933.

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 present invention relates to a machine for shearing or cutting pieces of sheet metal into blanks or strips adapted to be fed into a die press to have articles stamped therefrom.

One of the objects of the present invention is to provide a shiftable gage member arranged along the table over which the work is fed, which gage member will be moved solely by engagement of the edge of the work therewith, whereby the work will be forced over into contact with a fixed gage member without any binding or choking.

A further object of the invention is to provide means for shifting a guide member so as to cause the strip trimmed off from the forward edge of the work previous to the commencement of the shearing operation to be deposited outside of the receptacles for the cut blanks, and to cause this mechanism which effects this shifting operation to be actuated in accordance with the movements of the feeding mechanism, no matter at what speed the feeding mechanism may be operated.

A further object of the invention is to provide a supplemental cutting member which will act to trim surplus stock from the side of the work during the progress of the work through the shearer.

A further object of the invention is to provide a cut or notch in the work at intervals, which cut or notch will extend in the line of the side trimming cut, and cause the metal trimmed from the side of the work to fall away from the main body.

A further object of the invention is to arrange a punch for producing this cut or notch in the work, which punch may be operated by the movements of the movable portion of the shearing mechanism.

A further object of the invention is to provide a kicker or gage which will act to strike the side of the work and move the work crosswise of the shearer into proper relation therewith.

A further object of the invention is to provide means for operating this kicker or gage in accordance with the movements of the shearing mechanism. And the invention further consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings: Figure 1 is a plan view of a machine embodying the features of the present invention; Fig. 2, a side view, partly in section, of the parts shown in Fig. 1; Fig. 3, a rear view of the shearing mechanism, showing the kicker for moving the work transversely of the shearers; Fig. 4, an enlarged detail of this kicker member, showing a front view thereof; Fig. 5, a side view of said kicker member; Fig. 6, a cross section on line 6—6 of Fig. 4 on a somewhat enlarged scale; Fig. 7, a side view of the punch for making the cut or notch in the work, by means of which separation of the strip trimmed from the side of the work from the main body thereof is effected; Fig. 8, a front view of this punch mechanism; Fig. 9, a view showing a series of blanks, showing the side trimming cut placed thereon, and showing the manner in which the holes or notches placed in the work operate to form a separation between that portion of the work trimmed from the side and the main body of the work; Fig. 10, a sectional detail through the table of the machine, showing the relation of the fixed and movable gage upon said table; and Fig. 11, an enlarged perspective detail of the mechanism for rocking the blank guide to move it out of the way when the trimming cut along the front edge of the work is made.

This machine as a whole is of the general type disclosed in Letters Patent of the United States, No. 1,110,810, granted to me September 15, 1914, and entitled Metal shearing machines, and the same principle of producing a multiplicity of strips from a single operation of the shearing mechanism is present in the machine of the present invention. In view of the disclosure in the above-named Letters Patent, no detailed description of this portion of the mechanism is deemed necessary.

In the operation of these machines, it has been found that it is desirable to accurately center the blanks with respect to the shearing mechanism prior to the shearing opera-

tion. It has also been found that the work operated upon will sometimes vary as to the length or width, or both, and it is therefore necessary to effect trimming cuts to remove the surplus length and width of the work, if the same be present. By performing such trimming operation, the work will be accurately cut by the shearing mechanism and blanks of accurate dimensions will thus be produced. It is primarily toward this phase of the operation of the machine that the present invention is directed.

Referring now to the drawings, the machine comprises a base 12, of any suitable size and formation, a table 13, and upright guides 14. In the latter, the crosshead of the shearing member travels. The work is first fed across the surface of the table 13, and is initially fed forward by means of sprocket chains 14ª, provided with suitable feed fingers. These sprocket chains are driven through the instrumentality of a driving shaft 15. This driving shaft is actuated by means of a chain or cable 16 driven from what may be termed a main driven shaft 17, any suitable sort of a connection between this shaft 17 and the main driving shaft 18 being provided. On the shaft 17 is a sprocket 19, and on the shaft 15 is a sprocket 20, over which passes the chain 16. It is necessary, when a change in the size of work is made, to vary the speed of movement of the shaft 15. Hence, these sprockets 19 and 20 are made removable, so that other sprockets may be substituted therefor, and the speed of rotation of this shaft 15 changed.

