J. R. HARBECK.

PUNCHING MACHINE.

APPLICATION FILED JUNE 8, 1908.

907,690. Patented Dec. 22, 1908.

4 SHEETS—SHEET 1.

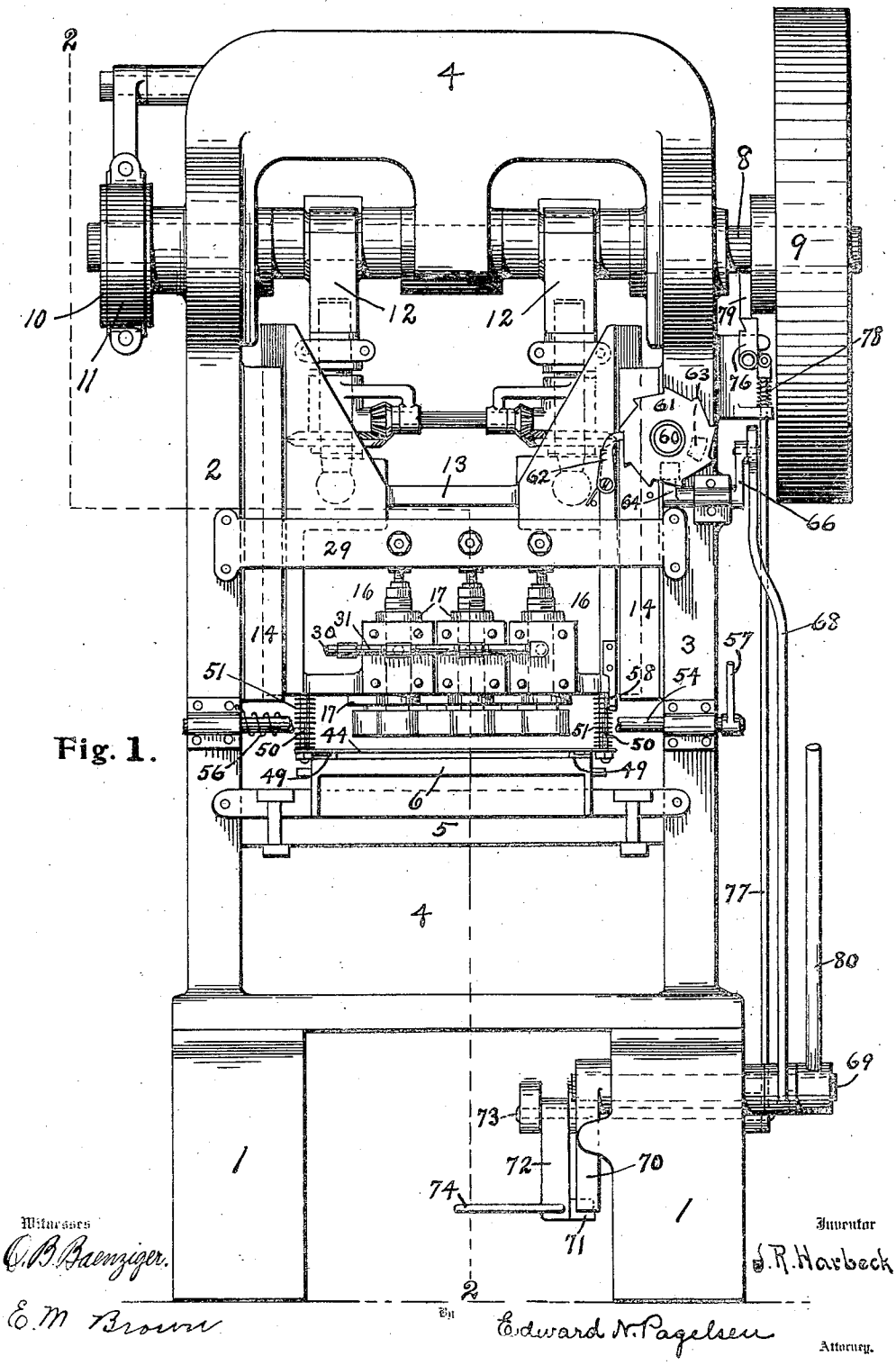

Fig. 1.

