

April 16, 1963

R. O. PLATT ETAL

3,085,458

APPARATUS FOR MAKING TAPERED METAL BLANKS FOR KEY BRICK CASES

Filed Sept. 28, 1960

3 Sheets-Sheet 1

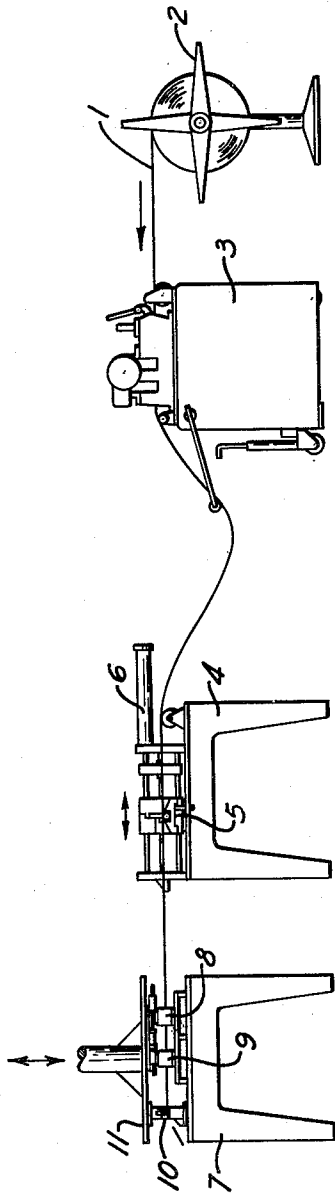


Fig. 1

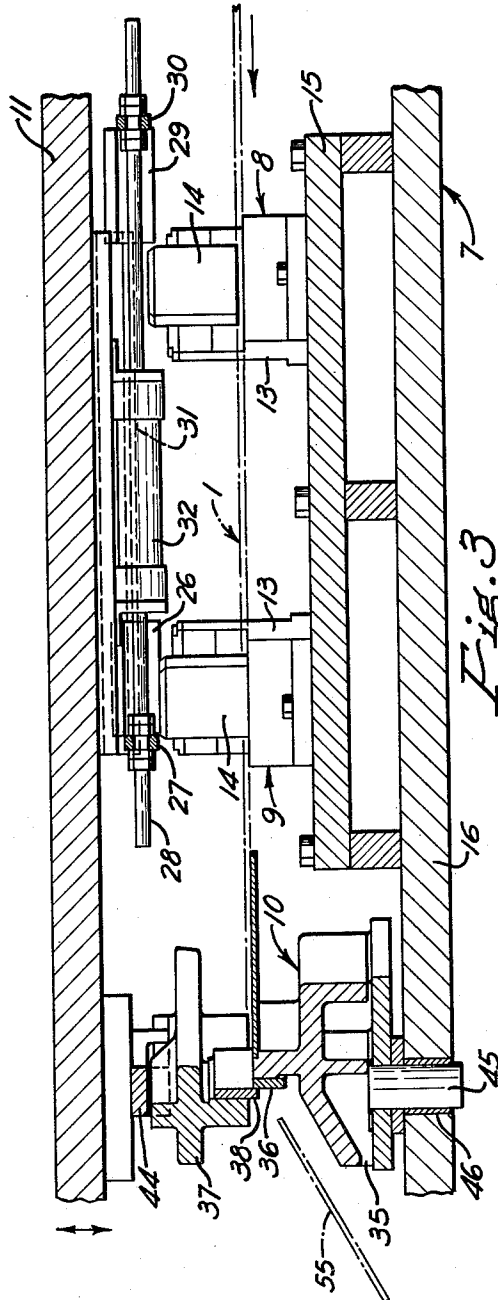


Fig. 3

INVENTORS
RICHARD O. PLATT
THOMAS W. LLOYD
BY

Brown, Critchlow, Flick & Peckham
ATTORNEYS

April 16, 1963

R. O. PLATT ET AL

3,085,458

APPARATUS FOR MAKING TAPERED METAL BLANKS FOR KEY BRICK CASES

Filed Sept. 28, 1960

3 Sheets-Sheet 2

