Sept. 7, 1926.

1,598,919

C. D. McDONALD

METAL SHEARING MACHINE

Filed July 10, 1925 7 Sheets-Sheet 1

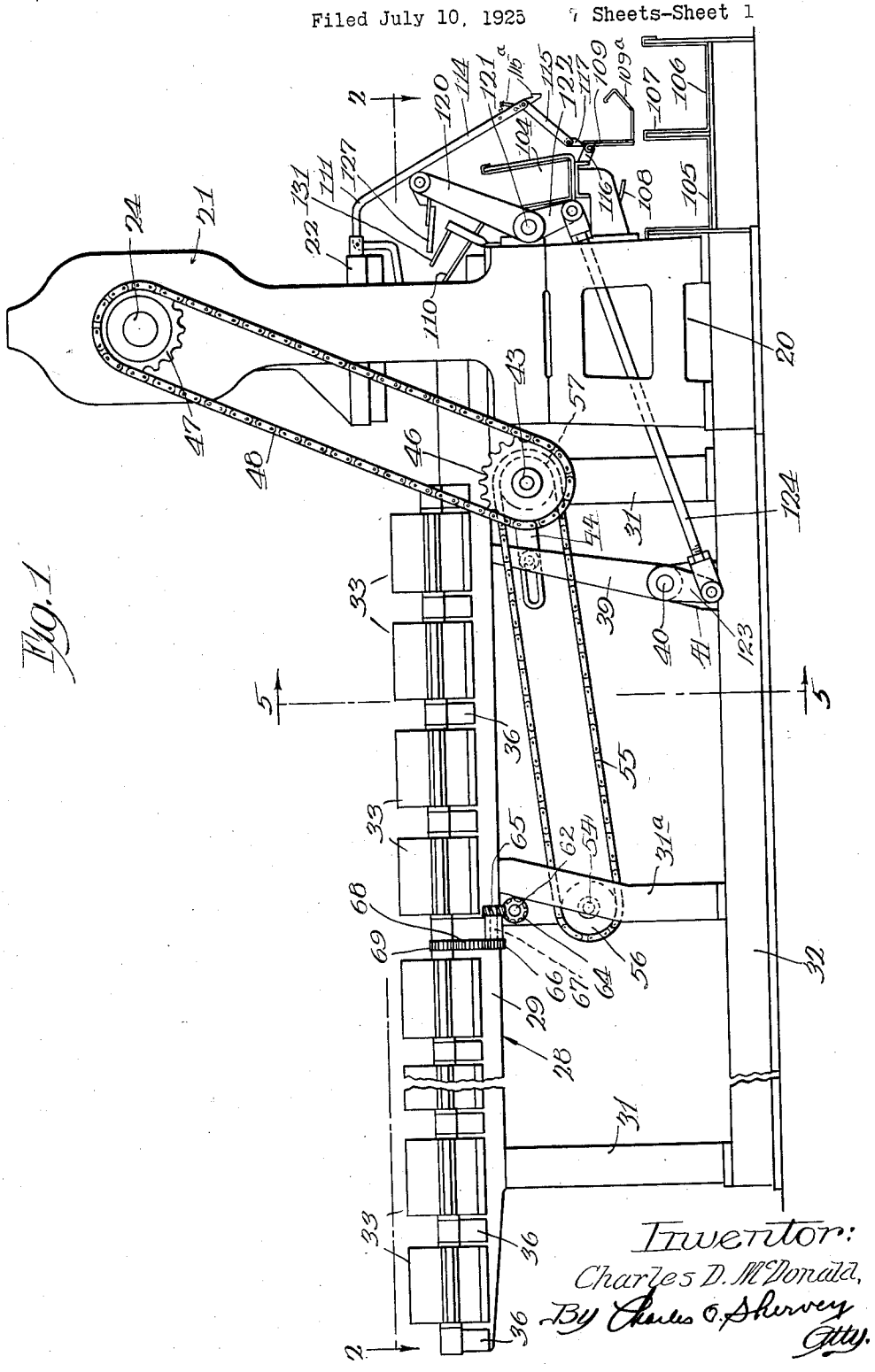


Fig. 1.

Inventor:
Charles D. McDonald,
By Charles C. Shervey
Atty.

Sept. 7, 1926. 1,598,919

C. D. McDONALD

METAL SHEARING MACHINE

Filed July 10, 1925 7 Sheets-Sheet 2

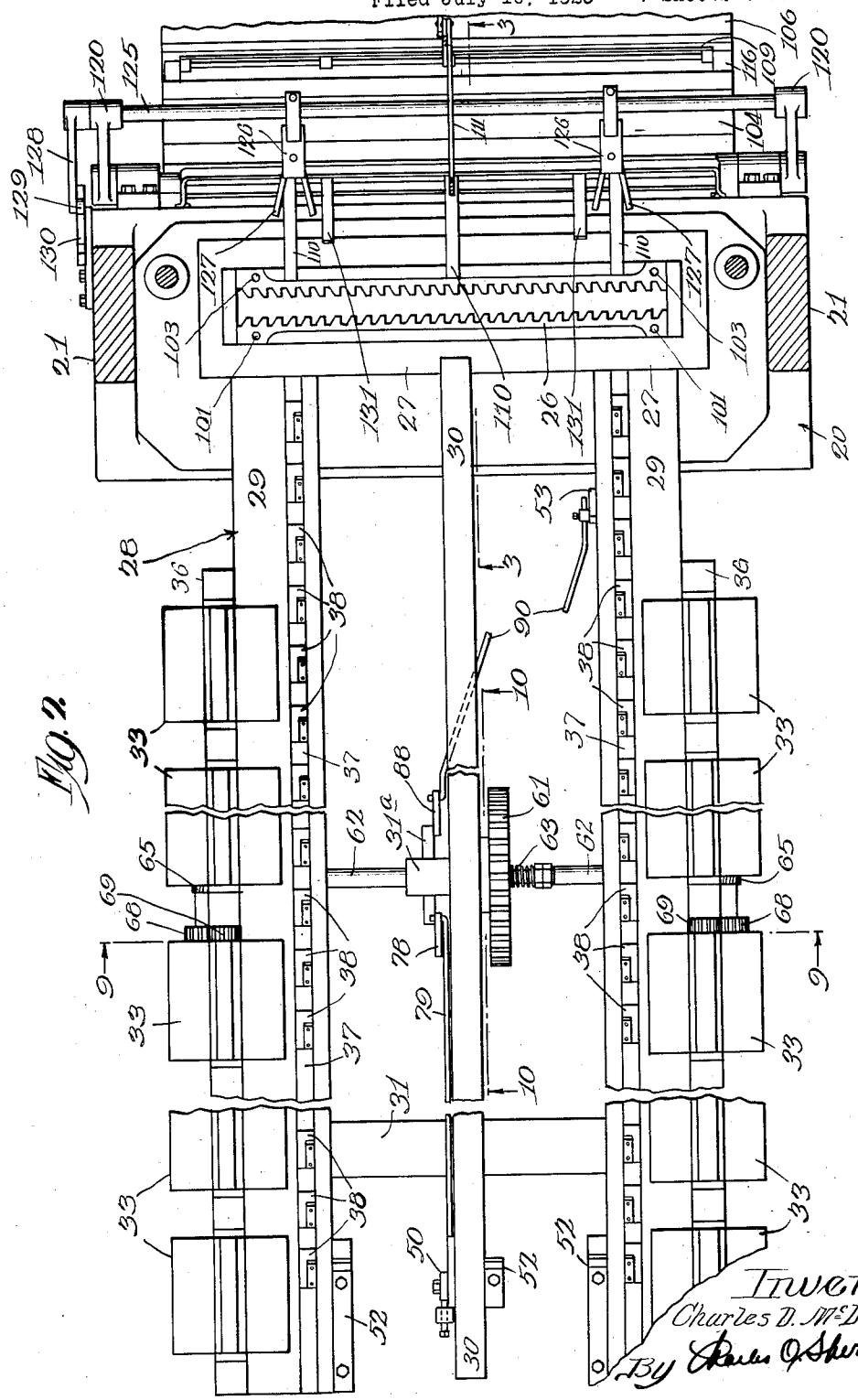


Fig. 2.

