No. 759,070. PATENTED MAY 3, 1904.

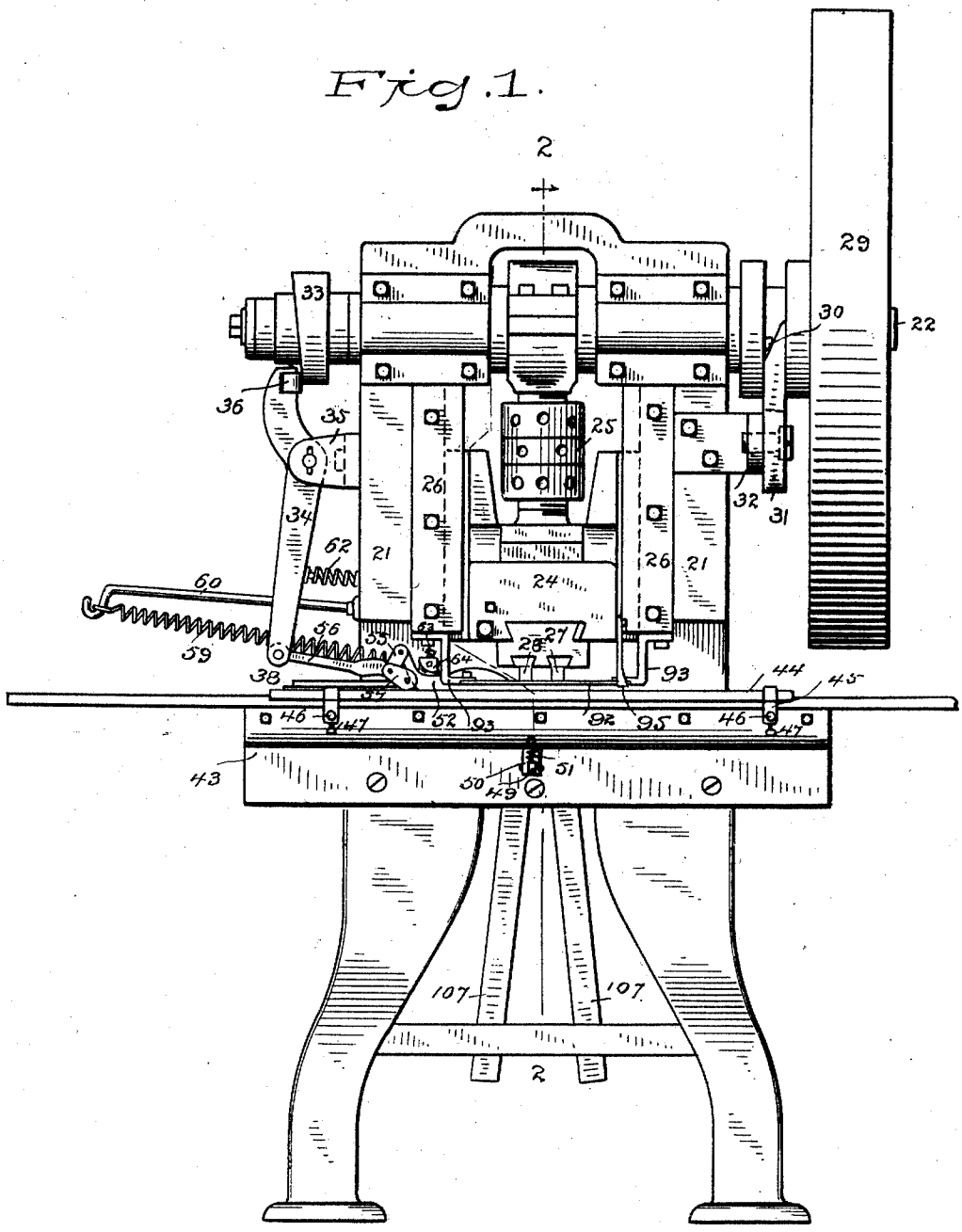
H. L. BRADLEY.

BLANKING MACHINE.

APPLICATION FILED JAN. 26, 1903.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.



WITNESSES.

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NO MODEL. 5 SHEETS—SHEET 2.

Fig. 2.