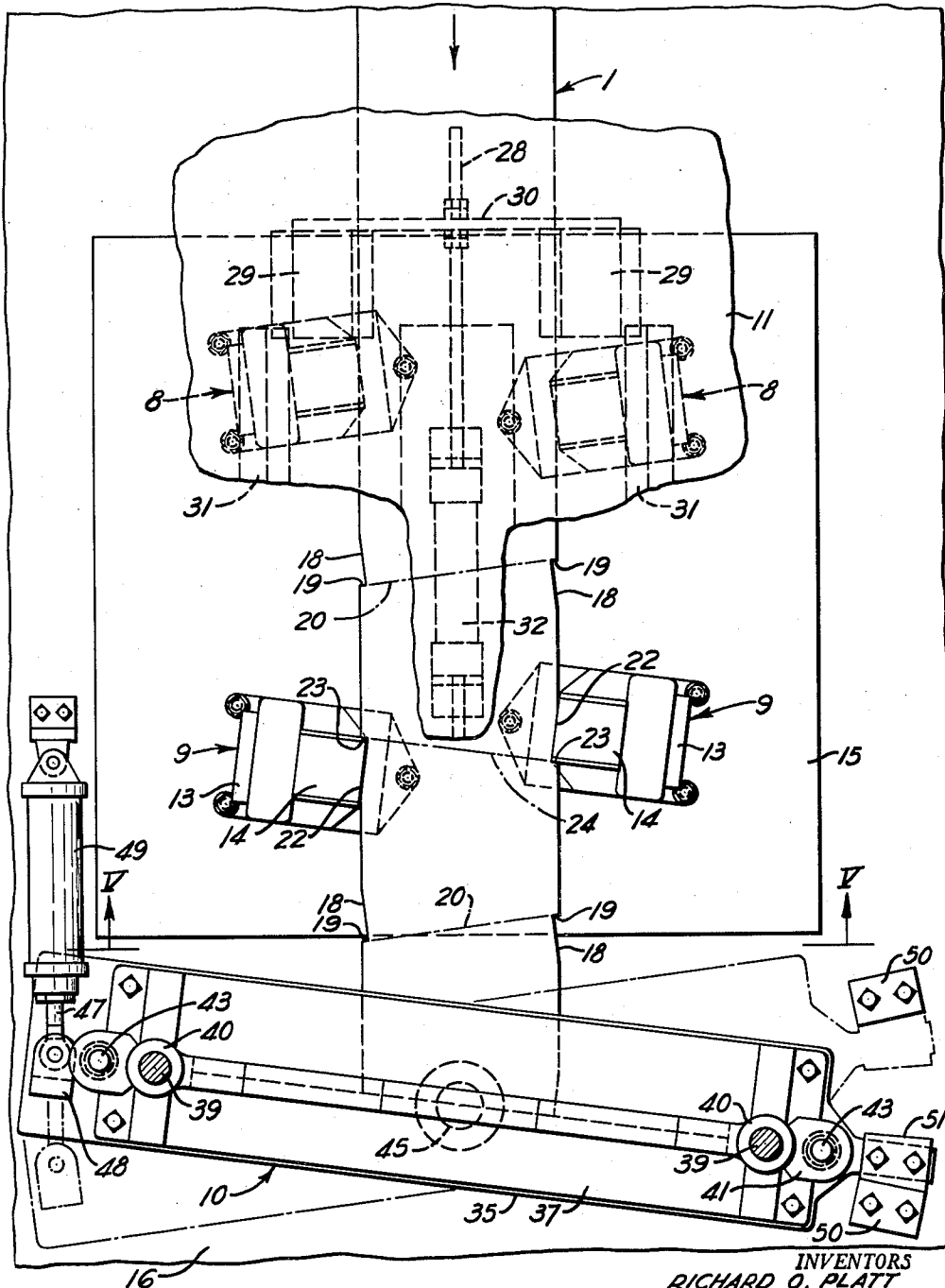


Fig. 2

INVENTORS
RICHARD O. PLATT
THOMAS W. LLOYD
BY

Brown, Critchlow, Flick & Pechman
ATTORNEYS

April 16, 1963

R. O. PLATT ETAL

3,085,458

APPARATUS FOR MAKING TAPERED METAL BLANKS FOR KEY BRICK CASES

Filed Sept. 28, 1960

3 Sheets-Sheet 3

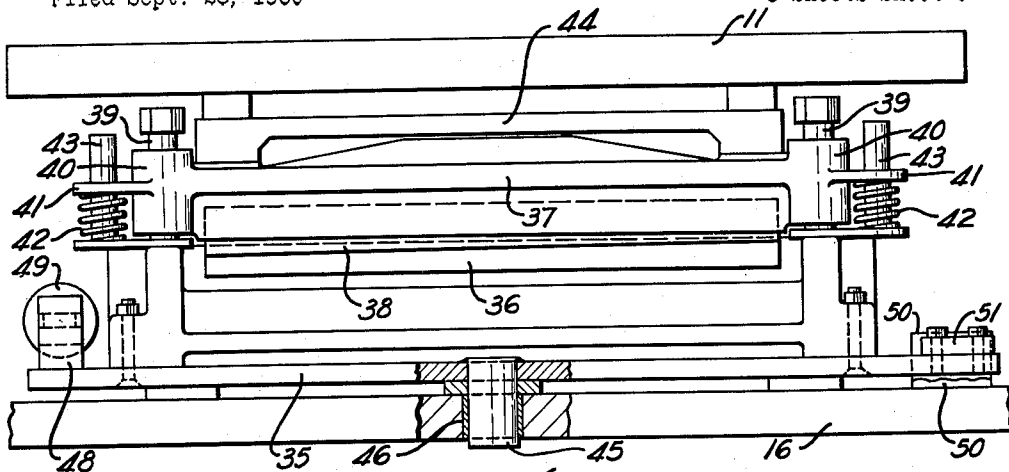


Fig. 4

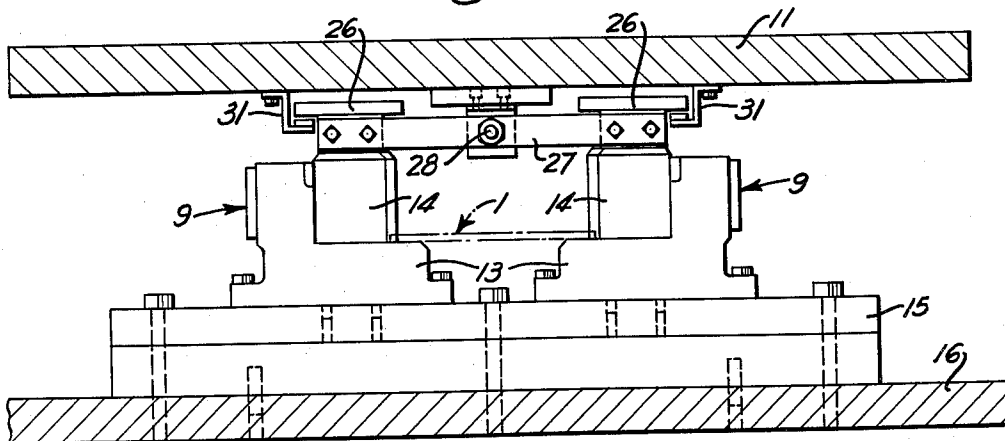


Fig. 5

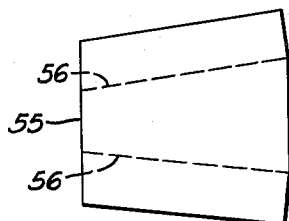


Fig. 6

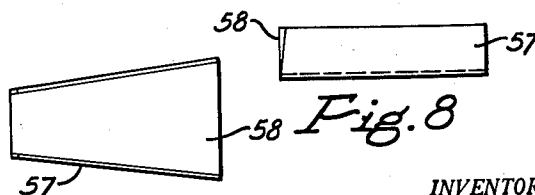


Fig. 7

Fig. 8

INVENTORS
RICHARD O. PLATT
THOMAS W. LLOYD

BY

Brown, Critchlow, Plick & Lockham
ATTORNEYS

1

3,085,458

APPARATUS FOR MAKING TAPERED METAL BLANKS FOR KEY BRICK CASES

Richard O. Platt, Bethel Park, Pa., and Thomas W. Lloyd,
Pasadena, Md., assignors to Harbison-Walker Refractor-
ies Company, a corporation of Pennsylvania
Filed Sept. 28, 1960, Ser. No. 59,040
4 Claims. (Cl. 83-240)

This invention relates to sheet metal cases for key bricks, and more particularly to apparatus for making the blanks from which the cases are formed.

