July 16, 1940. J. L. DWORCHUCK ET AL 2,208,022

MACHINE FOR CUTTING SHEET METAL

Filed March 4, 1940 3 Sheets-Sheet 1

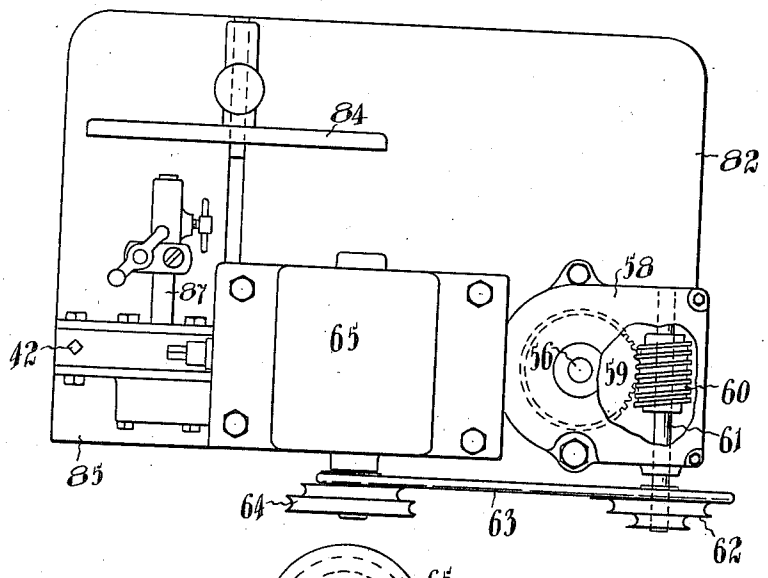

Fig. 1.

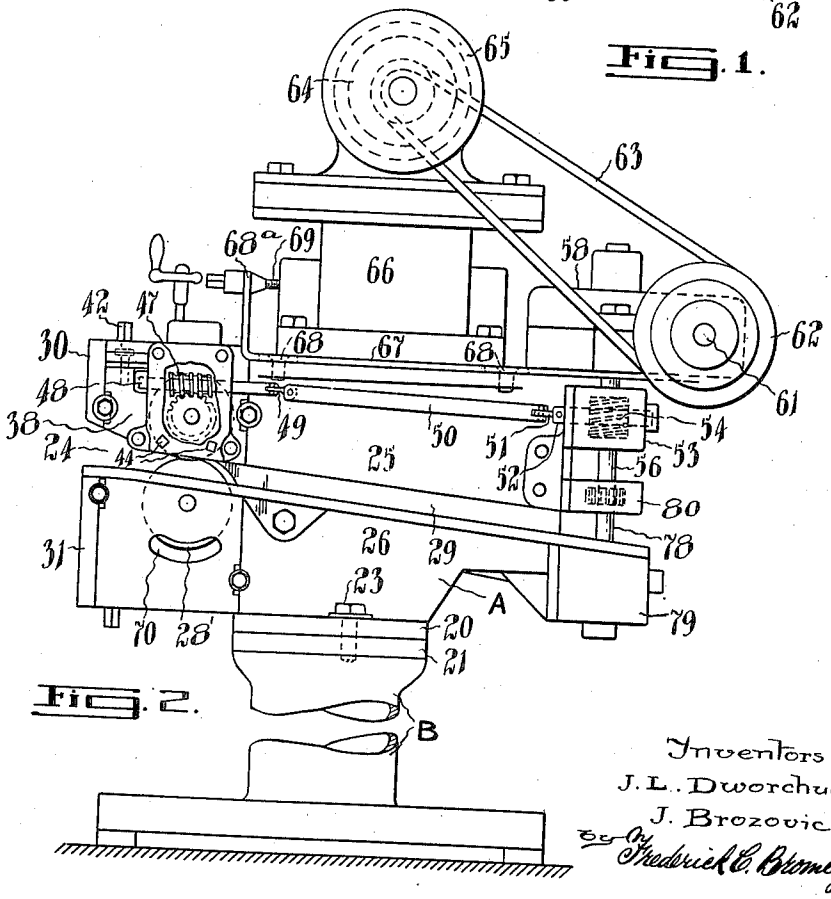

Fig. 2.