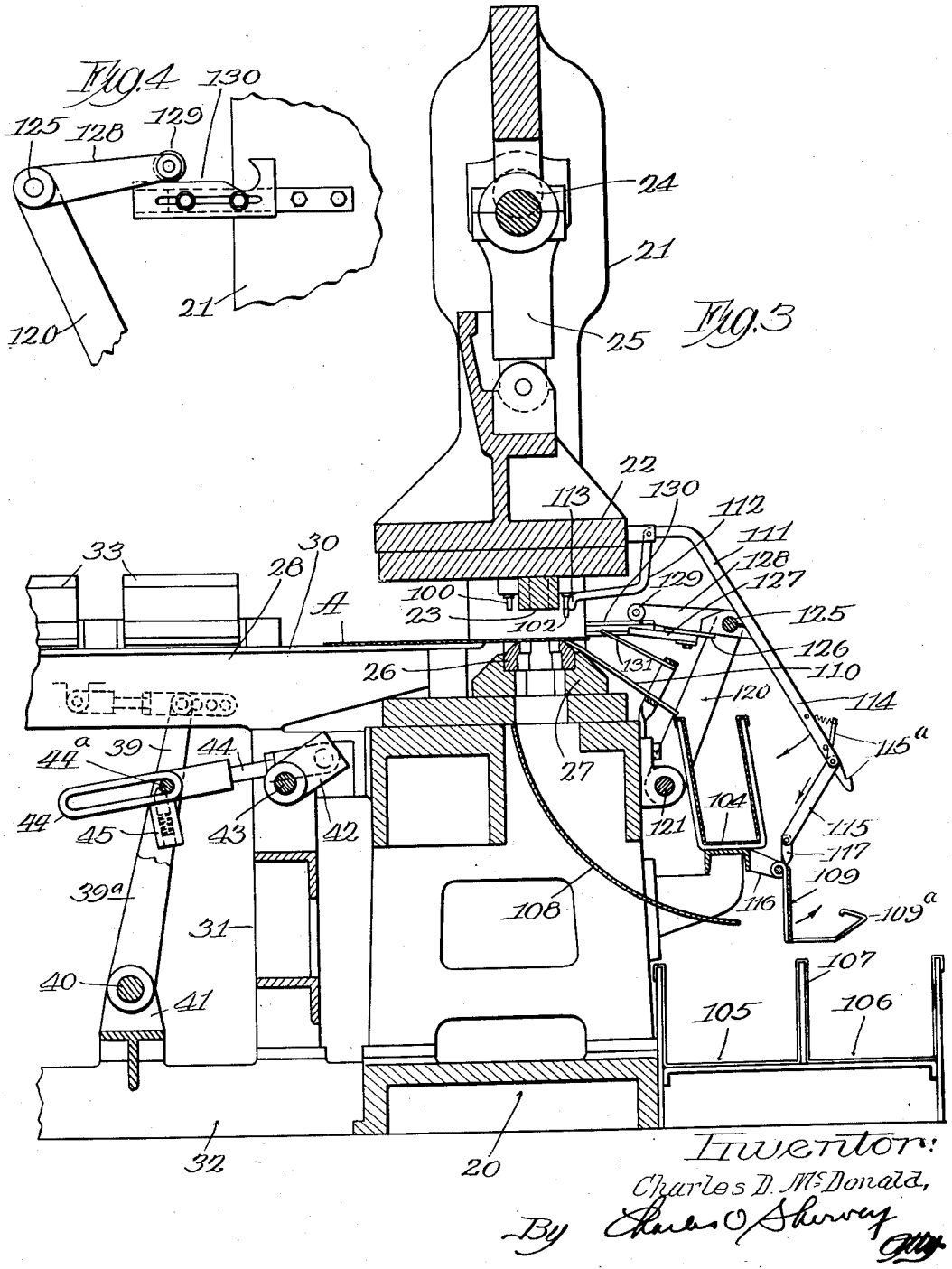
Inventor
Charles D. McDonald,
By Charles O. Sherman
Atty.