Key bricks are used in the roofs of industrial furnaces and in the side walls of rotary kilns. A key brick is one that has two opposite sides converging toward one end of the brick, while its other two sides are parallel. For well known reasons, refractory bricks, including key bricks, are partly or wholly enclosed in sheet metal cases. Often such a case consists of a channel, which leaves one side of the brick and its opposite ends exposed. When a tapered metal blank is bent to provide it with side flanges of substantially uniform width that converge toward one end of the blank to form a tapered channel for a key brick, the corners of the flanges at the wide end of the channel will project beyond the corresponding end of the brick. This is because the flanges are bent up at an oblique angle to the longitudinal axis of the brick. The projecting corners of the flanges are highly undesirable. They not only interfere with storing the bricks before use, but they are a dangerous hazard because they can easily cut a workman handling the cased brick.

It is an object of this invention to provide apparatus that will form a metal blank, from which a case for a key brick can be made, that will not project from either end of the brick. Another object is to provide such apparatus, which will form the blanks rapidly from a continuous metal strip.

In accordance with this invention, a flat metal strip is fed ahead past front and rear pairs of punches that notch the opposite edges of the strip. Each punch is shaped to form a notch having a long side inclined to the adjoining edge of the strip, and a short inclined side connecting the inner end of the long side with that edge. The rear punches are positioned to form a pair of notches, offset lengthwise of the strip, having their long sides parallel but with the inner ends of those sides overlapping so that the short sides of the notches will be aligned. The front pair of punches is positioned to form a like pair of notches similarly offset, but having their parallel long sides inclined to the long sides of the notches formed by the rear pair of punches. After the strip has been notched it is cut along a line joining the short sides of a pair of notches and then along a line joining the short sides of the following pair of notches to form a blank that is tapered lengthwise and has a straight edge across its narrow end. The wide end has a central edge portion parallel to the narrow end, but, due to the notching, the end edge portions at the wide end extend at a slight angle toward the narrow end. When the blank is bent to form a tapered case, the ends of the side flanges at the wide end will lie in a plane perpendicular to the web of the channel.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

FIG. 1 is a side view of apparatus suitable for carrying out the invention;

FIG. 2 is an enlarged fragmentary plan view of the blank-forming machine, with parts broken away;

FIG. 3 is a central longitudinal section of FIG. 2;

FIG. 4 is a view of the front end of the machine with the shear in neutral position;

2

FIG. 5 is a transverse section taken on the line V—V of FIG. 2;

FIG. 6 is a plan view of a case blank made on this machine;

FIG. 7 shows the blank bent into the shape of a channel and applied to a key brick; and

FIG. 8 is a side view of the cased brick.

Referring to FIG. 1 of the drawings, a coil of strip 1 is unwound from a reel 2 and pulled through a roller lever 3, where it is straightened. The strip then enters a feeding machine 4 of well known construction, which feeds the strip forward intermittently. This is done by an automatic clamping device 5 that is reciprocated horizontally by a fluid pressure motor 6. Every time the clamping device is pushed ahead it grips the strip and pulls it forward. On the return stroke the clamping device releases the strip and moves back for a new grip. In front of the feeder is the blank-forming machine 7 that forms the subject matter of this invention and through which the strip is fed step by step by the feeder. The blank-forming machine includes punches 8 and 9 for notching the edges of the strip, a shear 10 for cutting the strip, and a vertically reciprocating plate 11 that operates the punches and shear.

There are two pairs of punches, a rear pair 8 and a front pair 9, all located behind the shear. The punches in each pair are disposed on opposite sides of the strip in positions to receive those edges. The construction of the individual punches forms no part of this invention as they are commercial items. However, as shown in FIGS. 2, 3, and 5, each punch includes a base 13 and a vertically reciprocable block-like notching member 14 that may normally be held in its upper position by coil springs (not shown). The punches are rigidly mounted on a base plate 15 secured to a table 16, but they are adjustable thereon so that blanks of different sizes can be formed. The rear punches 8 are mounted at an oblique angle to the strip, as shown in FIG. 2, so that each one will punch out a triangular piece of metal to form a two-sided notch in the strip. Each notch has a long side 18 inclined to the adjoining edge of the strip, and a much shorter inclined side 19 connecting the inner end of the long side with the same edge of the strip. The long and short sides of the notch are substantially perpendicular to each other. The two rear punches are so positioned that the long sides of the notches which they form are parallel, but they overlap each other sufficiently for their short sides to be in line along an imaginary diagonal line 20 located at a predetermined angle to the axis of the strip. Thus, the two notches formed by the rear pair of punches are offset lengthwise of the strip.