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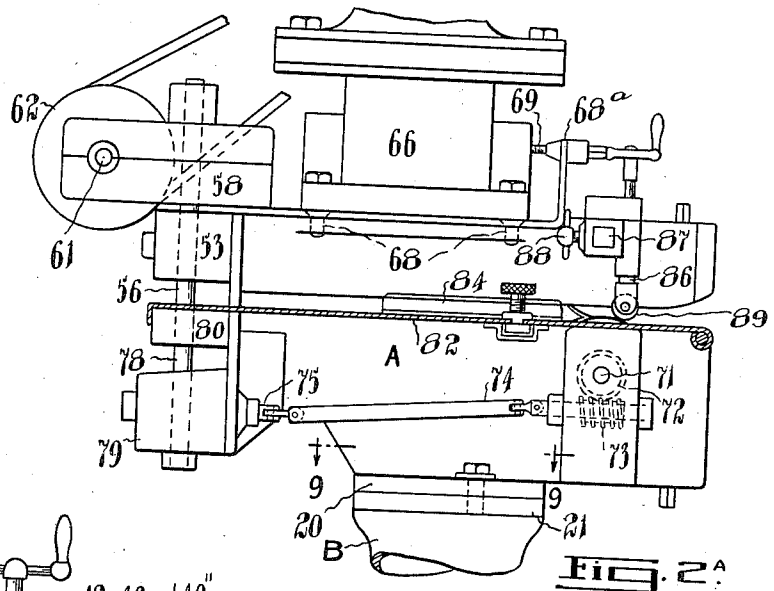

Fig. 2A.

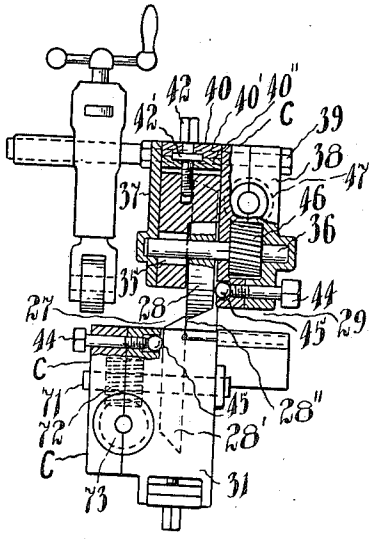

Fig. 5.

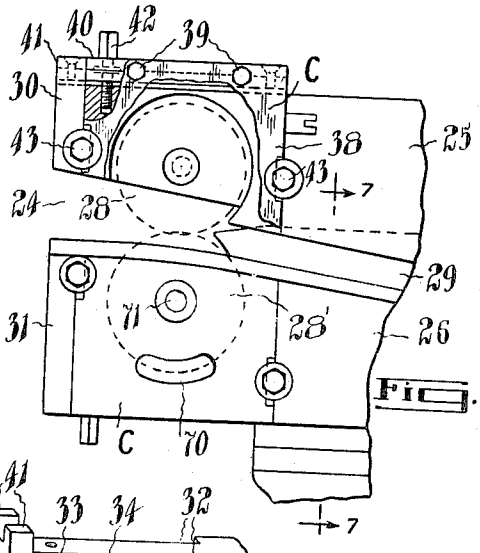

Fig. 6.

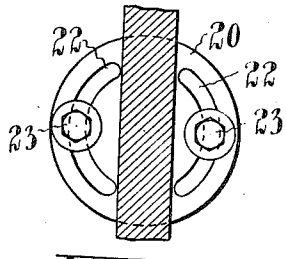

Fig. 9.