Sept. 7, 1926. 1,598,919

C. D. McDONALD

METAL SHEARING MACHINE

Filed July 10, 1925 7 Sheets-Sheet 3



Inventor:
Charles D. McDonald,
By Charles O. Shervey

Sept. 7, 1926. 1,598,919

C. D. McDONALD

METAL SHEARING MACHINE

Filed July 10, 1925 7 Sheets-Sheet 4

Fig. 5

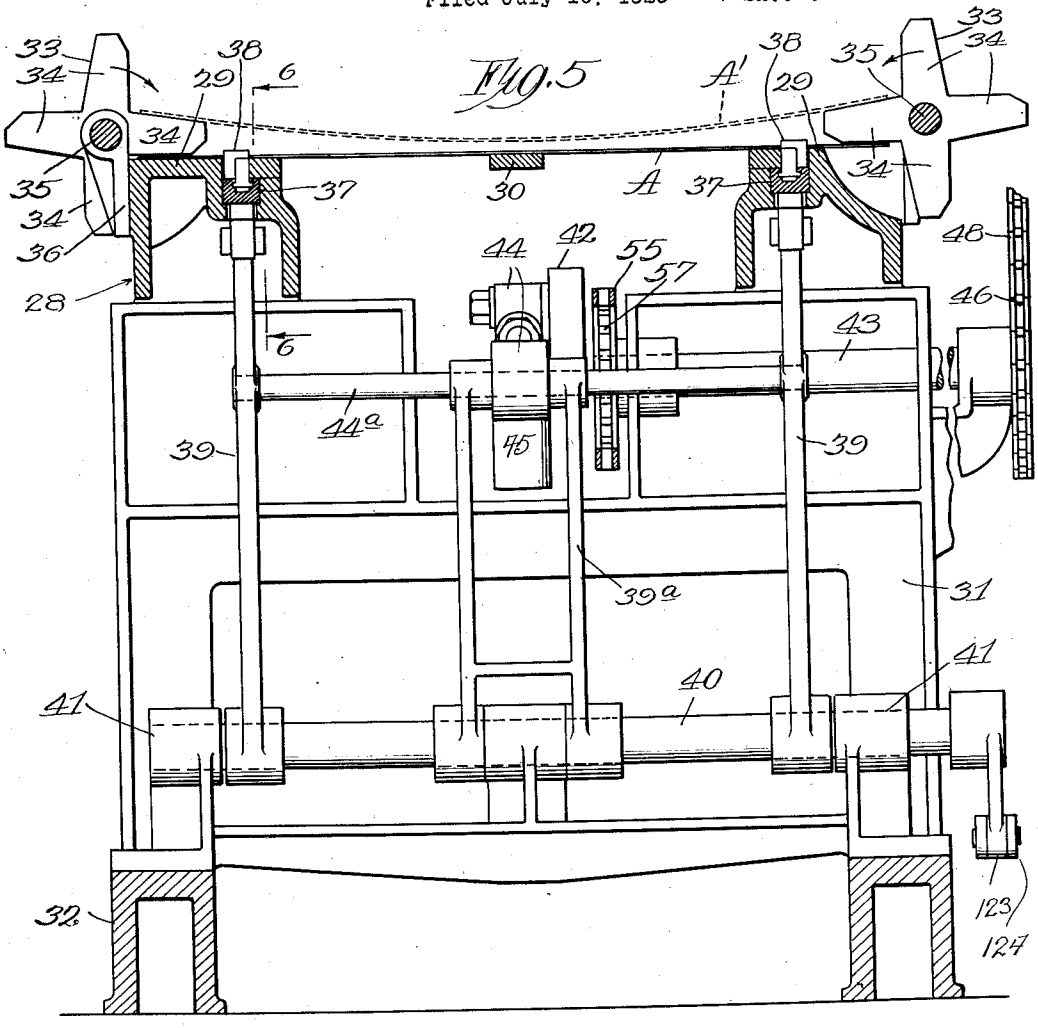


Fig. 6

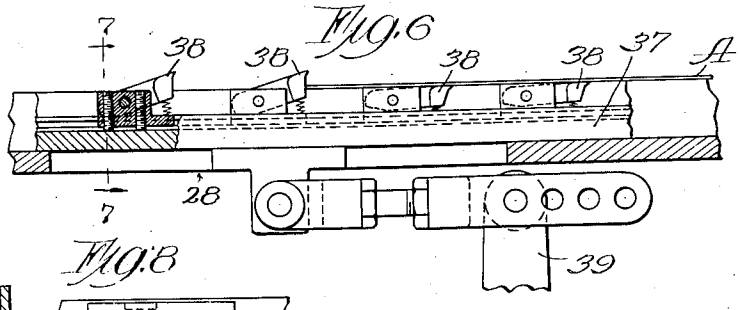


Fig. 7

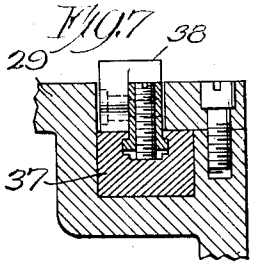
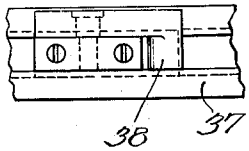


Fig. 8



Inventor:
Charles D. McDonald,
By Charles O. Skinner Atty.

Sept. 7, 1926. 1,598,919

C. D. McDONALD

METAL SHEARING MACHINE

Filed July 10, 1925 7 Sheets-Sheet 5

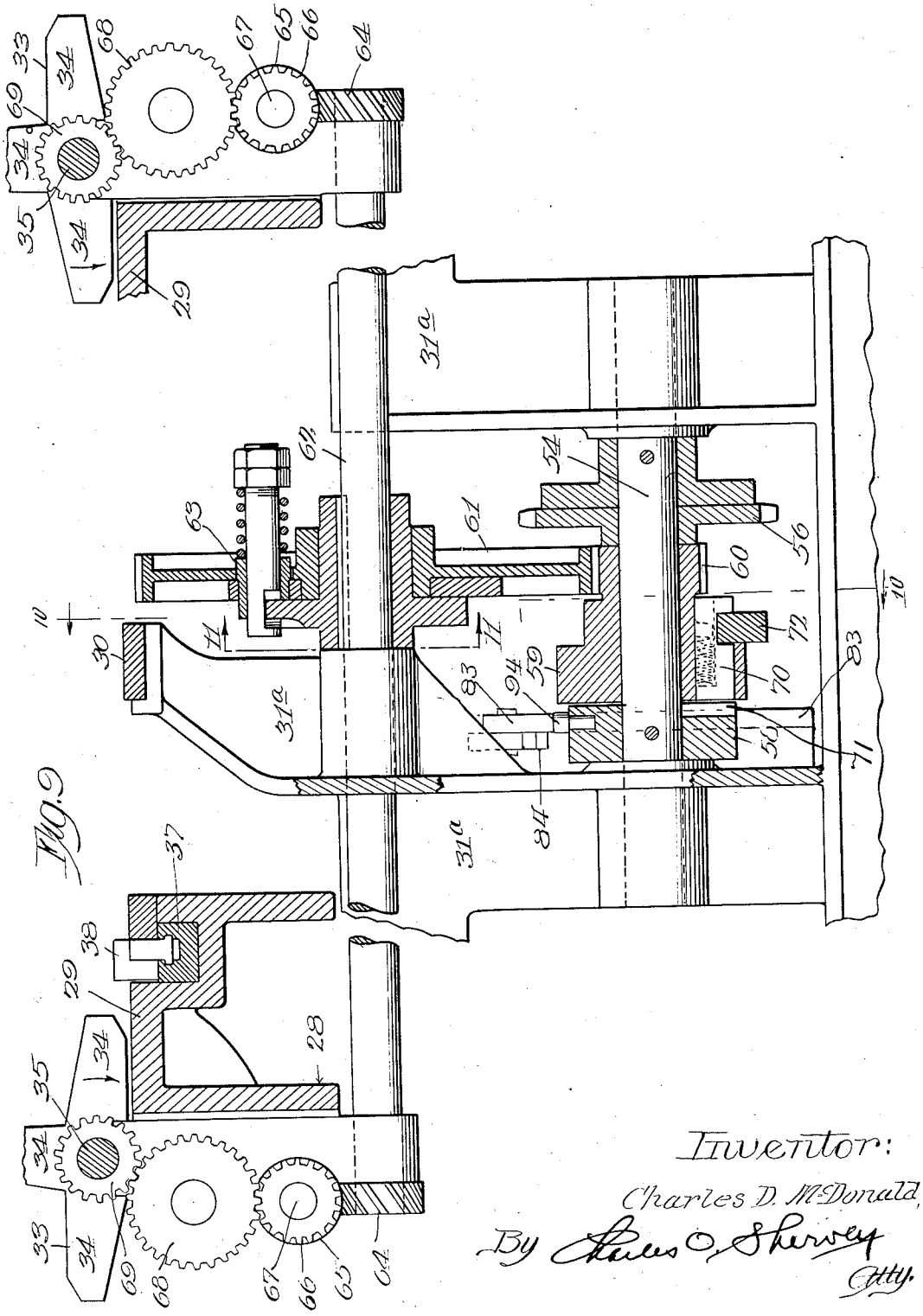


Fig. 9

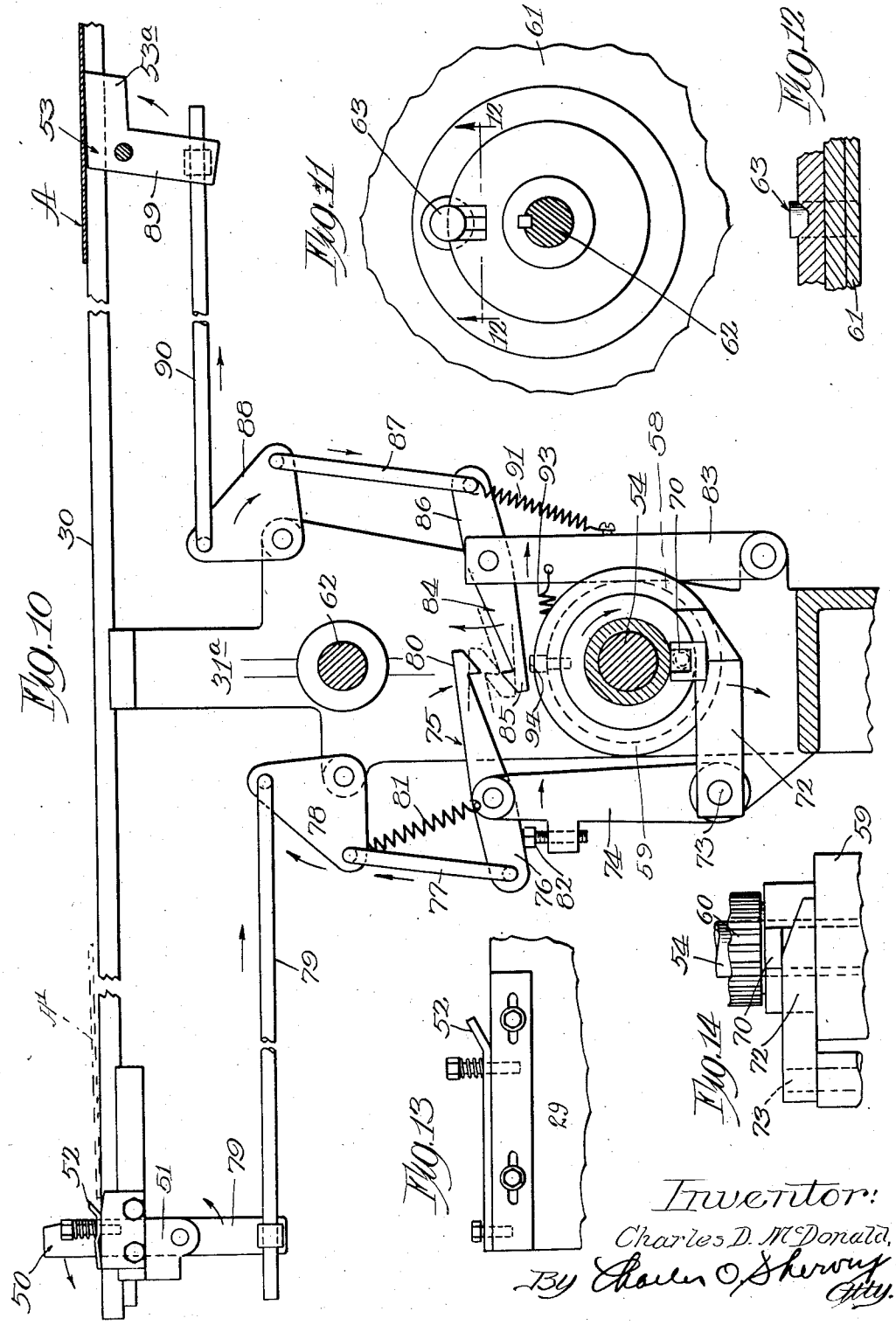
Inventor:
Charles D. McDonald,
By Charles O. Shervey
Atty.