Witnesses

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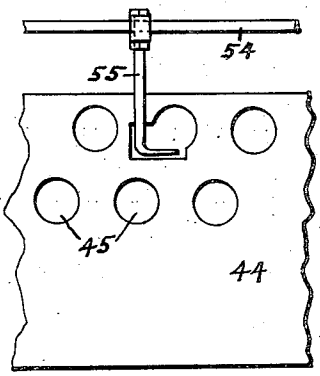

Fig. 3.

Fig. 2.

Witnesses

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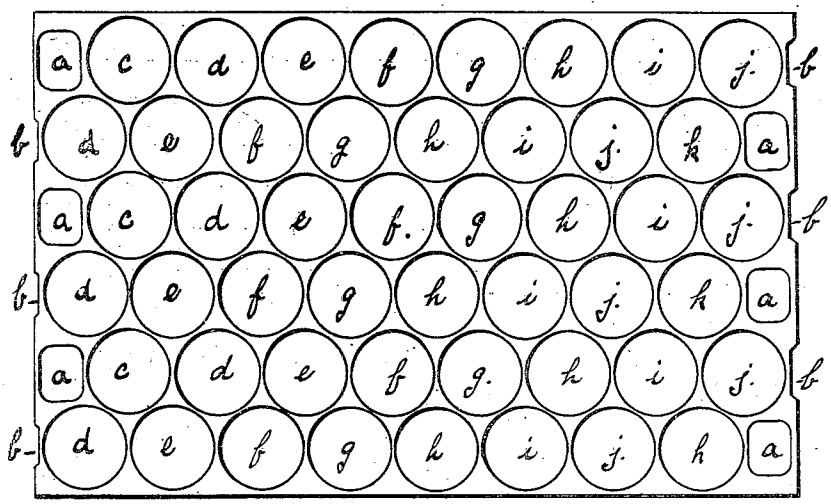

Fig. 4.

Witnesses

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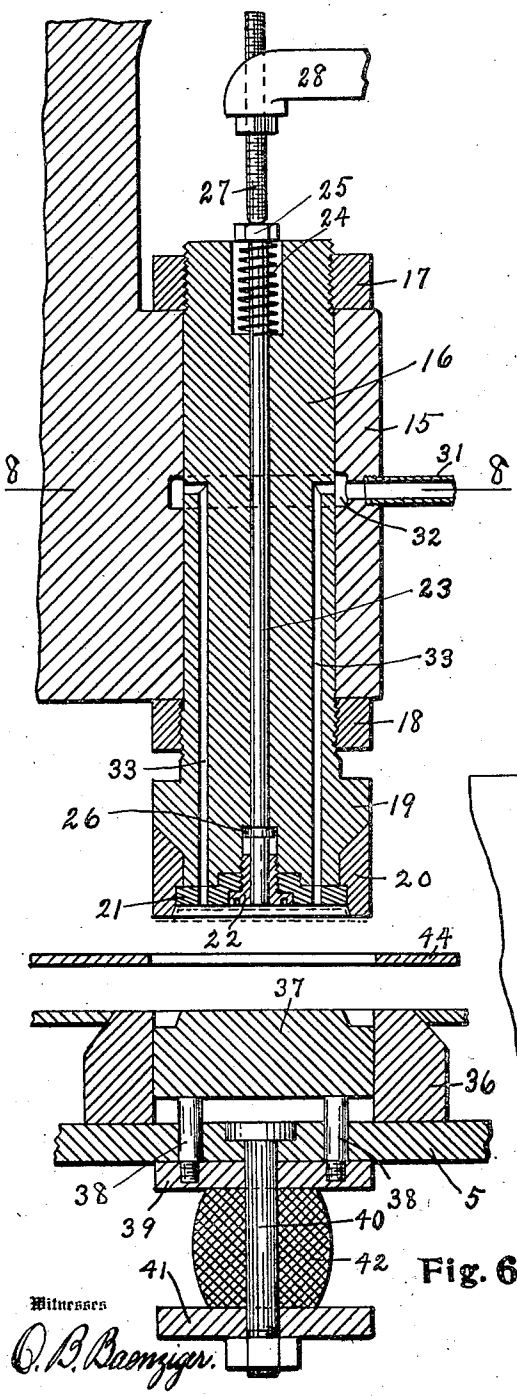

Fig. 6.