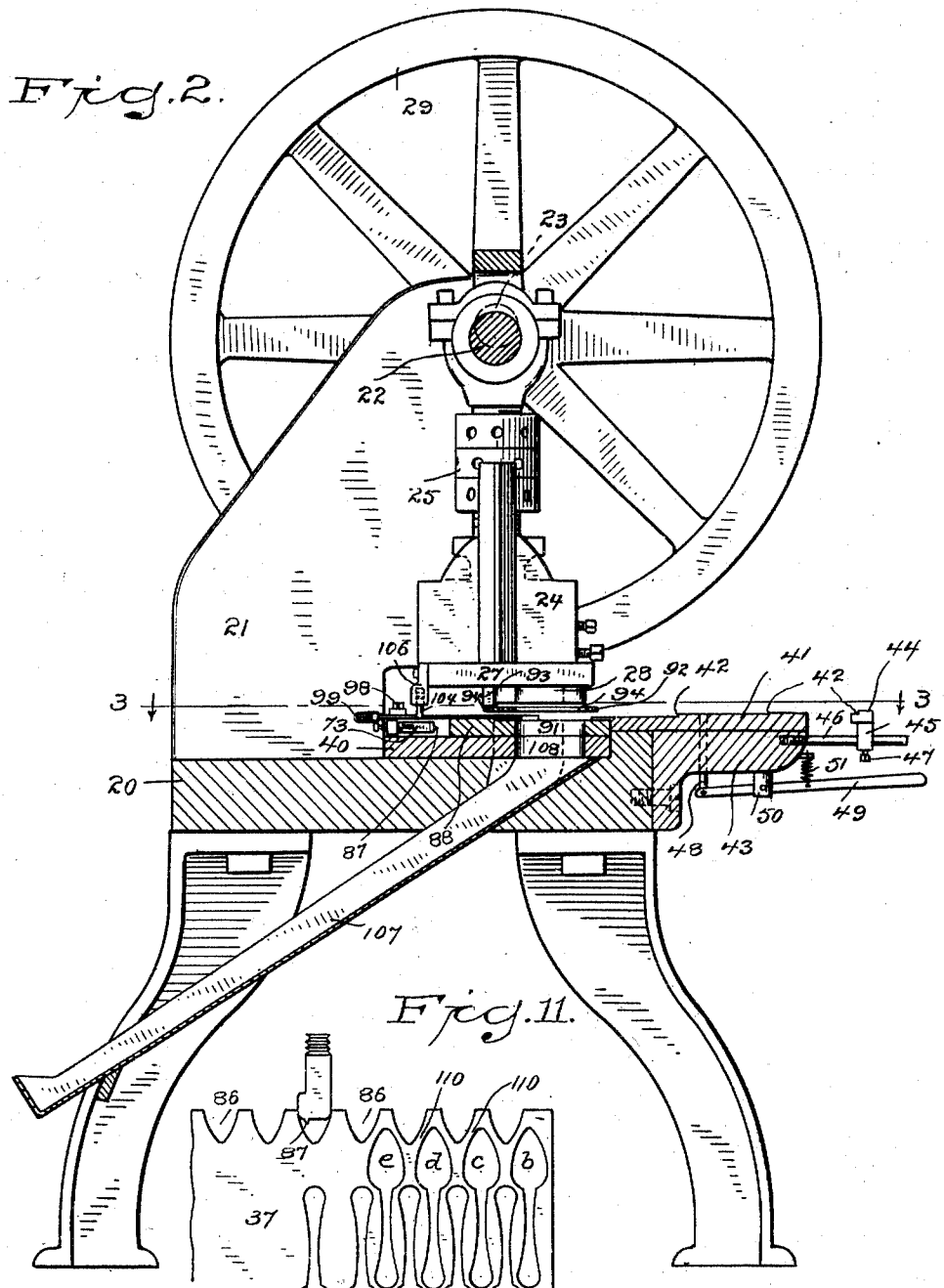

Fig. 11.

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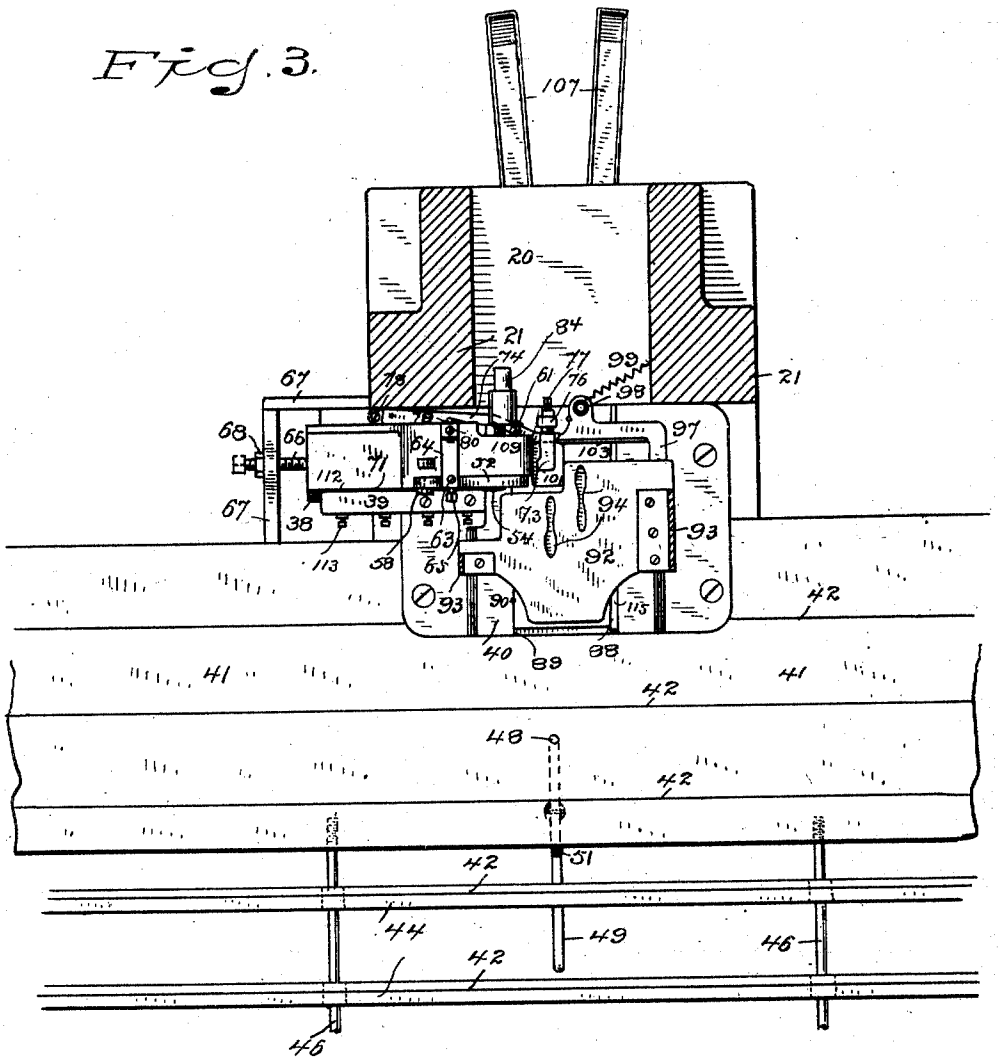
NO MODEL. 5 SHEETS—SHEET 3.

Fig. 3.



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NO MODEL. 5 SHEETS—SHEET 4.

Fig. 4.

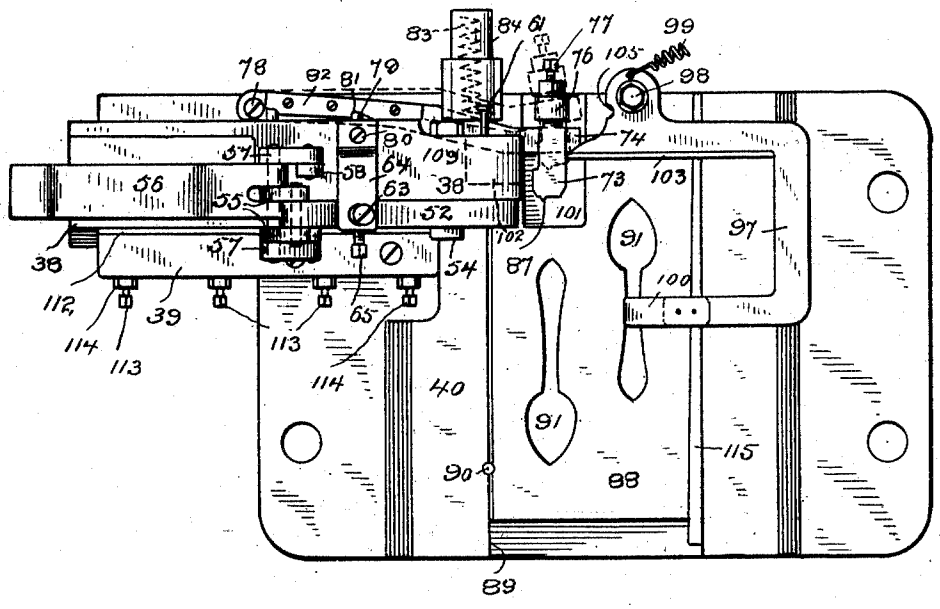


Fig. 5.