Sept. 7, 1926. 1,598,919

C. D. McDONALD

METAL SHEARING MACHINE

Filed July 10, 1925 7 Sheets-Sheet 6



Sept. 7, 1926. 1,598,919

C. D. McDONALD

METAL SHEARING MACHINE

Filed July 10, 1925. 7 Sheets-Sheet 7

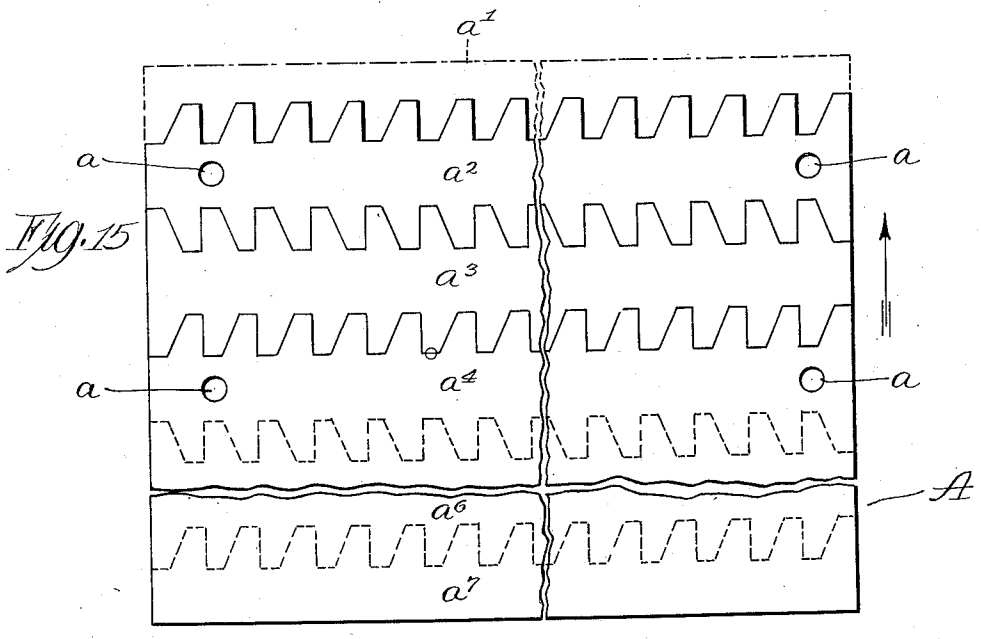


Fig. 15

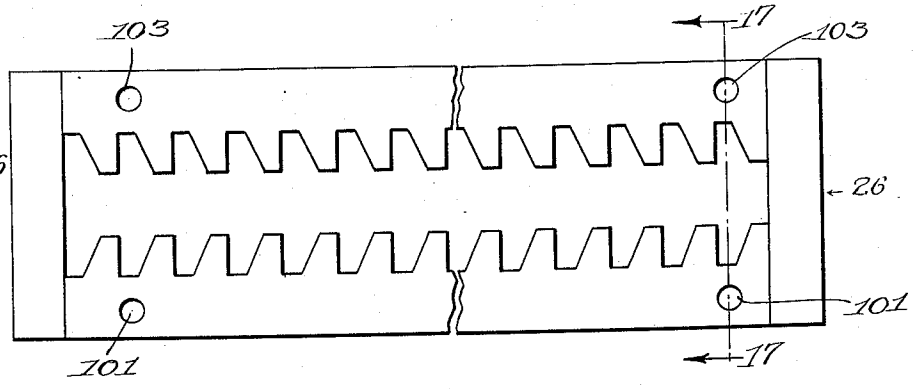


Fig. 16

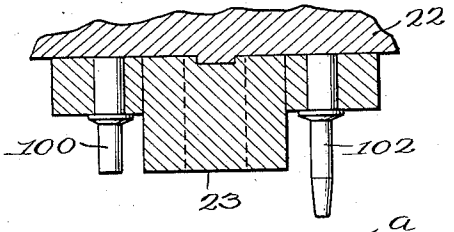
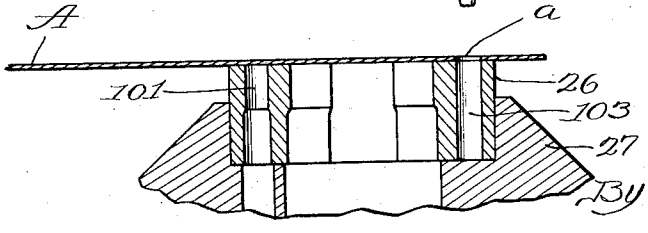


Fig. 17



Inventor
Charles D. McDonald,
By Charles A Sherwood
Atty.

Patented Sept. 7, 1926. 1,598,919

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.

Application filed July 10, 1925. Serial No. 42,632.

This invention relates to metal shearing machines, and more particularly to that type of metal shearing machines that operate to shear or cut strips from a long metal sheet. Machines of this type are frequently employed for shearing a long sheet of metal into strips, having scroll or otherwise irregular edges, which strips are sometimes subsequently operated on by die presses to form smaller sheet metal articles.

Among the objects of this invention are, automatic operation of the various elements that constitute the machine, efficiency, speed and accuracy.

Another object is to provide automatic means for separating the sheared metal strips from the scrap at the ends of the sheet. Another object is to provide means for accurately locating the sheet with respect to the dies, each time the sheet is fed forward to the dies; another object is to provide improved means for feeding the metal sheets to the dies in a step by step manner, and without any loss of time between successive sheets; another object is to provide automatic means for temporarily supporting a sheet adjacent, but out of engagement with the sheet feeding mechanism and subsequently bringing said temporarily supported sheet into engagement with the sheet feeding mechanism; another object is to provide improved means, controlled by the presence of the sheet which is being fed to the dies, and the temporarily supported sheet for automatically bringing said temporarily supported sheet into engagement with the sheet feeding mechanism at the proper time.