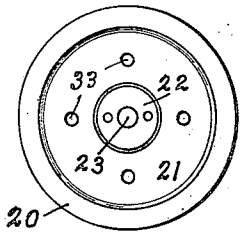

Fig. 7

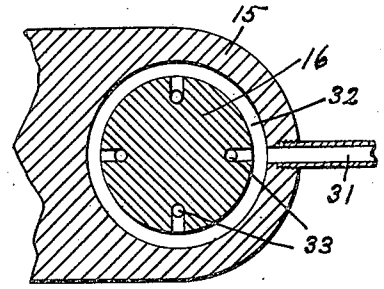

Fig. 8.

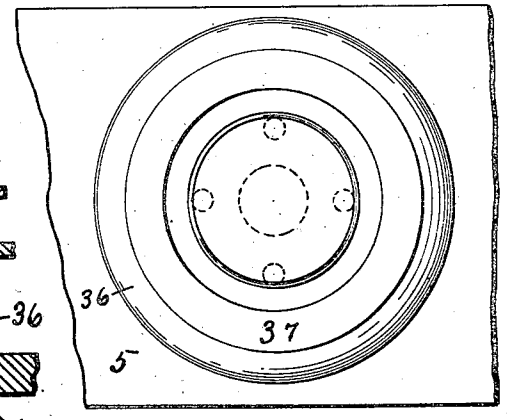

Fig. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

JERVIS R. HARBECK, OF DETROIT, MICHIGAN, ASSIGNOR TO KEMIWELD CAN COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

PUNCHING-MACHINE.

No. 907,690. Specification of Letters Patent. Patented Dec. 22, 1908.

Application filed June 8, 1908. Serial No. 437,259.

To all whom it may concern:

Be it known that I, JERVIS R. HARBECK, a citizen of the United States, and a resident of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Punching-Machine, of which the following is a specification.

My invention relates to presses for cutting out blanks from sheet metal and at the same time forming the blanks by means of punches and dies; and the object of this invention is to provide a machine of this kind which shall be adapted to rapidly and effectually turn out such products with a minimum expense for labor and material.

My invention comprises a novel punching machine having an inclined feed table.

It also consists in the novel arrangement of the punches and dies in staggered parallel rows at an angle to the horizontal.

It further consists in novel means for positioning the sheets from which the blanks are cut by this multiple system of dies.

It further consists in novel means for removing the finished blanks from the machine, and especially in the construction of the punches which effect this removal.

It further consists in a novel safety mechanism whereby the press is stopped at the end of a predetermined number of strokes.

It finally consists in the novel details of construction illustrated in the accompanying drawings in which—

Figure 1 is a view of this improved press looking down on a line at right angles to the plane of movement of the cross head. Fig. 2 is a cross section on the line 2—2 of Fig. 1. Fig. 3 is a view of the guide plate and stop gage. Fig. 4 is a view of a punched sheet. Fig. 5 is a plan of a die. Fig. 6 is a longitudinal central cross section of a punch and die. Fig. 7 is an end view of a punch. Fig. 8 is a transverse cross section on the line 8—8 of Fig. 6.

Similar reference characters refer to like parts throughout the several views.

In the drawings, the bed 1 of the press has a frame connected to it consisting of the side pieces 2 and 3, and the cross piece 4. Between the side pieces is a base provided with a main plate 5 and feed table 6. Vertical braces 7 extend from the bed 1 to the side pieces to stiffen the entire construction.

Revoluble in the side pieces is a shaft 8 on one end of which is the wheel 9 which is both driving pulley and fly wheel. On the other end is a brake wheel 10 which is engaged by the brake band 11 in the usual manner. The shaft is formed with crank pins which are embraced by the upper ends of the connecting rods 12, the lower ends of which are ball shaped and connect to the cross head 13. Adjusting means are provided as shown in Fig. 1, but this construction just described is well known and forms no part of this present invention.