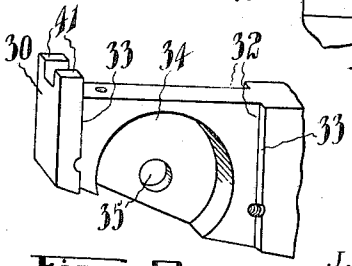

Fig. 8

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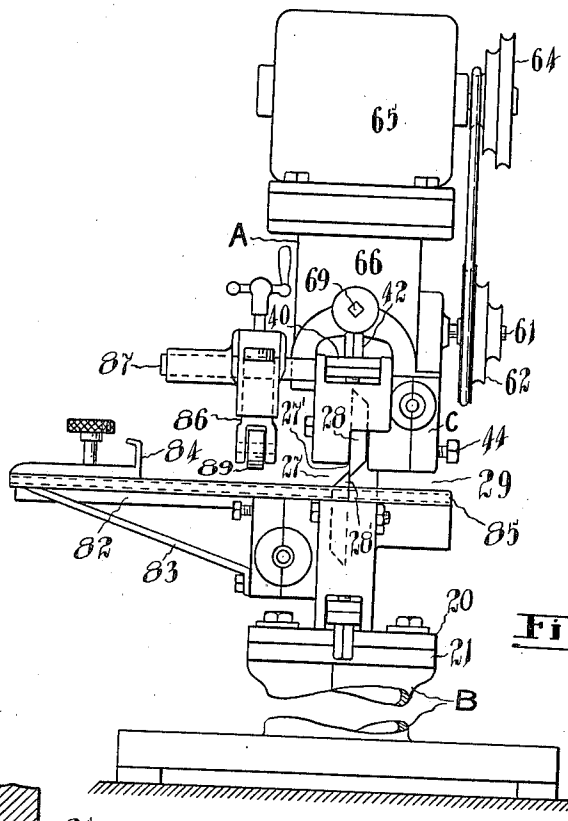

Fig. 3.

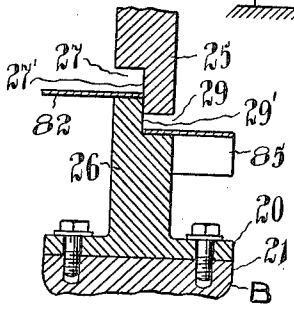

Fig. 7.

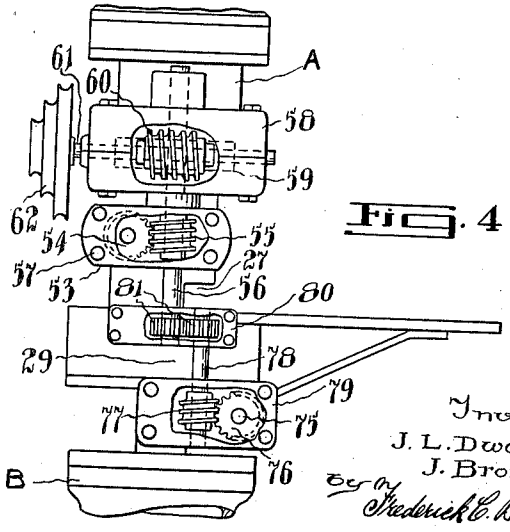

Fig. 4.

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UNITED STATES PATENT OFFICE

2,208,022

MACHINE FOR CUTTING SHEET METAL

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Application March 4, 1940, Serial No. 322,094

8 Claims. (Cl. 164—60)

The general object of the invention is to provide a power driven machine for cutting sheet metal into various widths and lengths without bending or buckling of the stock.

A further object is to produce a unitary machine incorporating rotary cutters or knives coacting to feed and cut the stock automatically and each power driven and adjustable to and away from one another.

A still further object is to furnish a serviceable and efficient mechanism for said adjustment of the knives, said mechanism including a pair of stationary jaws each equipped with a knife support adjustable in guide means and mounting gearing to which power is supplied by speed reducing gearing through the medium of a universal shaft.

A still further object is to provide adjustable means for taking the thrust on the knives and for compensating for wear and resharpening as occasion may require.

The machine herein disclosed is one of general utility and is capable of cutting sheet metal of various gauges regardless of the size of sheet and cut to be made. It is sturdy in construction and possesses salient features of advantage as will be apparent from the ensuing detailed description.

Referring to the accompanying drawings,

Figure 1 is a plan view of the machine.

Figure 2 is a view of the right hand side of the machine.

Figure 2A is a similar view but showing the left hand side thereof.

Figure 3 is a front elevation of the machine.

Figure 4 is a rear view showing parts broken away and depicting the reduction gearing to the universal shafts of the rotary cutters.

Figure 5 is a front end view, partly in section, showing the jaws with the rotary cutters thereof.

Figure 6 is a side elevation of Figure 5 depicting the rotary cutters in dotted lines.

Figure 7 is a fragmentary vertical section of the frame taken on line 7—7 of Figure 6.

Figure 8 is a perspective view of the upper jaw of the frame.

Figure 9 is a cross section on line 9—9 of Figure 2A.

Like numerals of reference denote similar parts in each figure of the drawings.