After the work has been carried along by the chains 14ª to the limit of their movement, it is then engaged by fingers of a feed bar 21, which is of the reciprocating type, and is then moved forward with an intermittent movement into position to be operated upon by the shearers. Previous to the operation of the shearers, the work is centered by means of movable centering mechanism 22 and fixed centering members 23, all of which is fully described in my Patent No. 1,110,810, previously referred to, and a detailed description thereof is not deemed necessary at the present time.

The fixed centering members 23 are carried by plates 24, which are suspended above the surface of the table by means of cross bars 25 and 26; and these cross bars also carry plates 27, in which are mounted rollers 28 that coöperate with rollers 28ª to center the work for the trimming cut, as fully described in my co-pending application, Serial No. 31,246, filed May 29, 1915, for metal shearing machines. Slidably mounted upon the bar 26 is a holder 29 for a movable gage member that forms a portion of the present invention. This holder, as will be seen from Fig. 2, is slotted to straddle the bar 26, and is held or locked in any desired position upon this bar by means of a bolt or other locking member 30. Pivoted to the holder 29 is an arm 31, which carries, on one end, a roller 32, and which, at its other end, is in engagement with a spring 33 that bears against the side of the holder 29. It is obvious that as the roller 32 is moved toward the outer edge of the machine, such movement will be against the force of the spring 33; and immediately upon cessation of such outward movement, the spring will act to return the roller inwardly and to normal position. An adjustable stop member 34 is provided for limiting the amount of this inward movement. On the opposite side of the machine from this movable gage member is a fixed gage member 35 in the form of a rail. This is termed a fixed gage member, since it normally remains in fixed position, although it may be adjusted in and out, as will be obvious from the drawings.

As previously stated, the width of work may be varied, and by the use of the spring pressed movable gage, no matter what the width of the work may be, one edge will always be forced over against the fixed gage 35, by reason of the roller 32 contacting the opposite edge of the work 369 and forcing it crosswise of the table; and there is no danger of a binding of the work by reason of its becoming clogged between the two gage members, since the roller 32 will automatically shift to accommodate itself to the width of the work. By the above means, the work is prevented from entering the machine on a bias, since the action of the roller 32 will swing it around into a straight line.

When the work is fed down into position to be acted upon by the shearing mechanism, it is necessary to aline it in order to shear off any excess width, and to accomplish this, I provide a kicker or gage member, which, in the construction shown, is located to the rear of the shearing mechanism. This kicker or gage member, as shown, comprises a plate 36, which is pivoted, as at 37, to a bracket or angle iron 38 that is a portion of the fixed structure of the machine. To the rear of this plate is located a member 39 having a cam-surface 40 thereon. This member 39 is provided with a stud 41, which projects through a slot 42 in the plate 36; and by this arrangement, the cam-faced member can be adjusted longitudinally of the plate 36 to raise or lower the same.

Located at the end of the plate 36, and extending crosswise thereof, is an angle-shaped member 43, which, as shown in Fig. 4, is connected to the plate in a manner to permit relative adjustment therebetween to move the member 43 in or out. It is this angular-shaped member 43 which engages

with the side edge of the work to shift the work transversely of the shearers and aline it to remove the surplus along the side. In the construction shown, this kicker is actuated by means of a stud 44 carried by the cross-head 45, which also carries the movable dies of the shearing mechanism. As this cross-head 45 descends, the stud 44 will travel along the face of the member 39, and when the cam-surface of the face of this member is reached, a spring 46 will act to throw the plate 36 and kicker 43 inward toward the work, whereupon said kicker will strike the side of the work and move it crosswise of the machine. Thus, at each operation of the shearing mechanism, this kicker is actuated; and by controlling its movements, by the movement of the shearing mechanism, a perfect timing between the operation of these parts is effected. The work is moved crosswise of the shearer and up against a fixed stop 47, thus alining the work for removing the surplus from the side thereof. As stated above, these sections of work operated upon may vary somewhat in width. By the use of the kicker mechanism above referred to, after each shearing operation, a previously trimmed edge of the work is forced up against a gage, so that the work is correctly placed to receive the next trimming operation.