The invention further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly illustrated in the accompanying drawings, in which:—

Fig. 1 is a side elevation, partly broken away, of a metal shearing machine embodying a simple form of the present invention; Fig. 2 is a view of the parts seen in Fig. 1, partly in plan and partly in horizontal section, the line of section being taken at 2—2 in Fig. 1; Fig. 3 is a detail vertical section of the die mechanism and scrap separating mechanism, the line of section being indicated at 3—3 in Fig. 2; Fig. 4 is a detail side elevation of certain members forming part of the scrap separating mechanism; Fig. 5 is a vertical cross section of the feed table and feed mechanism taken on the line 5—5 of Fig. 1; Fig. 6 is a detail vertical longitudinal section of a fragment of the finger bar mechanism of the sheet feeding mechanism, the line of section being taken at 6—6 in Fig. 5; Fig. 7 is a detail cross section taken on line 7—7 of Fig. 6; Fig. 8 is a detail plan of one of the sheet feeding fingers and associated parts; Fig. 9 is a detail, vertical cross section of the mechanism for dropping a temporarily supported sheet into engagement with the sheet feeding mechanism, the line of section being indicated at 9—9 in Fig. 2; Fig. 10 is a detail side elevation of the sheet controlled clutch mechanism therefor; Fig. 11 is a view, partly in side elevation and partly in section, of a certain safety device employed in said mechanism, the line of section being taken at 11—11 in Fig. 9; Fig. 12 is a detail section taken on line 12—12 of Fig. 11; Fig. 13 is a detail side elevation of a sheet detaining clamp; Fig. 14 is a view, looking from below, of the clutch mechanism seen in Fig. 11; Fig. 15 is a plan of a fragment of a metal sheet illustrating the manner in which it is cut up; Fig. 16 is a plan of one of the dies, and Fig. 17 is a detail, vertical, longitudinal section through the dies, the line of section being indicated at 17—17 in Fig. 16.

Metal shearing machines of the type embodying the present invention, and illustrating and describing, more in detail, the shearing mechanism, dies and sheet feeding mechanism of the finger bar type are disclosed in prior patents heretofore issued to me, among which are the following: No. 1,110,810, metal shearing machine, dated September 15, 1914; No. 1,194,728, metal shearing machine, dated August 15, 1916; No. 1,227,162, metal shearing machine, dated May 22, 1917, to which reference may be made. The present improvements, with certain modifications, may be adapted to the machines of said prior patents as will be readily understood.

Referring now to the drawings accompanying this specification, and which illustrate one embodiment of the present invention, the reference character 20 designates the base of the shearing mechanism of the

machine, and 21 a head frame supported thereon and containing the usual slideways for the cross head 22 that carries the movable or male shearing die 23. The cross head 22 is reciprocated by a crank shaft 24 and connecting rods 25 as is customary in machines of this type. The usual gearing (not shown) is provided for operating the crank shaft. The stationary or female shearing die 26 is secured in a table or other support 27 mounted on the base 20 and cooperates with the male shearing die 23 in blanking out the strips from the metal sheet. These parts are well known to those skilled in the art to which this invention pertains and require no further description so far as this invention is concerned. For blanking out or shearing off scroll edge strips or strips having irregular edges, the dies are given the proper shape to effect the desired shearing operation.

Behind the shearing mechanism just described is a feed table 28 which receives the metal sheets that are to be cut up into strips and said table may be of suitable length to receive relatively long sheets that are sometimes as much as ten feet long or more, and two or more feet wide. The table comprises two outer horizontal sheet supporting rails 29 (see also Figs. 5 and 9) and a middle horizontal bar 30 upon which the sheets are deposited by the temporary sheet supporting mechanism and supported during the time they are fed to the dies, and said rails 29 and bar 30 are supported by legs 31, 31ª that extend up from the base 32 of the table 28.

Located above and at the sides of said rails 29 are temporary sheet supporting members 33, 33 here shown in the form of star wheels, as a preference having four arms 34 formed on a central hub, and mounted on two parallel shafts 35 that extend along the rails 39 and are rotatively mounted in bearing brackets 36 secured to the outer faces of said rails. Normally said star wheels stand in the position illustrated in Fig. 5 wherein two of their arms lie in approximate horizontal planes and form temporary supports for one of the sheets A^1 that is to be fed to the shearing dies. Said arms support said sheet A^1 somewhat above the rails 29 whereby another sheet A may lie upon said rails during the time that it is fed to the shearing dies. The outer edge portions of the sheet A pass between the upper faces of the rails, 29, and lower edges of the arms 34 thereabove as is clearly seen in Fig. 5. At the proper time during a cycle of operation of the machine said star wheels are rotated one-fourth of a revolution in the direction of the arrows shown thereon in Fig. 5, thereby lowering the sheet A^1 upon said rails 29 in position to be fed to the shearing dies. The mechanism for intermittently rotating said star wheels will be described later on.

The metal sheet, which is supported by the rails of the table, is fed to the shearing dies in a step by step fashion by finger bar mechanism which will now be described.

In the upper faces of the rails 29 are slideways in which are mounted reciprocatory finger bars 37 upon which are pivotally mounted upwardly spring pressed fingers 38 that are placed equidistant on said finger bars, those on one finger bar being opposite those on the other, and they are arranged to successively engage the rear end of the sheet in feeding it to the shearing dies. The construction and operation of the finger bar mechanism is more fully shown and described in several of my prior patents above referred to. The finger bars extend throughout the greater portion of the length of the table and the fingers thereof are depressed by the sheet that lies on them, and the last pair of the two series of fingers is arranged to engage the rear end of the sheet and start it toward the shearing dies. Thereafter each succeeding pair of fingers engages the rear end of the sheet and feeds it forward in a step by step fashion. The mechanism which reciprocates the finger bars 37, as illustrated in the drawings, comprises levers 39 connected at their upper ends with the finger bars and mounted at their lower ends on a cross shaft 40 journaled in bearing brackets 41 supported on the base member 32 of the table 28. Means is provided for oscillating the levers 39 to effect the reciprocation of the finger bar mechanism and as shown said means comprises a crank arm 42 mounted upon a cross shaft 43 journaled in the legs 31 of the table and connected to the arms 39 by a link 44, a lever 39^a and a cross rod 44^a (see Fig. 5) which link 44, and cross rod 44^a, if desired, may have safety connection devices 45 between them as is illustrated in Fig. 3, whereby in case movement of the sheet A is stopped from any unusual cause, the link 44 may continue to reciprocate without effecting the levers 39, whereby the finger bar mechanism may remain at rest until the difficulty has been removed. The cross shaft 43 may receive its motion from the crank shaft 24 of the shearing mechanism and as shown it is connected thereto by sprocket wheels 46, 47 mounted on the cross shaft 43 and crank shaft 24 respectively, and connected by a sprocket chain 48. The parts are so arranged and timed that the finger bars reciprocate once for each stroke of the cross head and the sheet is thereby fed one step toward the dies. The sheet is fed forward toward the dies after the male die begins to move upward.

Inasmuch as the metal sheets upon which the work is performed, are large and cumbersome, and require some time in being

placed upon the table, means are provided for holding the star wheels 33 in position to receive a sheet A^1 and temporarily support it above the traveling sheet A, therebeneath until the greater part of said traveling sheet has been fed to the dies, whereupon the temporarily supported sheet may be lowered to the feed table in position to be engaged by the finger bar mechanism. The mechanism for accomplishing this result will now be described.

Referring to Figs. 2 and 10, a trigger 50, is seen adjacent the rear end of the table, which trigger is pivotally mounted on a bracket 51 secured to the rail 30. The upper arm of the trigger 50 projects above the table in position to be engaged by a sheet A^1 when placed on the star wheels 33, and moved in a backward direction. This is done by the attendant when placing a sheet on the star wheels. Adjacent the trigger 50 and at the rails 29 are spring pressed clamps 52 under which the sheet is placed when moved backward as above explained, and said clamps 52 act to hold the sheet against forward movement until positively moved in that direction by the finger bar mechanism. Adjacent the front end of the table is a dog 53 which is pivotally mounted on one of the rails and has one arm 53^a that is arranged to lie slightly above the rail, but arranged to be depressed whenever a sheet lies upon it. The trigger 50 and dog 53 cooperate under certain circumstances to operate a clutch that connects the mechanism which rotates the star wheels.