The side pieces 2 and 3 are provided with guides 14 between which the cross head 13 is slidable, and, as shown in Fig. 2, these guides are at an angle to the vertical and at right angles to the feed tables. Projecting from the sides of this cross head are bosses 15 in which the punch holders are mounted. The punch holders may be slipped up into bores in the bosses as shown in Fig. 2, or the bosses may be held in position as shown in Fig. 1.

Each punch holder is formed as shown in Figs. 6 and 8 with a cylindrical body 16 having threaded portions to receive the adjusting nuts 17 and 18, and a head 19 which is properly formed to receive the cutting ring 20 and the forming disk 21 of the punch. The disk 21 holds the ring 20 in position while it is itself held in position by the screw 22. As the formed blanks are usually lifted up by the punch, as shown in dotted lines in Fig. 6, a rod 23 is provided to discharge the same. This rod is slidably mounted in a central bore of the punch holder, being held upward by the spring 24 bearing against the nut 25, the upward movement being limited by the collar 26 on the rod.

When the cross head is reaching the upper end of its movement, the rods 23 will contact with pins 27 carried by the arms 28 projecting from the cross bars 29 which extend across between the side pieces 2 and 3. As a result, the rods 23 will be depressed and expel the blanks from the punches. To insure the lifting and to prevent these blanks from falling out of the punch before the proper time, a flexible hose 30 is provided which connects to an air pump and to the pipes 31. The bosses are formed with passages 32 which connect with the pipes 31 and with the upper ends of the passages 33 in the punch holders.

The dies for this machine are shown in the lower part of Fig. 6 and in Fig. 5. Each is formed by the ring 36 which rests on the

main plate 5. Within this ring is vertically movable the disk 37 which is normally held up by the pins 38 which connect to the disk 39. A bolt 40 extends through the main plate and carries the washer 41, between which and the plate 5 is placed any desirable resilient member, a rubber spring 42 preferred.

The rings 20 and 36 are the male and female shear members and the disks 21 and 37 the female and male forming members respectively. All four should be of tempered steel. When the punch descends, the ring 20 passing into the ring 36 cuts out a flat blank. Continuing down the flat blank is pressed between the disks 21 and 37, forming it as shown in dotted lines at the lower edge of the ring 20. Ordinarily, the stiffness of the rubber bumper 42 will hold up the disk 37 sufficiently to form the depression in the blank. For heavy sheet metal, it may be necessary for the disk 37 to contact with the main plate before the necessary resistance is obtained.

When the punch rises, the properly formed blank will generally be wedged into the depression in the end of the punch as shown in Fig. 6, but to insure it rising, the air ducts 33 are provided. After the punches have reached proper height, the rods 23 will eject the blanks which will fall on the guide plate 44. The press being inclined, the openings in the plate 44 will not be directly under the punches when the blanks fall and the blanks will slide off to the rear as shown in Fig. 2 and are thus separated from the waste.

The usual manner of punching out blanks by means of gang presses, in which the punches and dies are in a straight line at right angles to the feed, is wasteful because of the necessary wall of the die ring. By arranging the punches and dies in two parallel staggered lines, as shown by the openings 45 in the guide plate 44, Fig. 3, it is possible to punch the sheet in the manner shown in Fig. 4.

As large factories manufacture containers with heads of various sizes, it is economical to first cut out approximately rectangular blanks to form the openings *a* in the sheet, (Fig. 4). As sheets delivered by the tin plate mills are rarely of exact size, it is good policy to cut out the notches *b* along the edges so that on the first and last strokes of this machine on each sheet no slivers of metal will be left in the dies to cause breakage on the next stroke of the machine. This cutting out and notching is performed on a special machine.

The feed table 6 has an opening through which the die rings 36 and plates 37 may be positioned. The space around and between the rings 36 are filled by means of a plate 48 so that the entire feed table presents a flat surface over which the sheet may slide. The edges of the sheet are guided by the bars 49 (Fig. 1) secured to the table. The guide plate 44 is mounted on pins 50 carried by the cross head and is held against these bars by the springs 51, so that in case anything gets out of order or if the waste jams along side or around a punch ring 20, breakage will be avoided, the plate 44 rising freely with the punches.