I provide a side edge trimming die 48 (see Fig. 1) on the opposite side of the machine from that on which the kicker is located. When the shearer descends, this trimming die acts to cut off all portions of the work extending beyond the shearing mechanism, thus trimming the sides of the work during the shearing operation. In the construction shown, this trimming die is of a length equal to approximately one and one-half of the sheared strips, as will be apparent from Fig. 9. It thus cuts clear across one of said strips and part way of the next adjacent strip.

By referring to Fig. 9, it will be seen that on the initial cut, the side trimming die will produce a notch in the corner of the work; and the kicker acts to shove the work over until the notched portion strikes the gage 47, thus positioning the work for the next trimming cut. This cut will create a notch 49 in the corner of the work, and this notched portion will be shoved over by the kicker into engagement with the fixed gage and the work positioned for the next trimming cut. Also, by referring to Fig. 9, it will be seen that a trimming die of the kind described will leave a tail 51 extending from surplus portions 49^a, which are produced by a cross die 50. It is necessary to remove these tails or strips in order to produce the notched corners in the work. Therefore, at periodical intervals along the edge of the work holes or notches 52 are formed, which are in alinement with the trimming cut and extend to the edge of the work. Thus, the trimming cut will run into these holes and the tail 51 will drop away from the main body of the work, producing the notched edge 49. In order to produce this cut 52, I place a punch 53 (see Figs. 7 and 8) of any suitable construction adjacent to the front edge of the shearing mechanism, and I provide a strap 54 joined to the shearing mechanism, the end of which strap will, when the cross-head 45 of the shearing mechanism descends, strike the movable portion of the punch and make the hole previously referred to in the body of the work. By this arrangement, the hole or notch is cut previous to the shearing operation and a correct timing between the operation of this punch and the shearing mechanism is effected by causing the punch to be operated directly by the movements of the shearing mechanism.

There remains to be described the means by which the trimmed edge of the work is deposited outside of the receptacles for the cut blanks. This trimming of the edge of the work is produced by first placing the work in the position shown in Fig. 2, whereby a portion thereof overlaps the forward of the cutting surfaces of the shearing mechanism. The shearing mechanism then descends and this cut portion is trimmed from the edge of the work, and, as stated, a cut made along the side of the work, so that at this single operation a trimming of both the front end and front portion of the side edge is produced. A plurality of receptacles 55 are provided, in which the sheared blanks fall, and it is not desirable to have this trimming cut fall within these receptacles. Therefore, I provide a shiftable guide member 56, which is joined to a rock shaft 57. An arm 58 is connected to this rock shaft, carrying a roller 59, which is actuated by a cam 60 and a stub shaft 61. A sprocket 62 is joined to this stub shaft, which receives a chain 63 driven by a sprocket 64 on the shaft 15. This shaft 15, it will be remembered, drives the chains that initially feed the work across the surface of the table, and, inasmuch as it is only intended that the shiftable guide 56 should operate at the time the forward edge of the work reaches the shearing mechanism and the trimming cut made, it is obvious that a relative timing between the shaft 15 and stub shaft 61 is necessary. As previously stated, the speed of rotation of the shaft 15 may vary, but by driving the stub shaft 61 directly from the shaft 15, the speed of rotation of the stub shaft will vary in direct accordance with the speed of rotation of the shaft 15, and a movement of the same relative character will always be maintained between these two shafts, irrespective of the speed of movement of the shaft 15. When the trimming cut is made, the shift-

able guide 56 is moved into the full line position of Fig. 2, and it will be obvious that this trimming cut will then fall through the opening in the center of the machine and onto the floor. After the trimming cut has been made, the cam 60 moves to allow the shiftable guide 56 to move backward into the dotted position of Fig. 2, and the completed blanks which subsequently pass through the opening in the center of the machine will be deposited into their proper blank receptacles.