Journaled in bearings formed on the legs of the table is a cross shaft 54 (see Figs. 1 and 9) which, as shown, is continuously driven by a sprocket chain 55 trained over a sprocket wheel 56 fast on the shaft 54 and over a sprocket wheel 57 fast on the shaft 43. A clutch member 58 fast on the shaft 54 and a clutch member 59 loose on said shaft cooperate to couple a pinion 60 (which is part of or secured to the clutch member 59), with said shaft 54, whenever the traveling sheet A has completely passed over the dog 53, and another sheet A^1 has been put in place on the star wheels 33 and moved back against the finger 50. Unless two sheets are in such a position, the clutch remains inactive and the star wheels remain at rest. The pinion 60 is connected to the shafts 35 of the star wheels 33 by mechanism, comprising a gear wheel 61 mounted on a shaft 62, which is journaled in bearings formed in the table legs 31^a and said shaft 62 is coupled with the gear wheel 61 by a safety clutch device 63. On the ends of the shaft 62 are spiral gear wheels 64 which mesh with spiral gear wheels 65, that are connected to pinions 66 by short shafts 67, and the pinions 66 mesh with idle gear wheels 68 that mesh with pinions 69 fast on the star wheel shafts 35. The ratio of the gearing is such that for one revolution of the shaft 54, one-quarter revolution is given the star wheel shafts, and the star wheels are rotated in the direction of the arrows thereon in Fig. 9.

The clutch members 58, 59 are normally unclutched, but under certain circumstances are clutched together by a clutch pin 70 secured in the clutch member 59 and spring pressed toward the clutch member 58 by a spring. When clutched together, the clutch pin enters a notch 71 in the clutch member 58. A clutch pin retracting shoe 72 (see Figs. 10 and 14) having a beveled end engages in a notch in the clutch pin (see Fig. 9) and retracts and holds the clutch pin 70 out of engagement with the clutch member 58, except when withdrawn from the notch in the pin. The shoe 72 comprises part of the clutch actuating mechanism, and, as shown, is fast on a rock shaft 73 which is rotatively mounted in a bracket on the table leg 31^a and on said rock shaft 73 is an arm 74, upon the upper end of which a hook member 75 is pivoted, between its ends, one arm 76 of which is connected to the trigger 50 by mechanism, here shown as comprising a link 77, a bell crank lever 78, fulcrumed on the table leg 31^a, and a rod 79, which extends from the bell crank lever 78 to an arm 79 of the trigger 50. The arrangement of the parts just described is such that when a sheet A^1 has been placed upon the star wheels and moved back against the trigger and the upper end of the trigger has been swung back thereby, the hook end 80 of the hook member 75 is lowered as shown in dotted lines in Fig. 10, and when the trigger 50 is freed from the sheet the hook end 80 is swung upwards into the position shown in full lines in said figure. A spring 81, connected to the bell crank lever 78 and to some stationary support, acts to move the hook member 75 into the position shown in full lines, the purpose of which will appear presently. An adjustment screw 82 threaded in a lug on the arm 74 affords means for limiting the upward movement of the hook end 80.

Pivotally mounted on the table leg 31^a is a clutch shoe actuating lever 83, on the upper end of which is a hook member 84, which is pivoted between its ends on said clutch shoe actuating lever 83, and has a hook end 85 that lies below the hook end 80 of the hook member 75 in position to engage therewith, whenever both the trigger 50 and dog 53 are released from the sheets A^1, A. The end 86 of the hook member 84 is connected to the dog 53 by mechanism, here shown as comprising a link 87, connected to a bell crank lever 88 pivotally mounted on the table leg 31^a, which bell crank lever is connected to an arm 89 of the

dog by a rod or link 90. A spring 91 between the end 86 of the hook member 84 and clutch shoe actuating arm 83 acts to yieldingly hold the hook end of the hook member 84 up in the position indicated by the dotted lines in Fig. 10, and therewith hold the arm 53ª of the dog in raised position above the rail. A spring 93 between the lever 83 and some stationary support acts to draw the lever 83 toward the left, as viewed in Fig. 10, against the clutch member 58. Said clutch member 58 has a cam or pin 94 on its periphery that acts as a cam and once during each revolution of the shaft 54 and clutch member 58 said pin or cam 94 engages the lever 83 and swings it in the direction of the arrow thereon in Fig. 10. The movement of the lever 83 caused by the pin or cam 94 has no effect on the clutch shoe 72 when either hook member 75 or 84 is in the position shown by the full lines shown in Fig. 10, and which they occupy while the trigger 50 is held in the forward position and the dog 53 is held in the down position shown. When, however, a sheet A has passed over the dog 53, and released it, the spring 91 raises the hook end 85 of the hook member 84 to the position shown in dotted lines in Fig. 10, and raises the arm 53ª of the dog. If, however, a sheet has been placed on the star wheels and moved back against the trigger 50, and the latter has been swung back thereby, and the hook end 80 of the hook member 75 has been swung down into the position shown by the dotted lines in Fig. 10, the two hook members 75, 84 will then be in position for the hooks to engage each other, and the pin or cam 94 thereupon engages the lever 83, swings it in the direction of the arrow thereon, and the two hooked together hook members 75, 84, and lever 74, are drawn toward the right, and the clutch shoe 72 swung down, thereby releasing the clutch pin which is thereupon forced into the notch of the clutch member 58, and the shaft 54 thereby clutched to the clutch member 59 and pinion 60. The star wheels 33 are thereupon partially rotated, depositing the sheet A^1 upon the rails 29, and directly before the shaft 54 makes one complete revolution the clutch pin engages the beveled end of the clutch shoe 72 and is thereby retracted from the notch in the clutch member 58. At this time the star wheels have been rotated through one fourth of a revolution, and the sheet, supported thereby, is lowered upon the rails, whereupon the last pair of fingers of the finger bar mechanism engages the sheet and feed it forward one step. As soon as the sheet leaves the trigger 50, the hook member 75 is restored to its normal or inactive position as shown by the solid lines in Fig. 10, and as the sheet moves over the dog 53, it swings the arm 53ª of the dog down, and therewith moves the hook member 84 into its normal or inactive position, shown in full lines. The parts remain in this position until another sheet is engaged with the trigger 50, and the moving sheet runs off the dog 53, although the lever 83 is oscillated each time the pin or shoulder 94 engages it. The parts just described are so arranged that one sheet follows directly after each preceding one with only a slight gap therebetween.

Means are provided for lining up the sheets with respect to the dies to ensure accurate work, and, in its present form, said means comprises a pair of punches 100 (see Fig. 17) carried by the cross head 22 behind the male die 23, adjacent the ends thereof, which punches cooperate with holes 101 in the female die 26 to punch pilot holes a (see Fig. 15) in the sheet A. In front of the male die 23 are two pilot pins 102, which are in alignment with the punches 100, and spaced therefrom precisely the same distance as the fingers 38 are spaced apart, and in the female die 26 are holes 103 into which the pilot pins enter each time the cross head is moved down. The arrangement is such that the punches 100 form the holes a (Fig. 16) in the sheet, and the pilot pins 102 enter said holes when the sheet has been fed forward one step, and thereby positively line up each strip with the next succeeding one. The spacing of the fingers is such that the sheet is fed forward a distance which will permit the dies to produce two sheared strips each time the die descends, except when trimming the forward end of the sheet, and the parts are so arranged and proportioned that an end portion of the sheet marked a^1 (Fig. 15) is first moved under the male die and that part (which is scrap) is trimmed from the sheet, thereby leaving a sheared edge for the next strip a^2. The sheet is moved forward a certain distance each step, to bring the part a^3 under the male die, which part is next sheared off, the part a^2 being simultaneously sheared off. The last strip which is sheared off the sheet, is marked a^6 and a piece of scrap a^7 is sheared off at this end at the same time.

In order to separate the scrap from the strips, means are provided for conveying the strips and scrap to separate bins or racks. Referring to Figs. 1 and 3, three bins or racks 104, 105, 106 are supported in any suitable manner below the dies. The bins extend lengthwise across the front of the base 20 and an upright partition 107 separates the bin 105 from the bin 106. The part of the metal sheet which projects beyond the dies is sheared off into a strip that falls upon a chute 110 which conveys it to the bin 104 and the part of the sheet that lies above the

opening in the female die is forced therethrough by the male die, and falls upon a chute 108 which conveys it to the bin 106. The scrap falls through the opening in the female die, and is conveyed by the chute 108 to a gate 109 which arrests the scrap and causes it to fall into the bin 105 as will be presently explained.