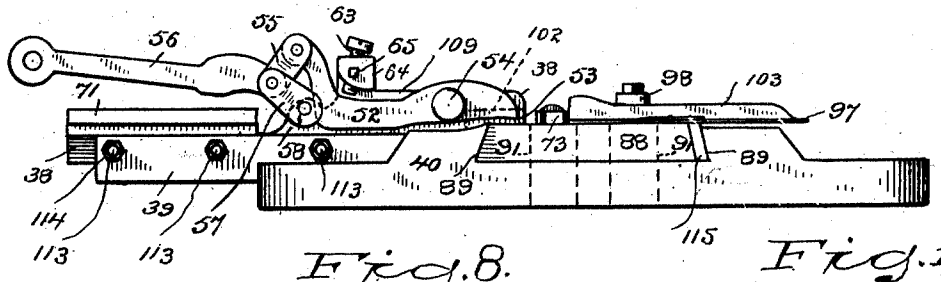


Fig. 8.

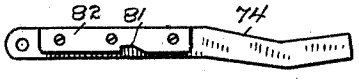


Fig. 9.

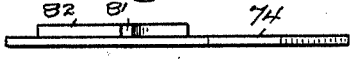
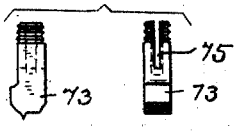


Fig. 10.



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NO MODEL. 5 SHEETS—SHEET 5.

Fig. 6.

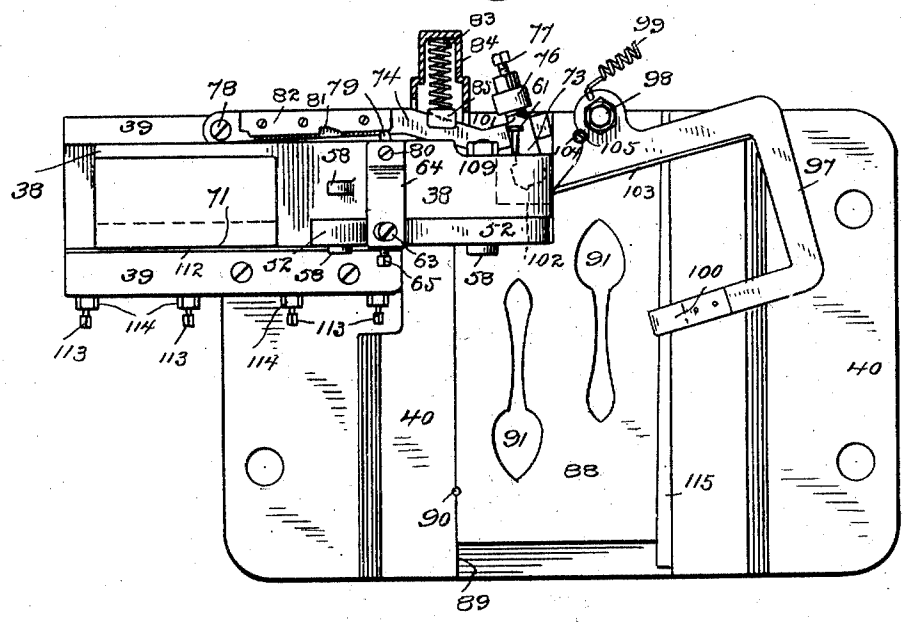
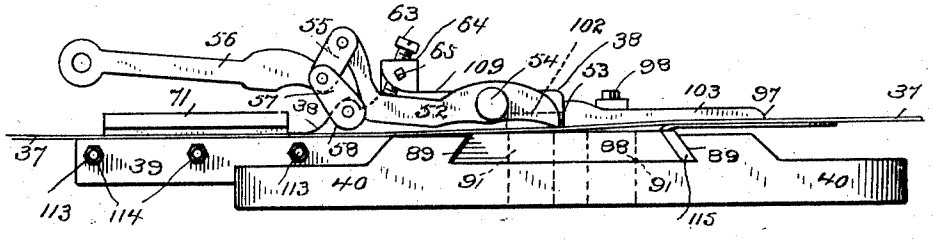


Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY L. BRADLEY, OF NEW HAVEN, CONNECTICUT.

BLANKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 759,070, dated May 3, 1904.

Application filed January 26, 1903. Serial No. 140,565. (No model.)

To all whom it may concern:

Be it known that I, HENRY L. BRADLEY, a citizen of the United States, residing at New Haven, county of New Haven, State of Connecticut, have invented a new and useful Blanking-Machine, of which the following is a specification.

My invention relates to the production of blanks, more especially pointed-ended blanks—such, for example, as the blanks from which spoons are formed—from sheet metal.

In blanking-machines as ordinarily constructed metal is fed to the machine in strips of sufficient width to cut two blanks placed in reverse position. This method of blanking is very wasteful, for the reason that cone-shaped pieces of metal are left on each edge of the strip between the tip ends of the blank-openings.

It is one of the objects of this invention to produce a blanking-machine so constructed as to operate upon large sheets of metal, and thus do away with the necessity for slitting the sheets of metal into strips before they can be fed to the machine.

It is a further object of the invention to produce a blanking-machine that will utilize a large portion of the scrap by cutting the tips of a row of blanks from the cone-shaped pieces of scrap left between the tip ends of the blank-openings after the punching out of a row of blanks.

It is a further object of the invention to produce a blanking-machine so constructed that at each forward movement of the sheet of metal one of the cone-shaped pieces of scrap will be placed over the die and the sheet trued up with perfect accuracy and locked in position until after the downward movement of the punches.