The front pair of punches 9 are designed to form a pair of notches like those formed by the rear pair of punches. Likewise, the two notches formed by the front pair of punches are similarly offset, except in the opposite direction as a result of the punches at one side of the strip being closer together than at the opposite side. Also, the long sides 22 of these notches are inclined to the long sides 18 of the notches formed by the rear punches. In other words, the two punches at each side of the strip are inclined lengthwise thereof relative to each other, the punches at one side of the strip diverging toward the strip while those at the opposite side of the strip converge toward the strip. The short sides 23 of the pair of notches formed by the front punches are aligned along an imaginary diagonal line 24 across the strip at the same angle with the strip axis as line 20. These two imaginary lines form the side boundaries of a tapered blank. Since each line is the front boundary of one blank and the rear boundary of the blank in front of it, alternate blanks taper toward opposite edges of the strip.

Although under certain conditions all of the punches could be operated simultaneously, after each pair of notches is punched the strip must be fed ahead two steps before it can be notched by the same punches again, so it is preferred that the punches be so arranged that the front and rear pairs operate alternately, with one pair punching after each step forward of the strip. The punches can be operated in various ways, but one of the simplest ways is by means of the vertically reciprocating plate 11 that covers the punches and shear. To prevent this plate from actuating all of the punches every time it descends, it is arranged so that it never touches the punches, but only filler means that are moved into and out of the spaces between the punches and the plate. When the filler means are between the front pair of punches and the reciprocating plate, those punches will be operated by the plate but the rear pair will remain idle. By removing the filler means from the front pair of punches and inserting fillers between the rear pair and the plate, the rear pair of punches will be operated.

The filler means preferably are two pairs of blocks, the front pair 26 being mounted on the opposite end of a cross bar 27 that has its central portion secured to the front end of a horizontal piston rod 28. The rear pair of blocks 29 are mounted on a cross bar 30 fastened to the rear end of the piston rod. The blocks are supported by tracks 31 attached to the bottom of the reciprocating plate 11. Rigidly mounted on the central portion of the rod is a piston (not shown) that is reciprocated in a horizontal cylinder 32 fastened to the bottom of the plate. Fluid pressure can be delivered to the opposite ends of the cylinder alternately by any suitable mechanism timed to the intermittent feed of the strip.

In the views shown in FIGS. 2 and 3, the front pair of punches are notching the strip and the rear pair are idle. On the previous downward stroke of plate 11 the rear punches notched the strip and then the strip moved ahead one step to the position shown. As soon as the plate rises and permits the front punches to rise, the strip will be fed ahead again a distance equal to the central width of the tapered blanks that are to be formed. At the same time, piston rod 28 will be moved ahead to remove the front blocks 26 from above the front punches and to simultaneously move the rear blocks 29 into positions above the rear punches, so that when the plate descends again only the rear punches will notch the strip.

The strip, notched by all four punches, moves forward through the shear a blank width at a time. As shown in FIGS. 2, 3 and 5, the shear frame includes a base 35 provided with a lower blade 36, and a head 37 that carries an upper blade 38. The base has studs 39 at its opposite ends extending up through bushings 40 on the opposite ends of the head. Projecting from the bushings are lugs 41 that rest on coil springs 42 encircling pins 43 projecting upward from the base. The head of the shear is pressed down periodically by a bar 44 mounted on the bottom of the reciprocating plate 11, and the blades of the shear are separated by the coil springs when the bar rises. The center of the shear base is mounted on a short pin 45 that is journaled in a bearing 46 in the table 16, so that the entire shear frame can swing back and forth in a horizontal plan. The bearing is midway between the opposite edges of the strip. The shear is oscillated by a piston rod 47 that is pivotally connected to a bracket 48 fastened to one end of the shear base. The piston rod extends into a cylinder 49, as shown in FIG. 2, where there is a piston (not shown), and the cylinder is pivotally connected to the table. The distance that the shear can be swung can be controlled by adjustable stops 50 secured to the table and against which a stop 51 on the adjacent end of the shear strikes.