Pivotally mounted on the cross head 22 is a bell crank lever 111 which has an arm 112 that underlies the cross head and is formed with a finger 113 which is arranged to contact with that part of a metal sheet which projects beyond the dies during the shearing operation. If no part of a metal sheet is present at this place the lever 111 remains inactive and merely moves up and down with the cross head. The lower end of the other arm 114 of the lever 111 is connected to the gate 109 by a link 115. The gate is hingedly or pivotally mounted on a bracket 116, and hangs down therefrom in front of the end of the chute 108 and over the partition 107. An arm 117 is secured to and projects up from the gate and is connected to the link 115. A spring like hook 109^a on the gate and a coacting hook 115^a on the link 115 are arranged to engage each other whenever the gate is opened, which hooks serve to detain the gate in open position temporarily and until disconnected when the angle between the arm 117 and link 115 becomes greater, due to the lifting of the link by the bell crank lever on the up stroke of the cross head.

The arrangement of the parts just described is such that when the cross head descends, the lever 111 descends with it and if no sheet is present above the front side of the dies, the link 115 and arm 114 of the lever 111 swing forward on their pivotal connections with the bracket 116 and cross head, the gate remaining in its upright position over the partition 107, thereby preventing any scrap from entering the bin 106. Whenever an end of a sheet projects over the female die, and the cross head descends, the finger 113 of the lever 111 strikes the projecting sheared edge portion of the sheet and fulcrums thereon during the final downward movement of the cross head, and the long arm 114 of said lever is thereupon swung in the direction of the arrow thereon, the link and gate moved in the directions indicated by the arrows, thereby opening a passage from the end of the chute 108 to the bin 106.

When two strips have been sheared off, the outer one falls into the bin 104 and the other one falls through the female die, rides down the chute 108 and its momentum carries it over the partition 107 and it falls into the bin 106.

The arrangement of the feed mechanism relative to the dies is such that an end part a^1 of a sheet is first fed over the rear half of the die and that part first sheared off the sheet. Inasmuch as no part of the sheet projects over the front part of the die the lever 111 remains inoperative, and the scrap end is punched through the female die, strikes the gate and falls into the bin 105; when the sheet is again fed forward the end part (which now has had the peculiar edge formed upon it) is moved over the front part of the die and arrests the finger 113 of the lever 111, when the male die descends, and the gate 109 is thereby opened permitting the strip, which is punched through the female die, to pass to the bin 106. The other sheared strip falls into the bin 104 as already explained.

When strips of the width shown are sheared, the part overhanging the front part of the female die is sufficient to overbalance the other part and the strip therefore falls by gravity from the die. When, however, narrower strips are formed, they are apt to remain on the die, and I have provided additional means for positively removing them therefrom. In its present form said means comprises arms 120 mounted upon a rock shaft 121, which is supported in bearing brackets mounted on the base 20, means for rocking the rock shaft 121, which as shown comprises a rocker arm 122 (see Fig. 1) on the rock shaft 121, a rocker arm 123 fast on the rock shaft 40 and a connecting rod 124 connecting said rocker arms 122, 123. Connecting the upper ends of the arms 120 is a rod 125, which is free to turn in said arms, and secured to said rod 125, by brackets or the like 126, are permanent magnets 127 that are arranged to be brought into contact with the sheared off end strips. On one end of the rod 125, is secured an arm 128 (see Fig. 4) on the end of which is a roller 129, that runs on a track 130, secured to the base 20, which track is formed with a depression near its rear end into which the roller 129 drops and permits the arm 128, and therewith the magnets 127 to drop slightly. As a result the magnets are moved over the end strip, and lowered upon it, thereby picking it up, and drawing it forward from the die as the arm 120 is swung forward. Stripping fingers 131 are supported below the magnets and engage the strip as it is being moved forward by the magnets, and strip it therefrom, whereupon it falls into the bin 104.

In the operation of the machine, a metal sheet is first placed upon the star wheels 33 and pushed back into engagement with the trigger 50, thereby depressing the hook end of the hook member 75. The dog 53 is then manually depressed thereby raising the hook end of the hook member 84 into position for engagement with the hook member 75 and when the pin 94 engages and swings back

the lever 83 of the clutch actuating mechanism, the clutch pin retracting shoe 72 is disengaged from the clutch pin, the two clutch members 58, 59 clutched together by the clutch pin and the star wheels thereupon given a quarter revolution thereby depositing the metal sheet upon the rails 29 in position to be engaged by the last pair of fingers of the finger bar mechanism. Upon the forward stroke of the finger bars, the fingers engage the rear end of the sheet and feed it forward one step and during each reciprocation of the finger bars the sheet is fed forward one step. Another sheet may now be placed upon the star wheels and moved back into engagement with the trigger 50 thereby again setting the hook member 75 in position to be engaged by the hook member 84 when the first sheet has completely passed over the dog 53, at which time the dog is released, thereby setting the hook member 84 in position for engagement with the hook member 75.

In its passage between the shearing dies, the front edge portion (which is scrap material) is trimmed off and falls through the die, 26, slides down the chute 108, strikes the gate 109 and drops into the bin 105. When the sheet is next fed forward the sheared front end overlies the front side of the die and when the cross head descends, the dies shear off the projecting end of the sheet and shear off the part located between the dies and because of the presence of the projecting end portion of the sheet the finger 113 of the lever 111 is arrested during the final downward movement of the cross head, and the gate 109 opened, thereby permitting the strip, which is punched through the dies, to pass by the gate and fall into the bin 106. The outer strip slides down the chute 110 and falls into the bin 104. Each time the sheet is fed forward between the dies, the pilot punches 100, punch the pilot holes in the sheet and when the sheet is fed forward the pilot pins 102 enter said holes and accurately line up the sheet with respect to the dies.

When the positive means described is used for removing the outer strip from the dies, the arms 120 are moved toward the sheet while the cross head is descending and the magnets 127 engage the outer strip and draw it forward while the cross head is ascending, thereby bringing the strip into engagement with the stripping fingers 131 which disengage the strip from the magnets, permitting it to drop into the bin 104.

More or less variation of the exact details of construction is possible without departing from the spirit of this invention; I desire, therefore, not to limit myself to the exact form of the construction shown and described, but intend, in the following claims, to point out all of the invention disclosed herein.

I claim as new, and desire to secure by Letters Patent:

1. In a sheet shearing machine, the combination with sheet shearing mechanism, and finger bar mechanism for feeding a sheet to said sheet shearing mechanism in a step by step manner, of two oppositely disposed sets of sheet supporting arms rotatively mounted above the finger bars of said finger bar mechanism, and arranged to temporarily support a second sheet above and out of engagement with said finger bar mechanism, means for partially rotating said arms to thereby release said sheet from said arms, and arm actuating means controlled by a dog, engaged by the fed sheet, and a trigger, engaged by the temporarily supported sheet, for intermittently rotating said arms, whereby said temporarily supported sheet is deposited into engagement with said finger bar mechanism.

2. In a sheet shearing machine, the combination with sheet shearing mechanism, and finger bar mechanism for feeding a sheet to said sheet shearing mechanism in a step by step manner, of two oppositely disposed sets of sheet supporting star wheels rotatively mounted above the finger bars of said finger bar mechanism, and having arms arranged to temporarily support a second sheet above and out of engagement with said finger bar mechanism, actuating means for partially rotating said star wheels to thereby release said sheet from said arms, and means, controlled by a dog, engaged by the fed sheet, and a trigger engaged by the temporarily supported sheet, for intermittently rotating said star wheels, whereby said temporarily supported sheet is deposited into engagement with said finger bar mechanism.