It is a further object of the invention to produce a blanking-machine in which a guide-finger is caused to oscillate underneath the scrap in such a manner as to lift the scrap during each forward movement of the sheet well out of the die-openings, rendering it practically impossible for the scrap to drop down into the die-openings and cause the sheet to buckle when it is fed forward.

It is a further object of the invention to produce a blanking-machine in which the useless portion of the scrap is cut off within the field of the dies, retaining, however, the cone-shaped pieces of scrap at the edge of the sheet that are left between the tip ends of the blank-openings after the blanks have been punched out.

With these and other objects in view the invention consists in certain constructions and in certain parts, improvements, and combinations, which will be hereinafter described and then specifically pointed out in the claims hereunto appended.

In the accompanying drawings, forming part of this specification, in which like characters of reference indicate the same parts, Figure 1 is a front elevation of my novel blanking-machine complete; Fig. 2, a central vertical section on the line 2 2 in Fig. 1; Fig. 3, a horizontal section of the housing on the line 3 3 in Fig. 2, showing the bed, stripper, and feeding and locking mechanism in plan; Fig. 4, an enlarged plan view showing the die-plate, die-openings, guide-finger, and feeding mechanism in the position in which the gripping-lever is about to grip the sheet of metal before the forward movement; Fig. 5, an elevation corresponding with Fig. 4; Fig. 6, an enlarged plan view corresponding with Fig. 4, except that the parts are in a changed position, the forward movement of the feeding mechanism having taken place and the sheet of metal having been released by the gripping-lever and the locking-finger just before the return movement, portions of the feeding mechanism being omitted for the sake of clearness; Fig. 7, an elevation corresponding with Fig. 6, the feeding mechanism being complete as in Fig. 5, but the position of the parts being the same as in Fig. 6. Figs. 8 and 9 are detail views of the arm which carries the locking-finger; Fig. 10, views of the locking-finger detached, and Fig. 11 is a view of a portion of a sheet of metal from which spoons have been blanked out by my novel machine and also illustrating the operation of the locking-finger and the scrap-cutter.

The special construction of the framework of the machine and the style of operating mechanism are wholly unimportant so far as

the principle of the invention is concerned. It is sufficient for the purposes of this specification to say that the framework of any ordinary type of blanking-press may be used.

20 denotes the bed, 21 the housing, 22 the shaft journaled at the upper end of the housing and provided with an eccentric 23, with which the gate 24 is connected by means of an eccentric-rod 25. The gate slides in ways 26 upon the housing and carries a block 27, which in turn carries the punches 28. The block may be made adjustable in the gate and the punches adjustable in the block in any ordinary or preferred manner, the special construction of these parts being wholly unimportant so far as my present improvements are concerned.

Power is applied to drive the machine by means of a belt (not shown) passing over a pulley 29 on the shaft. In the construction illustrated in the drawings the belt-pulley runs loose on the shaft and is connected thereto by means of a clutch 30, operated by means of a clutch-lever 31, pivoted to an arm 32, extending from the housing, so that the belt-pulley being running the machine is started by a movement of the clutch-lever. The feeding mechanism is actuated by means of a cam 33 on the shaft, which is engaged by a lever 34, fulcrumed on a lug 35, which extends from the housing. The feed-lever is shown as carrying an antifriction-roller 36, which engages the face of the cam.

The sheet of metal to be operated upon, which for the sake of clearness is omitted, save only in Figs. 7 and 11, where it is indicated by 37, is fed forward by mechanism which I will presently describe in detail carried by a feed-slide 38, adapted to reciprocate in ways 39, shown as rigidly secured to the die-plate 40, which is itself rigidly secured to the bed. It will be obvious, however, that the special details of construction and the arrangement and attachment of the parts are wholly immaterial so far as the principle of the invention is concerned.

For convenience in supporting a wide sheet of metal I provide a table 41, shown as resting upon a bracket 43, which is rigidly secured to the bed and is provided with a series of steps or shoulders 42, which descend from the outer edge of the table toward the blanking mechanism, and in front of the table I provide a series of rails 44, each having a step or shoulder 42, similar to those upon the table. These rails are provided on their under sides with blocks 45, having holes to receive rods 46, which are detachably secured to and extend outward from bracket 43. The steps 42 on the table and the rails are placed a distance apart equal to the exact width of metal removed from the sheet each time a double row of blanks is punched out—that, is the distance between two lines of cut of the scrap-cutter, as will presently be more fully explained. The blocks carrying the rails slide freely on the rods and after adjustment are locked in position by set-screws 47.

48 denotes a stop, adapted to move vertically in a hole in the table, which serves when raised above the surface of the table as a gage when a sheet of metal is inserted, as will be more fully explained. This stop is pivoted loosely to a lever 49, which is fulcrumed on a lug 50 on the under side of bracket 43. A spring 51, connected to the lever and to the bracket, acts to raise the rear end of the lever and depress the forward end so that the upper end of the stop will normally lie flush with or slightly below the surface of the table. To raise the stop, the operator simply presses down upon the rear or handle end of the lever.

The feeding mechanism.—In order to understand the operation of the feeding mechanism, it will be necessary to compare Figs. 4 to 7, inclusive, with Fig. 1, in which the feed-cam and feed-lever are shown. The feed-slide 38, as already stated, reciprocates in ways 39, which are rigidly secured to the die-plate. The operation of feeding is performed by causing a gripping-lever 52 to grip the sheet of metal when the feed-slide is at the retracted position to retain it firmly gripped during the forward movement of the feed-slide and to release it at the end of the forward movement of the feed-slide. The gripping-lever is provided at its forward end with a gripping-surface 53 and is pivoted to the raised forward end 109 of the feed-slide, as at 54. In order to insure that the gripping-lever will grip the sheet of metal firmly before the forward movement of the feed-slide commences and will wholly release the sheet before the return movement commences, I provide suitable means for producing the necessary amount of friction upon the feed-slide—as, for example, a gib 112 in one of the feed-slideways, which may be tightened up by set-screws 113 and locked in place after adjustment by set-nuts 114. The rear end of the gripping-lever is shown as curved upward for convenience and has pivoted thereto links 55, which are also pivotally connected to a rod 56, the rear end of which is pivoted to feed-lever 34. 57 denotes other links, one of whose ends respectively are pivotally connected to rod 56, their other ends being pivoted to lugs 58 upon the feed-slide. The links 55 and 57, in connection with rod 56 and the feed-lever, comprise a toggle which acts upon the gripping-lever to cause it to grip and release the sheet of metal quickly, but to hold the sheet with such a plentitude of power as to render slippage practically impossible and insure uniform forward movement of the sheet corresponding with the forward movement of the feed-slide, which is always somewhat retarded by friction. It will be noted that the forward movement of the feed-slide is produced by feed-cam 33, which acts upon the feed-lever

and the toggle. The return movement of the feed-slide may be produced by a spring or springs arranged in any manner that may be most convenient. I have shown two springs for accomplishing this purpose, either or both of which may be used according to the preference of the user or the requirements of use.