The machine comprises a main frame, generally denoted at A, carrying the rotary cutters and power drive therefor. The frame is turnably mounted upon a standard B in order that it may be angularly adjusted about a vertical axis. To this end the frame has a circular base plate 20 shouldered on the upper end 21 of the standard in such manner that it may be turned about the same. The standard is shown as a tubular member having an enlarged base portion that rests upon a floor surface. The base plate 20 is supplied with arcuate slots 22 in which is fitted cap screws 23 that threadedly engage the top 21 of the standard. When the frame is set to the desired angular position the cap screws 23 are tightened in order to secure it against movement.

Frame A is a vertical member of narrow width characterized by a pair of channels or slots relatively offset, which extend lengthwise and merge into a work-receiving mouth 24 at the front end. The rotary cutters meet at the mouth and the sheet to be cut is inserted in this aperture so as to be acted on by the cutting knives. The said channels or slots divide the frame into upper and lower parts 25 and 26 respectively, and coact to receive the divided edges of the sheet as they are cut such as to provide clearance for these edges and to permit of their feeding freely without obstruction. To attain this result the channel or slot 27 at the left hand side extends horizontally in endless manner and has its vertical end face 27′ in the plane of the engaged faces 28″ of rotary cutters 28 and 28′. Similarly the channel or slot 29 at the right hand side extends in endless manner and has its vertical end face 29′ in the plane of said faces 28″ but is inclined downwardly from the mouth 24 so that a connecting wall may exist between the upper and lower parts 25 and 26 of the frame. Accordingly, in cutting off a strip of material from a sheet the part that is being severed travels in the inclined channel or slot 29. The angle of divergence is so slight that the strip is not flexed beyond its inherent springiness.

The mouth 24 divides the front of the frame into a fixed upper jaw 30 and a fixed lower jaw 31. Each of these jaws serves to carry a vertically adjustable head, generally indicated at C, for varying the proximity of the rotary cutters. For this purpose the upper jaw 30 has its side faces oppositely recessed as at 32 with vertical end faces 33 so as to compose similar guideways. The right hand side of this jaw is counterbored circularly within the respective guideway as denoted at 34 to accommodate the upper cutter 28. The counterbore is diametrically larger than the cutter to permit of vertical shifting of the cutter in making adjustment of the same in relation to the lower cutter 28′. The jaw is pierced as at 35 centrally of the counterbore in order to supply an opening through which a shaft 36 may extend

loosely, which shaft is rigid with the cutter 28, and is capable of vertical movement in this opening.

The shaft is carried by the head on the upper jaw, which head comprises a pair of members 37 and 38 straddling the jaw and slidably fitted in the recesses 32. Said members are secured by fastening elements 39 to a top plate 40 overlying the jaw and coextensive therewith. The top plate is desirably guided at its forward end between lugs 41 and composed of two bars 40' and 40'' riveted or otherwise secured together. A headed screw 42 is lodged loosely in the top plate by means of a collar 42' interposed between the bars 40' and 40'' before they are secured to each other. The screw has threaded engagement with the jaw so that it may be turned to lower or raise the head as required in effecting vertical adjustment of the cutter 28. Cooperating with this adjusting screw are thru-bolts 43 lodged in holes at the front and rear edges of the members 37 and 38 and supplied with nuts so that they may be tightened when the head is properly adjusted in order to bind said members to the jaw and thus secure the head firmly in set position.

The member 37 is a plate in which one end of the shaft 36 is journalled. The member 38 is a split gear case disposed at the right hand side of the upper jaw and journalling that end of the shaft 36.

Headed screws 44 have threaded engagement with the member 38 in order to supply means whereby hardened steel balls 45 may be urged into contact with the cutter 28 for taking the thrust due to the cutting operation. The balls are lodged loosely in recesses and located in proximity to the periphery of the cutter. This construction provides for adjusting the upper cutter laterally of the lower cutter.

The case, composed of the member 38, houses a worm wheel 46 integral with or secured to shaft 36, and a worm 47 in mesh therewith and rotatable with a journalled shaft 48 horizontally arranged and fitted with a rearwardly protruding part capable of axial extension and united by a universal joint 49 to a shaft 50 freely extending to the rear of the frame A where it is connected by a universal joint 51 to a shaft 52 journalled in a case 53. Shaft 52 is disposed horizontally alongside of the rear of said frame and is rigid with a worm wheel 54 which is in mesh with a worm 55 integral with or keyed to the vertical drive shaft 56.