The operation of the machine with the improvements above noted will, it is thought, be understood from the foregoing, but briefly is as follows: The work is conveyed along the surface of the table by the action of the chains 14ª. The shiftable gage 32 operates to force one edge of the work against the fixed gage 35 and start it straight into the machine. The work is then carried forward by the reciprocating feed bar and placed in position to be operated upon by the shearing mechanism. Upon the first operation of the shearing mechanism, the entire forward edge of the work and the front portion of the side edge of the work are trimmed, and at this time the cam 60 operates to move the shiftable guide 56 into the position shown in Fig. 1, to allow the trimmed edge to fall upon the floor. The work is then fed forward into position for the first shearing operation. Previous to the actuation of the shearing dies, the punch 53 is operated to form a hole or notch in the side of the work, and the kicker member 43 is operated to move the work crosswise of the shears and force that portion of the side edge previously trimmed into engagement with the fixed gage. The cross-head 45 then descends and produces the sheared blank. At the same operation, the trimming die 48 acts to cut away the surplus or excess stock along the side of the work and produce the notch 49. The work is then fed forward, and the kicker acts to place the edge of the notch 49 against the fixed gage, and the shearing and trimming operations are completed. Thus, the work is trimmed both as to length and as to width during the shearing operation, and blanks of correct proportion for subsequent feeding into a die press are produced.

The principal practical point in trimming the strips in the manner specified is to form them exactly correct for feeding into the die press, since the main object of these metal shearing machines of this type is to produce a large number of blanks in a relatively quick time, thereby enabling the continuous operation of a large number of die presses.

I claim:

1. In a machine of the class described, the combination of shearing mechanism, a table, means for advancing the work across the surface of the table and into position to be acted upon by the shearing mechanism, a fixed member along one side of the table terminating medially thereof and extending diagonally outward from its front to its rear end, a shiftable member opposed to the fixed member and arranged in approximate alinement with the forward end of the fixed member, said shiftable member pressing the edge of the work and acting to turn the work about the end of the fixed member as a center to prevent the work entering into position to be engaged by the advancing means in an oblique manner, substantially as described.

2. In a machine of the class described, the combination of shearing mechanism, a table, means for advancing the work across the surface of the table and into position to be acted upon by the shearing mechanism, a fixed member along one side of the table terminating medially thereof and extending diagonally outward from the front to the rear end, a shiftable member opposed to the fixed member and arranged in approximate alinement with the forward end of the fixed member, a carrier for the shiftable member, means for adjusting the position of said carrier, and said shiftable member engaging a side of the work and acting to turn the work about the end of the fixed member as a center to prevent deliverance of the work to the advancing means in an oblique manner, substantially as described.

3. In a machine of the class described, the combination of shearing mechanism, a table, means for advancing the work across the surface of the table and into position to be acted upon by the shearing mechanism, a fixed member along one side of the table terminating medially thereof and extending diagonally outward from its front to its rear end, a shiftable member opposed to the fixed member and arranged in approximate alinement with the forward end of the fixed member, said shiftable member engaging one edge of the work and acting to turn the work about the end of the fixed member as a center to prevent deliverance of the work to the advancing means in an oblique manner, a carrier to which the shiftable member is pivoted, a stop for limiting the movement of the shiftable member in one direction, and tension mechanism against the pressure of which the shiftable member works when moved in the opposite direction, substantially as described.

4. In a machine of the class described, the combination of shearing mechanism, a table, means for advancing the work across the surface of the table and into position to be acted upon by the shearing mechanism, a fixed member along one side of the table terminating medially thereof, with the forward end arranged closer to the center of

the table than the rear end, a spring-pressed shiftable member opposed to the fixed member and arranged in approximate alinement with the forward end of the fixed member, and said shiftable member engaging a side of the work and acting to turn the work about the end of the fixed member as a center to prevent deliverance of the work to the advancing means in an oblique manner, substantially as described.

5. In a machine of the class described, the combination of shearing mechanism, means for placing the work in position to be operated upon by the shearing mechanism, means for producing a trimming cut along the forward edge of the work, a receptacle for cut blanks, means for guiding said blanks into said receptacle, means for moving said guiding means out of guiding position previous to the trimming cut, a cam for effecting such movement of said guiding means, a shaft carrying said cam, an endless member for conveying the blanks, a driving shaft for said endless member, a sprocket and chain connection between said driving shaft and cam shaft, a main driving shaft, and a sprocket and chain connection between the main driven shaft and the driving shaft of the endless member, substantially as described.

6. In a machine of the class described, the combination of shearing mechanism, means for feeding the work into position to be operated upon by the shearing mechanism, and means for moving the work crosswise of the shearing mechanism previous to the shearing operation for positioning the work with respect to the shearing mechanism to receive a side trimming cut, substantially as described.