59 denotes a spring, one end of which is connected to a rod 60, extending outward from one of the housings, and the other end to a pin 61, (see Figs. 4 and 6,) extending outward from the feed-slide. It is obvious that when the feed-slide is moved forward it will be against the power of this spring, which will act to return the feed-slide to its retracted position as soon as the pressure of the feed-cam, feed-lever, toggle, &c., is relieved.

62 denotes a spring, one end of which bears against one of the housings, the other against feed-lever 34. The inward movement of the feed-lever in producing the forward movement of the feed-slide compresses this spring, which acts to move the feed-lever outward again as soon as the pressure exerted thereon by the feed-cam is relieved, both springs acting to cause roller 36 to follow the incline of the feed-cam.

In order to insure that while the pressure of the gripping-lever upon the sheet of metal shall be amply powerful to hold it firmly at all times, but at the same time obviate the danger of so great a pressure upon the metal as to mar it or roughen it or should too much friction be applied to the feed-slide, I provide an adjusting-screw 63, against the end of which the gripping-lever strikes at the extreme of the forward movement of the toggle, thereby limiting the pressure that can be placed upon a sheet of metal by the gripping-jaw, toggle, feed-lever, and feed-cam. This screw is carried by an arm 64, which is rigidly secured to the feed-slide and extends upward and over the gripping-lever, as clearly shown. A set-screw 65 locks the adjusting-screw rigidly in position after it has been adjusted. It will be obvious that should it be required to lessen the pressure of the gripping-lever upon the sheet the operator would loosen the set-screw, turn the adjusting-screw inward as much as might be required, and then lock it in place by tightening up the set-screw again.

It will be readily understood from the drawings that at each forward movement of the feed-slide the movement will always stop at a certain time and will always leave the slide in identically the same position. It will be obvious, therefore, that the amount of forward movement imparted to the sheet of metal will depend upon the extent of the backward movement of the feed-slide. This backward movement of the feed-slide must therefore be adjusted with the greatest accuracy. I have shown in the drawings two adjustments for effecting the desired result, either or both of which may be used, as preferred by the user or found best adapted to the requirements of use.

66 denotes a set-screw carried by a frame 67, the ends of which are rigidly secured in place in any suitable manner, as to one of the housings and to the table. (See Fig. 3.) This screw is turned inward until its end is in such a position that when engaged by the feed-slide in its backward movement it will stop the latter in such a position that in the forward movement the gripping-lever will carry the sheet of metal forward the exact distance required to place cone-shaped pieces of the scrap over the die-openings. When adjusted, set-screw 66 is locked in position by a set-nut 68.

In order to insure that after each return movement of the gripping-lever the sheet of metal will be trued up with perfect accuracy and locked in position until seized by the gripping-lever, I provide a locking-finger 73, which is carried by a lever 74, shown as pivoted, as at 78, to one of the ways 39, in which the feed-slide reciprocates. It is of course necessary that the locking-finger should be so attached to the lever as to be capable of the very finest adjustment. This adjustment I effect by providing a slot 75 (see Fig. 10) in the rear end of the finger to receive the lever, threading the rear end of the finger for engagement by a nut 76, and providing a set-screw 77, which extends down through the nut and the rear end of the finger and engages the back of the lever. Having placed the finger at the exact adjustment on the lever that is desired, the operator turns down nut 76, which clamps the opposite walls of the slot against the lever, and then turns set-screw 77 down against the back of the lever, thus rendering it impossible under the ordinary conditions of use for the adjustment of the finger to be disturbed. Lever 74, carrying the locking-finger, is moved from the locking position, as in Figs. 4 and 11, to the reverse position, as in Fig. 6, by means of a lug 79, which extends outward from arm 64, in which it is locked by a set-screw 80. The forward face of lug 79 is beveled to adapt it to engage the inclined forward end of a recess 81 in lever 74. In the present instance the recess is shown as formed in a plate 82, which is rigidly secured to the lever. This special construction is wholly immaterial so far as the principle of the invention is concerned. The lever and locking-finger are moved toward the locking position and normally retained there by means of a spring 83, bearing against a shoe 85, which itself engages the back of the lever. The spring and shoe are shown as inclosed within a housing 84, which may be secured in any suitable manner to the die-plate and is slotted on opposite sides to receive the lever. The action of the locking-finger will be clearly understood from Fig. 11, which see in connection with Figs. 4 and 6. As the

feed-slide moves toward the retracted position, as in Fig. 4, spring 83 bearing against the back of the lever will cause the lever to move inward as lug 79 rides down the beveled forward end of recess 81, so that the lever, and with it the locking-finger, will swing from the position shown in Fig. 6 to the position shown in Figs. 4 and 11, the locking-finger passing into one of the recesses 86 in the edge of the sheet of metal, which is indicated by 37. It will be readily seen from Fig. 11 that these recesses are the tip portions of the openings left in the sheet by the punching out therefrom of spoon-blanks, as will be more fully explained. It will, furthermore, be noted that the forward end of the locking-finger is rounded on opposite sides, so as to leave it free to swing into and out of the recesses 86 without coming in contact with any portion of the sheet except the walls of the recesses, and that the forward end of the finger is provided with a sharpened rib 87, which engages the straight edge of a new sheet before any tip-recesses have been formed therein by the punching out of spoon-blanks. This sharpened rib by its engagement with the edge of a new sheet locks it until seized by the gripping-lever in the same manner that the finger locks it after tip-recesses have been formed. When the forward movement of the feed-slide takes place—that is, when it starts to move from the position shown in Fig. 4 toward the position shown in Fig. 6—the engagement of the lug 79 with the incline of recess 81 will throw lever 74, and with it the locking-finger, outward to the position shown in Fig. 6, so that there will be no interference with the forward movement of the feed-slide.