The reason for oscillating the shear is to permit the strip to be cut at oblique angles in opposite directions along lines 20 and 24 so that the tapered blanks can be

formed. Piston rod 47 is pulled back into cylinder 49 to swing the shear into the position shown in FIG. 2 for cutting on lines 24. The shear is swung in the opposite direction to cut along lines 20. The shear is swung every time the strip is fed ahead, and the shear is operated every time plate 11 descends. Consequently, one set of punches and the shear are operated each time the strip comes to rest after having been fed ahead the width of one blank as measured along the center line of the strip. The finished blanks fall from the front of the shear and look like blank 55 in FIG. 6. The blank can be bent along lines 56 to form a tapered channel or case 57 as indicated in FIGS. 7 and 8 for receiving a key brick 58. The size and angle of the notches that are formed in the strip are so calculated that the ends of the case flanges at the wide end of the case will lie in a plane perpendicular to the base or web of the case. In other words, those flange ends will be at right angles to the longitudinal edges of the flanges.

According to the provisions of the patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. Apparatus for making longitudinally tapered metal blanks adapted to be bent to form channel-like cases for key bricks, said apparatus comprising means for feeding a flat metal strip ahead intermittently, a front and a rear pair of punches spaced longitudinally of the direction of strip feed for notching the opposite edges of the strip, a shear in front of the punches for cutting the notched strip transversely at oblique angles to its length, each punch being shaped to form a notch having a long side inclined to the adjoining edge of the strip and a short inclined side connecting the inner end of the long side with said edge and being substantially perpendicular to said long side, the rear pair of punches being positioned to form a pair of notches, one in each side edge of the strip, having their long sides parallel and the inner ends of those sides overlapping and their short sides aligned so that the two notches will be offset lengthwise of the strip, means to actuate the rear pair of punches to form said notches during a dwell in the intermittent strip feed, the front pair of punches being positioned to form a like pair of notches spaced from the notches formed by the rear pair and similarly offset but having their parallel long sides inclined to the long sides of the notches formed by the rear pair of punches, means to actuate said front pair of punches during a dwell in the intermittent strip feed, and means for swinging the transverse shear about an axis substantially perpendicular to the strip first in one direction and then in the opposite direction, means to actuate said shear subsequent to each swinging motion and during a dwell of the intermittent strip feed to cut along a line joining the short sides of each pair of notches, whereby the wide end of each tapered blank thus formed will have an edge with a straight central portion connecting the outer ends of the inclined long sides of two of said notches.

2. Apparatus according to claim 1, in which said shear includes a frame, means pivotally mounting the frame at the center of the path of movement of the strip, a pair of blades mounted in the frame, fluid pressure means connected with one end of said frame for swinging it from one strip-cutting position to another, and adjustable stops for engagement by the opposite end of the frame to limit said swinging.

3. Apparatus according to claim 1, in which said punch-actuating means operate alternately, and said shear-actuating means operates every time a pair of said punches is actuated.

4. Apparatus according to claim 1, in which said front and rear punch-actuating means include a reciprocating member movable toward and away from said punches in the direction of their movement but always spaced from them, filler means adapted to be pushed against the punches by said reciprocating member to actuate them, and means for removing said filler means from between said member and first one pair of punches and then the other pair alternately, said reciprocating member also serving as said shear-actuating means to actuate the shear every time said member moves toward the punches.

5

10

References Cited in the file of this patent

UNITED STATES PATENTS

566,054	Bonsack	Aug. 18, 1896
874,515	Lorenz	Dec. 24, 1907
1,640,466	Ohlsson	Aug. 30, 1927
1,880,935	Elliot	Oct. 4, 1932
1,882,451	Sherman	Oct. 11, 1932
2,219,908	Ryan	Oct. 29, 1940
2,576,328	Allison	Nov. 27, 1951
2,767,789	Budlong	Oct. 23, 1956
2,920,521	Abbenante	Jan. 12, 1960