The feed of the sheet is controlled by a stop mechanism which is mounted on a shaft 54 across the front of the machine and comprises a finger 55. A spring 56 holds down this finger, a handle 57 on the outer end of the shaft enabling the operator to raise the finger at will which finger passes down through an opening in the plate 44 as shown in Fig. 3. The sheet in Fig. 4 is shown upside down. The operator first lifts the finger and slips the sheet down the table and lowers the finger into an opening *a* so that the sheet rests against the finger. The machine then operates, cutting out the blanks to form the openings *c* Fig. 4. On rising, the catch 58 on the cross head engages the end of the arm 59, raising the finger 55 for an instant, during which time the sheet slips down the incline. The notches *b* prevent the second row of punches clipping the edge of the sheet and getting slivers in the annular depressions of the plates 37. As the sheet slips, the arm 59 swings out of the path of the catch 58 and the finger 55 falls into the middle opening *c*, stopping the sheet. The punches then cut out the six openings *d*, then in turn the openings *e*, *f*, *g*, *h*, *i*, and *j*. At the next operation, the first row of punches do not cut as they are at the rear notches *b* but the rear punches cut the openings *k*. At the next stroke of the machine, the rear line of punches are due to cut down on the sheet around the rear openings *a* which would fill the lower dies with chips. To prevent this a stop mechanism is provided as follows. Journaled on the pin 60 projecting from the side piece 3 is a ratchet wheel 61 adapted to be turned one space at each stroke of the cross head by the pawl 62. This pawl is omitted in Fig. 2 but shown in Fig. 1. There is one tooth for each stroke of the machine necessary to complete the cutting out of blanks from a sheet. A shoulder 63 on this wheel is in the path of the upper end of the lever arm 64 on the shaft 65. On the other end of the shaft is an arm 66 having a pin which is movable in the slot 67 in the lever 68. This lever is connected to the shaft 69 which carries an arm 70 at its inner end. This arm normally engages the shoulder 71 on the lever 72, which lever is connected to the shaft 73, and is also provided with a treadle 74. On the opposite end of this shaft is a crank arm 75 which is connected to the pivoted stop 76 by means of the link 77. A spring 78 tends to swing the stop to the left into the path of the pin 79

on the hub of the fly wheel. A hand lever 80 connected to the shaft permits the operator to stop the press at pleasure. A spring 81 is adapted to hold the arm 70 against the shoulder 71.

When the sheet has been placed on the feed table with the finger 55 in an opening *a*, (the finger 59 being released by pressing back the catch 58) the operator presses down the treadle 74 until the lug 71 engages in the notch in the end of the arm 70 as shown in Fig. 2. This moves the stop 76 out of the path of the pin 79 and the machine begins its operations. At each stroke of the cross head the pawl 62 turns the wheel 61 one step, until the shoulder 63 engages the lever arm 64, swinging back the upper end of the lever arms 66 and 68. This causes the arm 70 to swing forward, releasing the lever 72 and permitting the stop 76 to move into the path of the pin 79, stopping the machine. Should the operator desire to stop the machine at any time, he can do so by pushing back the hand lever 80 to release the lever 72.

The pin 79 is so positioned that the finger 55 will be in raised position when the press stops. This permits the waste to slide out of the machine. It will be observed that the distance between the end of the finger 55 and the adjacent punch determines the width of the waste. This finger may be duplicated if desired. This width of waste should be no more than what is necessary to hold the fragments together.

The advantage gained by inclining the table is that the sheet feeds itself down the incline. Where the rows of dies are placed diagonally to or in line with the incline, power feeds of some suitable type would be necessary. A further advantage of this inclination of the press is that the finished blanks do not fall back into the dies, but fall onto the guide plate and slip out of the machine separately from the waste.

Having now explained my improvements, what I claim as my invention and desire to secure by Letters Patent is:—

1. In a punching machine for sheet metal, the combination of an inclined table, dies mounted thereon in parallel staggered rows, punches for said dies mounted for movement at right angles to the table, and a stop for contacting with said sheet, means to move the stop out of the path of the sheet immediately after the end of each stroke of the machine.

2. In a punching machine for sheet metal, the combination of an inclined table, a stationary shearing and forming die carried by the table, a shearing and forming punch adapted for movement at right angles to said table, and an inclined plate through which the punch may pass, means to space the plate from the table the punch being adapted to carry the finished blank upward through said plate and to permit it to fall on the plate so it may slide to its proper place.