The intermediate part of said shaft 56 is journalled in said case 53 which is attached to the rear of the frame aforesaid and is of ordinary construction, being provided with a cap held by the fastening elements 57. The upper end of this shaft is journalled in a gear case 58 of the split type and is keyed to a worm wheel 59 within the case and in mesh with a worm 60 on the horizontal drive shaft 61. Shaft 61 is suitably journalled in the case 58 and has a projecting end carrying a stepped pulley 62 driven by a belt 63 from a like pulley 64 on the shaft of an electric motor 65.

The case 58 is rigidly attached to the rear of the top of the frame A and the shaft 56 is offset at the rear of the frame in order to clear the channel or slot 27 at the left side so as not to obstruct the passage of work through the same. This shaft terminates short of the channel or slot 29 at the other side so as to avoid interference with work passing therethrough. The arrangement of this shaft and its associated gearing will best be seen from an inspection of Figure 4.

The motor 65 is surmounted on the frame by means of an adjustable stand 66 to which it is bolted. The stand rests upon a horizontal supporting wall 67 secured to or forming a part of the top of the frame A. The stand is held in place by means of fastening elements 68 that extend through lengthwise slots in wall 67 whereby the motor may be adjusted for tensioning the belt thereof. To aid in effecting such adjustment and to retain the stand against shifting, the wall 67 has a vertical arm 68 provided with a screw 69 shouldered thereon and threadedly engaged with the stand.

It will be gathered from the preceding description that the belt drive of the motor is transmitted by the worm 60 and the worm wheel 59 to the vertical shaft 56 at reduced speed. Power is taken off this shaft by the worm 55 and worm wheel 54 for the operation of the universal shaft 50 at a further reduction in speed, and in turn the worm 47 and the worm wheel 46 rotate the cutter 28 at a still lesser speed. The universal drive functions to transmit the power irrespective of the position of adjustment of the cutter head.

Having described in detail the construction and arrangement of the upper cutter or knife mechanism, it is not necessary to recount in detail the construction and arrangement of the lower cutter or knife mechanism for the reason that it is identical. The counterbore, however, that accommodates the lower cutter 28' has an opening 70 (Figure 6) at its bottom portion to enable particles of cuttings, et cetera, to drop out so as to avoid clogging. The shaft 71, that carries the cutter 28', has its worm wheel 72 located at the left hand side of the frame A, and the worm 73 in mesh therewith is driven by a universal shaft 74 at that side of the frame, as best discernible in Figure 2A. The shaft 74 extends rearwardly and downwardly, and is connected by a shaft 75 to a worm wheel 76 meshed with a worm 77 on a stub shaft 78 vertically arranged at the rear of the frame so as to parallel the shaft 56 and extend downwardly from the lower end thereof. The lower extent of shaft 78 is journalled in a split case 79 that houses the worm wheel 76 and the worm 77; the upper extent is journalled in a split case 80 that provides a bearing for shaft 56 and houses a pair of spur gears 81, of which one is keyed to shaft 56 and the other secured to shaft 78. The spur gears are equal in diameter and merely serve to transmit the drive of the shaft 56 to the shaft 78 at the same speed so that the lower cutter 28' will be simultaneously driven with the upper cutter 28..

The reason for offsetting the drive by means of the stub shaft 78 is to clear the channel or slot 29, as otherwise were the shaft 56 continued downwardly to provide a direct power take-off for the worm 77 it would obstruct this channel or slot.

For the purpose of supporting sheet metal during the cutting operation a table is attached to the frame A, which table extends laterally from each side of the frame and comprises a section 82 at the left side braced as at 83 and equipped with an adjustable gauge 84. The complementary section 85 at the right side is sloped coextensive with the channel or slot 29. A pressure bar 86 is supplied over the section 82 to hold a sheet while it is being cut. The bar is slidably carried on an arm 87 laterally projecting from the upper head aforesaid. A locking device 88

is used to secure the bar in any position of adjustment. The lower end of the bar has a roller 33 for contact with a sheet so as to hold it against tilting on the table. The bar has a vertical screw adjustment for setting the roller.

It is believed that the construction and arrangement of the machine should be entirely clear to those skilled in the art, and it will be manifest that a sheet of metal can be cut by inserting it edgewise at the juncture of the rotary cutters when the same are in operation. Work cut on this machine has a clean edge and is not bent or curled in any way. The cutters are capable of both lateral and vertical adjustment, and the machine is adapted for handling sheets of any length.