88 denotes the die, which is shown as beveled at its edges to engage undercut ways 89 in die-block 40. The die is locked in position in the block in any suitable manner, as by means of a pin 90 engaging recesses in the die and die-plate and a key 115 driven between one of the ways and the die.

101 denotes a recess in die 88, and 102 (see dotted lines in Figs. 4 and 6) denotes a recess in the raised forward end 109 of the feed-slide, both of which are provided to give clearance to the locking-finger. The die is provided with two openings 91, which correspond with the punches carried by the gate, as already described. Slightly above the dies I provide a stripper 92, which is carried by arms 93, rigidly secured to ways 26 or to the housings. The stripper is provided with openings 94, through which punches pass in the downward movement, the stripper acting to prevent the sheet of metal from rising with the punches should it adhere when the upward movement takes place.

95 denotes a cutting-tool carried by the gate, which I term the "scrap-cutter," the action of which is to chop off the scrap a short distance in advance of the punches. (See Fig. 11, in which I have indicated the cut made by the scrap-cutter by 96.) It will be noted that all of the surplus scrap is severed from the sheet a short distance ahead of the punches, leaving only the tips of the openings left by punching out the bowls of spoons. These recesses I have indicated by 86 and have also shown in Fig. 11 the mode in which one of these recesses is engaged by the locking-finger to true up the blank just before it is engaged by the gripping-lever. It should be noted that between each pair of recesses 86 is a cone-shaped piece of metal, which I have indicated by 110. These cone-shaped pieces I utilize for the tips of new blanks, as will be clearly understood from Fig. 11.

It will be seen that by using wide sheets of metal instead of strips just wide enough to provide metal and the necessary scrap for a double row of blanks and by saving the cone-shaped pieces between the tips of the recesses I effect a very great saving in the amount of metal required to produce a given number of blanks.

In order to avoid the possibility of the scrap, more especially that portion surrounding the opening in the sheet of metal from which the first spoon-blank, counting from the left, has been punched, from dropping into or engaging the edge of the second die-opening when the forward movement of the feeding mechanism takes place, I provide a guide-finger 97, which is shown as pivoted, as at 98, to the die, although it is of course immaterial in just what manner the guide-finger is pivoted, and the end of which drops into and covers the right-hand edge of the second die-opening. As the sheet of metal is fed forward the scrap portion thereof rides over the guide-finger, so that it is made impossible for any of the edges to engage the die-openings, more especially the second die-opening. A spring 99, connected to the guide-finger and to the housing or to any fixed portion of the machine, acts to normally retain the guide-finger in the operative position, as in Fig. 4, in which it will be seen that the feed-slide and gripping-lever are at the retracted position, the latter being at the raised or releasing position and the guide-finger in position over the central portion of the second die-opening, counting from the left. The operative portion of the guide-finger is preferably a detachable resilient plate, as 100, which is rigidly secured to the finger and whose forward end is curved downward to cause it to engage the surface of the die. I have shown guide-finger 97 as provided with a rib 103, which serves to stiffen it, and is also engaged by the raised forward end 109 of the feed-slide, so that during the latter portion of the forward movement of the feed-slide the guide-finger is engaged thereby and is oscillated from the position shown in Fig. 4 to the

position shown in Fig. 6. This oscillatory movement of the guide-finger is for the purpose of getting it out of the way of the second punch, counting from the left, when the downward movement takes place. In order to insure that the guide-finger cannot move from the position shown in Fig. 6 toward the position shown in Fig. 4 until after the upward movement of the gate has carried the punches upward well out of the way and the feed-slide has moved backward out of the way, I provide a pin 104, which engages a recess 105 in the guide-finger and locks it at the retracted or inoperative position. This pin is preferably in practice a spring-pin, as indicated in Fig. 2, the base of the pin and the spring by which it is held down being socketed in a recess in a block 106, which is rigidly secured to punch-block 27 or to any convenient portion of the gate. The fact that pin 104 is a spring-pin makes it safe to permit it to engage the top of the die in the downward movement, and should an obstruction intervene damage is prevented to any portion of the machine.

The spoon-blanks punched out from the sheet of metal may be disposed of in any ordinary or preferred manner. I have shown chutes or ways 107, which receive the spoon-blanks as they are punched through openings 91 in the die and corresponding openings 108 in die-plate 40.

In use in starting with a sheet of metal the parts are placed in the position shown in Fig. 1 to 5, inclusive, except that the locking-finger is held back, as in Fig. 6—that is, the punches are raised, the feed-slide retracted, the gripping-lever raised, the locking-finger held back, and the guide-finger thrown forward. It should be noted, as already explained, that while operating upon a new sheet of metal—that is, before any tip-recesses 86 have been formed therein—the sharpened rib 87 at the forward end of the locking-finger will engage the edge of the sheet of metal and will lock it in position in the same manner that it is locked after the first double row of spoon-blanks have been punched out by the engagement of the locking-finger itself with a recess 86. The gage for inserting the sheet is stop 48, which is raised above the surface of the table by pressing downward on lever 49. The sheet of metal is slid in from left to right, as seen in Figs. 1 and 3, until the right-hand edge engages the stop, the front edge of the sheet—that is, the edge that is to be operated upon—resting upon and against the feed-slide under the gripping-lever and under the overhanging edge 71 and the rear edge of the sheet engaging one of the steps or shoulders 42 on table 41 or on one of the rails 44, depending upon the width of the sheet Having placed the sheet of metal in position as described, the machine is started. The timing of the several mechanisms is as follows: The first mechanism to operate is the feeding mechanism. Feed-cam 33 operates through the intermediate connections described to cause gripping-lever 52 to grip the sheet firmly, after which the feed-slide moves forward, carrying the sheet with it, the locking-finger swinging backward out of the way, as already fully described. The sheet does not, however, move forward far enough at this actuation so that the right-hand edge will ride up over the guide-finger, which is moved backward to the position shown in Fig. 6 through the engagement therewith of the forward end of the feed-slide, as is clearly shown in Fig. 6. After the forward movement of the feeding mechanism ceases said mechanism, still gripping the sheet, is held stationary at its extreme forward position, while the punches descend, passing through the openings in the stripper, the left-hand punch blanking out a spoon-blank from the opening indicated by *a* in Fig. 11. It should be noted that pin 104, also carried by the gate, descends with the punches and locks the guide-finger in the position shown in Fig. 6. An instant later the backward movement of the feeding mechanism commences. This backward movement is completed, and the locking-finger consequently operates, before the punches have been drawn out of the sheet. The sheet is therefore held in exactly the position in which it was when the last spoons were blanked out, while the gripping-lever is again taking hold. The gripping-lever, through the operation of the feed-cam, feed-lever, rod 56, and the link, first rises, as shown in Fig. 5, after which the feed-slide moves backward to the position shown in said figure. As soon as the feed-slide, gripping-lever, &c., have reached the retracted position, as in Fig. 4, the punches rise, the stripper acting to prevent the sheet from rising with them. It should be noted, however, that pin 104, which is also carried by the gate, extends downward farther than the punches, so that the guide-finger is not released by said pin until after the punches have risen above it and until after the feed-slide has moved backward well out of the way. The instant the guide-finger is released by the pin spring 99 acts to return it to the operative position, as in Fig. 4. As the feed-slide reaches the retracted position, as in Fig. 4, lug 79 rides down the incline of recess 81 in lever 74, which throws the locking-finger into the locking position and trues up the sheet of metal with perfect accuracy against one of the steps or shoulders with which the opposite edge of the sheet is in contact, the sharpened rib engaging the edge of a new sheet and the rounded end of the finger engaging a recess in the edge of the sheet after the first double row of blanks has been punched out. This truing-up action of the locking-finger is important, as it insures not only the accuracy of the direction of the line of feed by holding one edge of the sheet always against one of the straight steps or shoulders and pre-