3. In a punching machine for sheet metal, the combination of an inclined table, a die carried thereby, a punch movable in a path at right angles to the table and adapted to lift the cut out blank from the same, and a plate for conveying away the blank and means to support the plate above the table to permit sheet metal to pass below the plate.

4. In a punching machine for sheet metal, the combination of an inclined table, a die carried thereby consisting of a shearing ring and forming plate, a punch movable in a path at right angles to the table and consisting of a cutting ring and a forming plate corresponding to the forming plate of the die, the punch being adapted to carry up the formed blank from the die and an inclined plate upon which the blanks may fall and slide out of the machine and means to hold the plate a distance above the table.

5. In a punching machine for sheet metal, the combination of an inclined table, a die mounted therein, a complementary punch adapted to lift the severed blanks in their upward movement, an inclined plate above the feed table and apertured for the passage of the punch, means to separate the plate and table and means for releasing the blank from the punch after being lifted above the plate.

6. A punch for sheet metal comprising a cutting ring, a forming disk within the same, a holder on which the ring and disk are mounted, said holder having air passages opening through said disk, said air passages connecting with the suction pipe of an air pump, whereby the finished blanks may be lifted when the punch recedes from the die.

7. In a punching machine for sheet metal, the combination of the die, a punch adapted to co-act with said die for the cutting out of blanks, said punch provided with air passages in which a partial vacuum may be created which vacuum shall be adapted to cause the blank to adhere to the bottom of the punch as it recedes from the die.

8. A punch for sheet metal provided with a suction hole for causing the blank to adhere to the punch so it may be lifted out of the sheet from which it was cut.

9. In a punching machine for sheet metal, the combination of a frame, an inclined table, a die mounted therein, a punch for said die mounted on said frame for movement at right angles to the table, a shaft mounted on the frame, a finger carried by the shaft normally in the path of the sheet metal, an arm on the shaft, engaging means mounted to move with the punch and engage the arm carried by the shaft to lift the finger when the punch is leaving the die.

10. In a punching machine for sheet metal, the combination of a frame, a table to support the metal sheets, a die carried by the table, a punch reciprocally mounted in the frame, a finger normally in the path of the sheet and engaging successive shoulders formed on the same, and means to move the finger out of the path of the sheet immediately after each operation of the punch.

11. In a punching machine for sheet metal comprising a punch and die, an inclined table for the sheet metal, a frame to hold the table at an inclination at which the sheet will slide down the same, a finger in the path of the sheet engaging one of successive shoulders on the same, means actuated at each operation of the punch to move the finger out of the path of the sheet sufficiently to permit it to slide, and a spring to return the finger to engage the succeeding shoulder.

12. In a punching machine for sheet metal, the combination of an inclined table, a frame for supporting the same at an angle sufficient to permit sheet metal to slide down the same, a punch for cutting blanks from the sheet, a finger extending into the path of the sheet below and in line with the punch, and means to raise the finger at each operation of the punch to permit the sheet to slide, and a spring to return the finger to engage the next succeeding shoulder formed by the punch.

13. In a punching machine for sheet metal, the combination of a frame, an inclined table carried thereby, a punch movable in a path at right angles to the table and adapted to lift the cut out blanks from the same, and a plate spaced above the line of the feed of the sheet through which the punch passes and on which the blank falls and slides away.

14. In a punching machine for sheet metal, the combination of a frame, an inclined table, a die mounted therein, a punch for said die mounted in said frame for movement to cut blanks from a sheet of metal, the inclination of the table being such that the sheet will slide down the same, and means for disengaging and reëngaging the sheet between successive strokes of the punch to position the sheet.

15. In a punching machine for sheet metal, the combination of a frame, an inclined table carried thereby, a punch movable in a path at right angles to the table, means on the punch for lifting the cut out articles therewith as it rises and to discharge them from the punch at the upper part of the movement thereof, and an apertured inclined plate spaced above the line of the feed of the sheet through which the punch passes and on which the blank falls from the punch.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

JERVIS R. HARBECK.

Witnesses:
ELIZABETH M. BROWN,
EMMA GREY HARBECK.