What we claim is:

1. In a sheet metal cutter, a frame, a vertical jaw forming a rigid part thereof and having its side faces recessed with vertical guide shoulders or edges, one of the recessed side faces being counterbored within the recess thereof and an aperture being supplied through the counterbored portion, a head disposed on said jaw, said head having a top plate overlying the jaw and members depending from the plate and lodged in the recessed faces of the jaw and engaged with the vertical guide shoulders or edges thereof, a screw securing said top plate to the jaw whereby the said members are adjustable, means for clamping the members when in adjusted position, a rotary cutter contained loosely in the aforesaid counterbored portion of the jaw, a shaft rigid with the rotary cutter and extending loosely through said aperture of the jaw, said shaft being journalled in the aforesaid members of the head, and means for operating the shaft.

2. In a sheet metal cutter, a frame having a jaw, a circular cutter for coacting with a mating cutter, a head mounted on said jaw for movement to and away from the mating cutter above referred to, means for effecting such adjusting movement of the head, means journalling said circular cutter in the head, gearing carried by the head for driving said circular cutter, a universal shaft connected to said gearing, and power transmitting means on the frame for actuating said universal shaft.

3. In a sheet metal cutter, a vertical frame having a mouth portion at its front end providing an upper and a lower jaw, a head carried by each jaw and adjustable in vertical manner, a rotary cutter journalled in each head, the cutters extending into said mouth for coacting in the cutting of sheet metal inserted in the mouth, means journalling the cutters in the respective heads, speed reducing gearing carried by each head for driving the cutter thereof, a universal shaft connected to the gearing of each head, each universal shaft extending to the rear of said frame, speed reducing gearing disposed at the rear of the frame and operably connected to each universal shaft, and an electric motor mounted on the frame and having a driving connection with said speed reducing gearing at the rear of the frame.

4. A structure as set forth in claim 3, in which the frame is swivelly mounted for angular adjustment about a vertical axis.

5. A structure as set forth in claim 3, in which the electric motor has a belt drive to the speed reducing gearing, and in which the motor is mounted on an adjustable stand to permit tensioning of the belt.

6. In a sheet metal cutter, a vertical frame having channels or slots extending inwardly from each side thereof so as to divide it into upper and lower parts which merge into a mouth at the front portion of the frame, said channels or slots extending divergently from the mouth so as to provide a connecting wall or web portion between the upper and lower parts, said channels or slots having their inner ends in a common vertical plane, a pair of rotary cutters mounted on the frame and disposed to meet in the mouth aforesaid, said cutters having inner faces meeting substantially in the plane of the inner ends of said channels or slots, whereby the severed edges of sheet metal may have unhampered passage through these channels or slots in the cutting operation, one of the cutters being carried by the upper part of the frame and the other cutter being carried by the lower part thereof, and means for operating said cutters including a pair of vertical shafts at the rear of the frame and offset in a transverse plane, said shafts being arranged one below the other and interconnected such that power may be taken off each without obstructing the channels or slots, the upper shaft being driven from a source of power.

7. A structure as set forth in claim 6, in which the frame is supplied with a table divided into two sections each of which is extended parallel to a channel or slot for supporting work, and in which a pressure bar surmounts one section of the table and has a roller for engaging the work.

8. In a sheet metal cutter, a vertical frame having channels or slots extending inwardly from each side thereof so as to divide it into upper and lower parts which merge into a mouth at the front portion of the frame, said channels or slots extending divergently from the mouth so as to provide a connecting wall or web portion between the upper and lower parts, said channels or slots having their inner ends in a common vertical plane, a pair of rotary cutters mounted on the frame and disposed to meet in the mouth aforesaid, said cutters having inner faces meeting substantially in the plane of the inner ends of said channels or slots, whereby the severed edges of sheet metal may have unhampered passage through these channels or slots in the cutting operation, a head adjustably supporting one of the cutters on the upper part of the frame, a head similarly supporting one of the cutters on the lower part thereof, a worm wheel connected to each cutter, a worm journalled in each head and meshed with the worm wheel of the cutter thereof, a universal shaft disposed on each side of the frame and extending rearwardly from each worm, a worm wheel connected to each universal shaft, a worm in mesh with each of the last mentioned worm wheels, a pair of vertical shafts journalled at the rear of the frame, one of these shafts being disposed below the other and geared thereto, the shafts being offset with respect of said channels or slots so as to clear the same and each shaft being united with one of the last mentioned worms, reduction gearing connected to one of the shafts, and a source of power for operating this reduction gearing.

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