vents any movement of the sheet toward either side of the proper line of feed, but it also causes the sheet to be held or locked in absolutely accurate position for the action of the punches relatively to the recesses 86 that were formed by the preceding row of blanking operations, so that the new blanks will have their points cut out of the metal between said recesses without liability of a new cut intersecting an old one. In other words, each blank will have a perfect and complete outline formed at a single operation without liability of a portion of the edge resulting from a previous operation, because the finger 73 engages both sides of a recess 86 and locks the sheet against endwise movement in either direction and at the same time trues up the sheet and prevents any lateral movement and insures that the operation of the punch or punches will be in the exact place in the sheet that it should be in relatively to preceding operations and the operations that are to follow. It will be noted that the sheet is held by the punches until after it has been engaged by the locking-finger, so that the sheet is at all times held in place either by the locking-finger, the gripping-lever, or the punches, neither mechanism releasing it until after it has been engaged by one of the others. The parts are now in the starting position again. The gripping-lever now grips the sheet again, and the feed-slide moves forward, carrying the sheet with it, the right-hand edge of the sheet passing over the forward end of the guide-finger, which prevents the edge of the sheet—*i. e.*, the scrap surrounding the opening from which a spoon-blank has been punched out—from by any possibility engaging the second die-opening, counting from the left. As soon as the edge of the sheet has passed over the end of the guide-finger the guide-finger, moving with the sheet, commences to swing backward toward the position shown in Fig. 6, so as to be entirely out of the way of the punches. The punches now descend again and punch out spoon-blanks from the openings indicated by *b b* in Fig. 11, these operations being repeated continuously. The third operation of the punches removes blanks from the openings indicated by *c c* in Fig. 11, the fourth from the openings indicated by *d d*, the fifth from the openings indicated by *e e*, and so on, at each descent of the punches cutter 95 cutting off the scrap at the line indicated by 96 in Fig. 11, so that the openings 86 are left in the edge of the sheet after the first double row of blanks has been punched out. Having passed the sheet through the machine and punched out a double row of blanks, the machine is stopped and the sheet removed and inserted, as before, the rear edge of the sheet lying under the gripping-lever and against plate 71 and the raised forward end of the feed-slide, the right-hand edge engaging the stop and the rear edge resting against the step 42 next in front of the step it engaged during its former passage through the machine. Each time the sheet is inserted in the machine the rear edge thereof rests against the step next in front of the one last engaged.

It will be seen that I wholly avoid the use of a slitting-machine and am enabled to use sheets as wide as they can be conveniently handled. I am thus enabled to effect a great saving in the cost of handling and a very great saving in metal, for the reason that I utilize the cone-shaped pieces of metal between the tip-openings left after each double row of blanks has been punched out to form the tips of a new row of blanks.

Having thus described my invention, I claim—

1. In a machine of the character described the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by punches, a guide for one edge of the sheet, and a laterally-oscillating finger which engages the other edge of the sheet as the feeding mechanism returns to the retracted position and trues it up before it is again engaged by the feeding mechanism.

2. In a machine of the character described the combination with punches, a die and operating mechanism, of feeding mechanism comprising a slide, a gripping-lever pivoted thereto, a rod 56, links pivoted to said rod and to the gripping-lever and feed-slide respectively, so that forward movement of the rod will first cause the lever to grip a sheet of metal and will then move the slide forward carrying the sheet with it, and means for truing up the sheet laterally as it is fed through the machine.

3. In a machine of the character described the combination with punches, a die and operating mechanism, of feeding mechanism comprising a slide having a raised forward end, a gripping-lever pivoted to said forward end, a rod 56 and links pivoted to said rod and to the gripping-lever and feed-slide respectively, so that when a sheet of metal is placed under the gripping-lever, forward movement of the rod will cause the lever to grip the sheet between itself and the slide and will then move the slide forward carrying the sheet with it, backward movement of the rod causing the lever to release the sheet, and then moving the feed-slide backward leaving the sheet in the position to which it was carried by the forward movement.

4. In a machine of the character described, the combination with a punch and feeding mechanism, of a guide for the edge of a sheet of metal, and a laterally-movable locking-finger for intermittently engaging the other edge of the sheet, whereby said sheet will be trued up and intermittently locked in position.

5. In a machine of the character described,

the combination with a punch and feeding mechanism, of a guide for the edge of a sheet of metal, and a laterally-movable locking-finger for intermittently engaging the other edge of the sheet, said locking-finger being formed to enter recesses in the edge of the sheet.

6. In a machine of the character described, the combination with a punch and feeding mechanism, of a guide for one edge of a sheet of metal, and a laterally-movable locking-finger for intermittently engaging the other edge of the sheet, said locking-finger being formed to enter recesses in the edge of the sheet and having also a sharp rib or tooth adapted to engage a sheet having a straight edge.