7. In a machine of the class described, the combination of shearing mechanism, means for feeding the work into position to be operated upon by the shearing mechanism, means for moving the work crosswise of the shearing mechanism previous to the shearing operation for positioning the work with respect to the shearing mechanism to receive a side trimming cut, and means operatively connected for actuating said moving means by the operation of the shearing mechanism, substantially as described.

8. In a machine of the class described, the combination of shearing mechanism, means for moving the work into position to be acted upon by the shearing mechanism, a kicker member adapted to strike the edge of the work and move it crosswise of the shearing mechanism to position the work with respect to the latter, and means operatively connected for moving the kicker member in synchronism with the operation of the shearing mechanism, substantially as described.

9. In a machine of the class described, the combination of shearing mechanism, means for moving the work into position to be acted upon by the shearing mechanism, a swinging member adjacent the shearing mechanism adapted to strike the edge of the work and move the same crosswise of the shearing mechanism to position the work with respect to the latter, a cam-surface on the swinging member, a contact carried by the shearing mechanism adapted to engage the cam-surface, and tension means for moving the swinging member into engagement with the work, substantially as described.

10. In a machine of the class described, the combination of shearing mechanism, means for moving the work into position to be acted upon by the shearing mechanism, a swinging plate-like member adjacent the shearing mechanism, a kicker member carried by the swinging member and arranged to strike the edge of the work when the swinging member is moved to move the work crosswise of the shearing mechanism and position the work with respect to the shearing mechanism, a member carried by the swinging member and provided with a cam-surface, a contact member carried by the shearing mechanism and adapted to engage the cam-surface, and tension mechanism for moving the swinging member in the direction of the work, substantially as described.

11. In a machine of the class described, the combination of shearing mechanism, means for feeding the work into position to be acted upon by the shearing mechanism, and means for making an initial trimming cut along the forward edge of the work and simultaneously trimming a portion of one side of the work, the latter trimming defining a line of cut for subsequent side trimming operations, substantially as described.

12. In a machine of the class described, the combination of shearing mechanism, means for feeding the work into position to be acted upon by the shearing mechanism, means for making an initial trimming cut along one side of the work to define a line of cut for subsequent side trimming operations, and means for effecting a separation at each side trimming operation of the work trimmed from the side thereby, substantially as described.

13. In a machine of the class described, the combination of shearing mechanism, means for feeding the work into position to be acted upon by the shearing mechanism, means for trimming the surplus width from the work, means for placing cuts at intervals along the side of the work being trimmed, said cuts being in alinement with the line of the side trimming cut, whereby the trimmed surplus width is separated from the main body of the work, substantially as described.

14. In a machine of the class described, the combination of shearing mechanism,

means for feeding the work into position to be acted upon by the shearing mechanism, means for trimming the surplus width from the work, punch mechanism arranged in advance of the trimming means, and means operatively connected to operate said punch mechanism to form cuts at intervals along the side of the work being trimmed, said cuts being in alinement with the line of the trimming cut, whereby separation of the trimmed surplus width is made from the main body of the work, substantially as described.

15. In a machine of the class described, the combination of shearing mechanism, means for feeding the work into position to be acted upon by the shearing mechanism, means for trimming the surplus width from the work, punch mechanism arranged in advance of the trimming mechanism, means carried by the shearing mechanism for actuating the punch mechanism, said punch acting to place cuts at intervals along that side of the work being trimmed, said cuts being arranged in alinement with the line of the trimming cut, whereby separation of the trimmed surplus width is made from the main body of the work, substantially as described.

16. In a machine of the class described, the combination of shearing mechanism, means for feeding the work into position to be operated upon by the shearing mechanism, means for positioning the work to enable a trimming cut to be made along the forward edge thereof, means for simultaneously trimming off a portion of the side of the work with the trimming of the forward edge to produce a trimmed notch in the forward end of the work, and means for moving the edge of the trimmed notch portion into engagement with a fixed gage to position the work for the next side trimming cut, substantially as described.

17. In a machine of the class described, the combination of shearing mechanism, means for feeding the work across the shearing mechanism to place a portion beyond the shearing mechanism, and means for notching the forward edge of that portion placed beyond the shearing mechanism to establish a line of cut for subsequent side trimming operations, substantially as described.

CHAS. D. McDONALD.

Witnesses:
JAMES C. HINES,
CHAS. E. ENNES.