3. In a metal shearing machine the combination with sheet feeding mechanism, of other sheet supporting means for temporarily supporting a second sheet adjacent and out of contact with said sheet feeding mechanism, mechanism for actuating said sheet supporting means to lower the sheet supported thereby into the path of said sheet feeding mechanism and including a continuously moving driving element, an intermittently moved driven element and a clutch therebetween, and clutch actuating mechanism, including a dog controlled by the moving sheet and a trigger controlled by the temporarily supported sheet.

4. In a metal shearing machine the combination with sheet feeding mechanism, of other sheet supporting means for temporarily supporting a second sheet adjacent and out of contact with said sheet feeding mechanism, mechanism for actuating said sheet supporting means to lower the sheet sup-

ported thereby into the path of said sheet feeding mechanism and including a continuously moving driving element, an intermittently moved driven element and a clutch therebetween, and clutch actuating mechanism, comprising connectible and disconnectible members, a dog controlled by the moving sheet connected to one of said last mentioned members, and a trigger controlled by the temporarily supported sheet and connected to the other of said members.

5. In a metal shearing machine the combination with sheet feeding mechanism, of other sheet supporting means for temporarily supporting a second sheet adjacent and out of contact with said sheet feeding mechanism for actuating said sheet supporting means to lower the sheet supported thereby into the path of said sheet feeding mechanism and including a continuously moving driving element, an intermittently moved driven element and a clutch therebetween, and clutch actuating mechanism comprising a lever actuated by said driving element, a clutch pin releasing lever, connectible and disconnectible members between said levers, a dog controlled by the moving sheet and connected to one of said last mentioned members and a trigger controlled by said temporarily supported sheet and connected to the other of said members.

6. In a metal shearing machine, the combination with sheet feeding mechanism, of other sheet supporting means for temporarily supporting a second sheet adjacent and out of contact with said sheet feeding mechanism, mechanism for actuating said sheet supporting means to lower the sheet supported thereby into the path of said sheet feeding mechanism and including a continuously moving driving element, an intermittently moved driven element and a clutch therebetween, and clutch actuating mechanism comprising a lever actuated by said driving element, a clutch pin releasing lever, two normally disconnected hook members, one pivotally mounted on each of said last mentioned levers, a dog controlled by the moving sheet and connected to one of said hook members, and a trigger controlled by said temporarily supported sheet and connected to the other of said hook members.

7. In a metal shearing machine, the combination with sheet shearing mechanism and sheet feeding mechanism, of rotatory sheet supporting means for temporarily supporting a second sheet above and out of contact with said sheet feeding mechanism, a continuously rotating drive shaft, an intermittently rotated cross shaft, gearing between said cross shaft and said rotatory sheet supporting means, gearing between said drive shaft and cross shaft, a clutch interposed between one of the gears of the last mentioned gearing and said drive shaft, and clutch operating mechanism therefor having connectible and disconnectible clutch actuating members, controlled by a sheet actuated dog connected to one of said last mentioned members and a sheet actuated trigger connected to the other of said members.

8. In a metal shearing machine, the combination with sheet shearing mechanism and sheet feeding mechanism, of a pair of intermittently rotated shafts adjacent said sheet feeding mechanism and having arms thereon for temporarily supporting a second sheet above and out of contact with said sheet feeding mechanism, a continuously rotating drive shaft, an intermittently rotated cross shaft, gearing between said cross shaft and said pair of intermittently rotated shafts, gearing between said drive shaft and cross shaft, a clutch interposed between one of the gears of the last mentioned gearing and said drive shaft, and clutch operating mechanism therefor having connectible and disconnectible clutch actuating members, controlled by a sheet actuated dog connected to one of said last mentioned members and a sheet actuated trigger connected to the other of said members.

9. In a metal shearing machine, the combination with sheet shearing mechanism and finger bar mechanism for feeding a sheet to said shearing mechanism, of a pair of intermittently rotated shafts adjacent said finger bar mechanism and having star wheels, thereon for temporarily supporting a second sheet above and out of engagement with said finger bar mechanism, a continuously rotating drive shaft, an intermittently rotated cross shaft, gearing between said cross shaft and said pair of intermittently rotated shafts, gearing between said drive shaft and cross shaft, a clutch interposed between one of the gears of the last mentioned gearing and said drive shaft and clutch operating mechanism therefor having connectible and disconnectible clutch actuating members, controlled by a sheet actuated dog connected to one of said last mentioned members and a sheet actuated trigger connected to the other of said members.

10. In a metal shearing machine, the combination with sheet shearing mechanism having die supports and male and female dies mounted thereon, of a scrap receiving bin, a strip receiving bin adjacent thereto and a chute terminating above the scrap receiving bin, a second strip receiving bin, a gate for arresting scrap, located between said scrap receiving bin and first mentioned strip receiving bin and gate opening mechanism operatively connected to the shearing mechanism and controlled by the end portion of a metal sheet operated on.

11. In a metal shearing machine, the combination with sheet shearing mechanism having die supports and male and female

dies, mounted thereon, of a scrap receiving bin, a strip receiving bin adjacent thereto and a chute terminating above the scrap receiving bin, a second strip receiving bin, a gate for arresting scrap, located between said scrap receiving bin and first mentioned strip receiving bin, a gate opening lever fulcrumed on the male die support and having a finger adapted to engage the end portion of a metal sheet when the latter is projected over the female die, and thereby swing said lever and therewith open said gate.

12. In a metal shearing machine, the combination with sheet shearing mechanism having die supports and male and female dies mounted thereon, of a scrap receiving bin, a strip receiving bin adjacent thereto and a chute terminating above the scrap receiving bin, a second strip receiving bin, a gate for arresting scrap, located between said scrap receiving bin and first mentioned strip receiving bin, a gate opening level fulcrumed on said male die support, and a link connecting one end of said lever with the gate, said lever having an arm terminating in a finger adapted to engage the end portion of a metal sheet when the latter is projected over the female die, and thereby swing said lever and therewith open said gate.

13. In a metal shearing machine, the combination with sheet shearing mechanism having die supports and male and female dies mounted thereon, of a scrap receiving bin, a strip receiving bin adjacent thereto and a chute terminating above the scrap receiving bin, a second strip receiving bin, a gate for arresting scrap, located between said scrap receiving bin and first mentioned strip receiving bin, gate opening mechanism operatively connected to the shearing mechanism and controlled by the end portion of a metal sheet operated on, and retarding means between the gate and gate opening mechanism for delaying the closing movement of the gate.

14. In a metal shearing machine, the combination with metal shearing mechanism having male and female dies, cooperating to shear strips of metal from a metal sheet, of strip removing mechanism for removing sheared strips from the female die, and comprising an oscillatory member, means for oscillating said member in timed relation with the movements of the male die, strip engaging means carried by said oscillatory member, and adapted to carry sheared strips laterally away from the female die and stripping means for disengaging the strips from said strip engaging means.

15. In a metal shearing machine, the combination with metal shearing mechanism having male and female dies, of strip removing mechanism for removing strips from the female die, that are sheared off a metal sheet, and comprising an oscillatory member, means for oscillating said member in timed relation with the movements of the male die, magnets carried by said oscillatory member, and adapted to be brought into contact with the sheared off strips, and stripping means for disengaging the strips from the magnets.

16. In sheet feeding mechanism for metal shearing machines, the combination of reciprocatory finger bar mechanism for feeding forward a metal sheet, sheet supporting means for temporarily supporting a sheet above and out of contact with said finger bar mechanism and sheet releasing mechanism for releasing said temporarily supported sheet and depositing it upon said finger bar mechanism, said sheet releasing mechanism being controlled by both of said sheets.

17. In a sheet feeding mechanism for metal shearing machines, the combination of reciprocatory finger bar mechanism, for feeding forward a metal sheet, sheet supporting star wheels for temporarily supporting a metal sheet above and out of contact with said finger bar mechanism and mechanism under the control of both sheets for partially rotating said star wheels to deposit the temporarily supported sheet upon the finger bar mechanism.

CHARLES D. McDONALD.