7. In a machine of the character described the combination with punches, a die and operating mechanism, of feeding mechanism comprising a slide, a gripping-lever pivoted thereto which grips a sheet of metal upon the slide, means for operating the gripping-lever and reciprocating the slide, a laterally-movable locking-finger adapted to engage one edge of the sheet when the feeding mechanism is retracted, a guide for the other edge of the sheet, a lever by which the locking-finger is carried, means for throwing said lever and finger to the retracted position and holding it there while the feed-slide moves forward and a spring acting to return said lever and finger to the locking position.

8. In a machine of the character described the combination with punches, a die, operating mechanism and feeding mechanism comprising a slide, a gripping-lever carried thereby which grips a sheet of metal upon the slide and means for operating said lever and reciprocating the slide, of a locking-finger adapted to engage the sheet when the slide is retracted, a lever by which said finger is carried and which is provided with an inclined recess 81, a spring for forcing said lever and finger to the locking position and a fixed lug which engages said recess in the retracted position of the slide and rides up the incline throwing the lever and finger to their retracted position when the slide moves forward.

9. In a machine of the character described the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by the punches, a laterally-oscillating locking-finger adapted to engage one edge of the sheet when the feeding mechanism is at the retracted position, the forward end of said locking-finger being shaped to enter tip-recesses in the edge of the sheet after the first double row of blanks has been punched out and having a sharpened rib to adapt it to engage the edge of a sheet, and a guide for the other edge of the sheet.

10. In a machine of the character described the combination with punches, a die and operating mechanism, of feeding mechanism which moves the sheet forward into position to be operated upon by the punches and moves backward while the sheet is held by the punches, a locking-finger which engages the sheet when the feeding mechanism is at the retracted position, a lever by which said finger is carried and means for accurately adjusting said finger on the lever.

11. In a machine of the character described the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which the sheet is gripped and fed forward into position to be operated upon by the punches, a locking-finger which engages the sheet when the feeding mechanism is retracted and is provided with a slot 75, an oscillating lever which engages the slot, a nut which engages the rear end of the finger and a set-screw which passes through the nut and the rear end of the finger and engages the back of the lever to lock the finger in place after adjustment.

12. In a machine of the character described the combination with punches, a die and operating mechanisn, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by the punches, and an oscillating guide-finger by which the scrap portion of the sheet of metal is prevented from engaging the die-openings when the sheet is fed forward.

13. In a machine of the character described the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by the punches and an oscillating guide-finger over which the scrap portion of the sheet rides to prevent engagement with the die-openings and which is itself moved out of the way of the descending punches by the forward movement of the feeding mechanism.

14. In a machine of the character described the combination with punches, a die and operating mechanism, of a reciprocating feed-slide, a gripping-lever carried thereby by which the sheet is gripped and fed forward, an oscillating guide-finger over which the scrap portion of the sheet rides to prevent engagement with the die-opening and which is itself engaged by the feed-slide and moved forward out of the way of the punches, a spring acting to move the guide-finger into operative position and a pin moving with the punches which engages the guide-finger and holds it out of operative position against the power of the spring until the punches have moved upward and the feed-slide has moved backward out of the way.

15. In a machine of the character described the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated

upon by the punches, and a scrap-cutter by which surplus scrap is chopped off at each actuation of the machine.

16. In a machine of the character described the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by the punches and a scrap-cutter moving with the punches which removes surplus scrap leaving only the tips of the blank-openings.

17. In a machine of the character described the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by the punches, an oscillating locking-finger which engages the sheet as the feeding mechanism returns to the retracted position and a scrap-cutter moving with the punches which removes surplus scrap leaving only the tips of the blank-openings, one of which is engaged by the locking-finger, substantially as described.

18. In a machine of the character described the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by the punches and a table having a series of steps descending from the outer edge toward the punches against one of which the rear edge of the sheet rests each time it is placed in the machine and while being operated upon by the punches.

19. In a machine of the character described the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by the punches, a table having a series of steps descending from the outer edge toward the punches and rails supported in front of the table and each provided with a step similar to those upon the table, said steps serving as a rest for the rear edge of the sheet while it is being operated upon.

20. In a machine of the character described the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by punches, a table having a series of steps descending from the outer edge toward the punches, rods 46 extending outward from the table and rails adjustably secured to said rod and each having a step similar to those upon the table, substantially as shown, for the purpose specified.

21. In a machine of the character described, the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by the punches, a table having a series of steps descending from the outer edge toward the punches, against which the rear edge of the sheet rests while being operated upon, a stop 48 which normally lies flush with the surface of the table and which is adapted to serve as a gage for the right-hand edge of a sheet when being placed in the machine, and means for raising the stop into operative position.

22. In a machine of the character described, the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped, fed forward and held while being operated upon by the punches, the sheet being held by the punches during the backward movement of the feeding mechanism, a guide for one edge of the sheet, and a locking-finger which engages the other edge of the sheet as it reaches the retracted position, trues it up and locks it until after it is again engaged by the feeding mechanism.

23. In a machine of the character described, the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by the punches, a guide-finger over which the edge of the sheet passes as it is fed forward, for the purpose set forth, and a locking-finger which engages the edge of the sheet as it reaches the retracted position, said locking-finger being caused to release the sheet and the guide-finger being moved forward out of the way of the punches by the forward movement of the feeding mechanism.

24. In a machine of the character described, the combination with punches, a die and operating mechanism, of a reciprocating feed-slide, a gripping-lever carried thereby by which the metal is gripped and fed forward, a guide-finger over which the edge of the sheet passes and which is moved out of the way of the punches by the forward movement of the feed-slide, a spring for moving the guide-finger into operative position and a pin for retaining the guide-finger out of operative position until the punches have moved upward and the feed-slide moved backward out of the way.

25. In a machine of the character described, the combination with punches, a die and operating mechanism, of reciprocating feeding mechanism by which a sheet of metal is gripped and fed forward into position to be operated upon by the punches, a stripper through which the punches pass and which prevents the sheet from rising and a scrap-cutter which removes surplus scrap from the sheet.

26. A metal cutting and stamping apparatus, having dies for cutting a blank from a sheet, and a stepped gage for the edge of the sheet, substantially as and for the purpose set forth.

27. A metal cutting and stamping apparatus, having dies, an abutment near the dies for spacing the blanks in a row, an adjustable gage for properly placing the sheet for stamping the first blank in a row, and a stepped gage for equidistant transverse spacing, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY L. BRADLEY.

Witnesses:
ALICE M. BROWN,
LOUISE D. BROWN.