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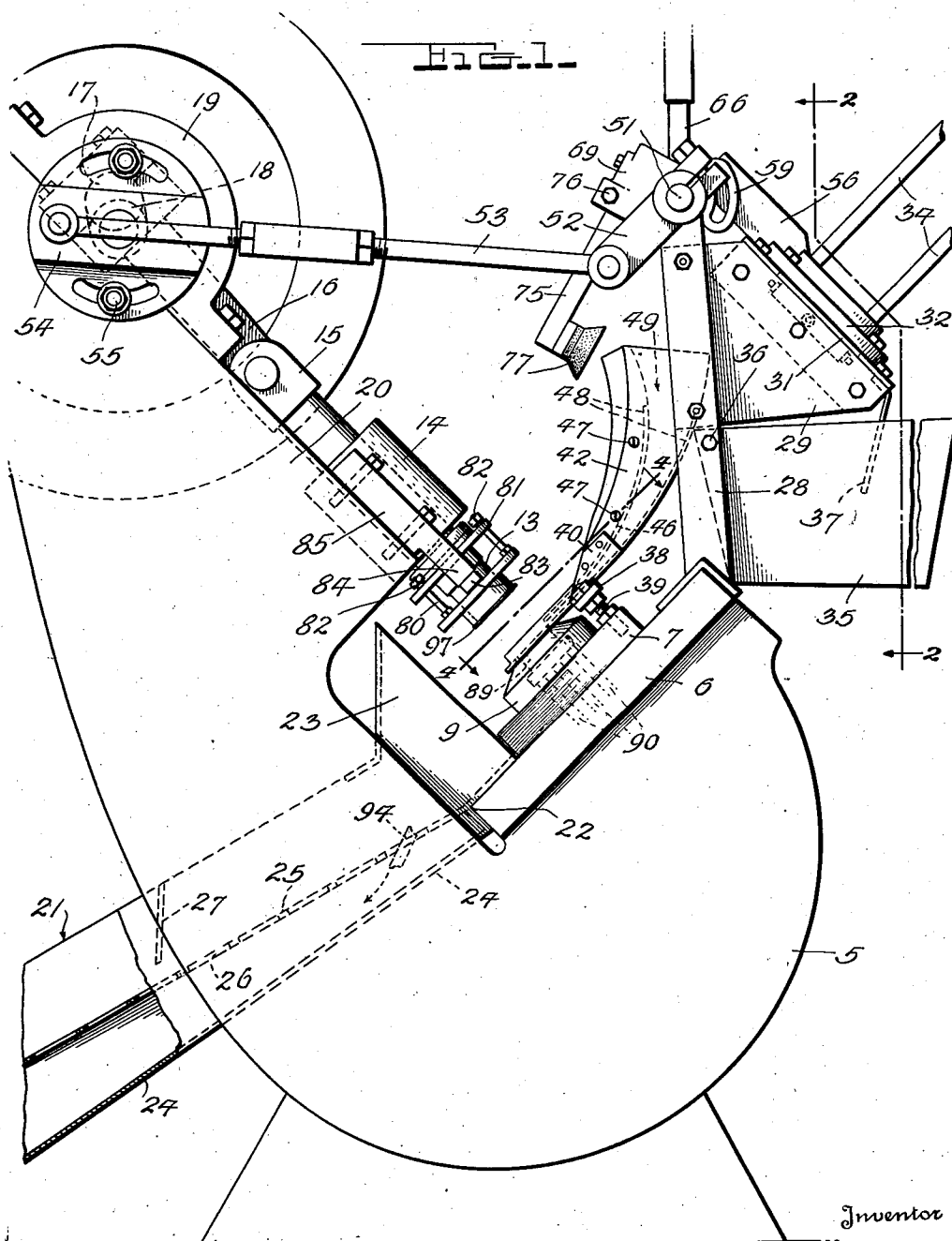
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2,391,304

BLANK FEEDING APPARATUS

Filed Nov. 24, 1944

5 Sheets-Sheet 1



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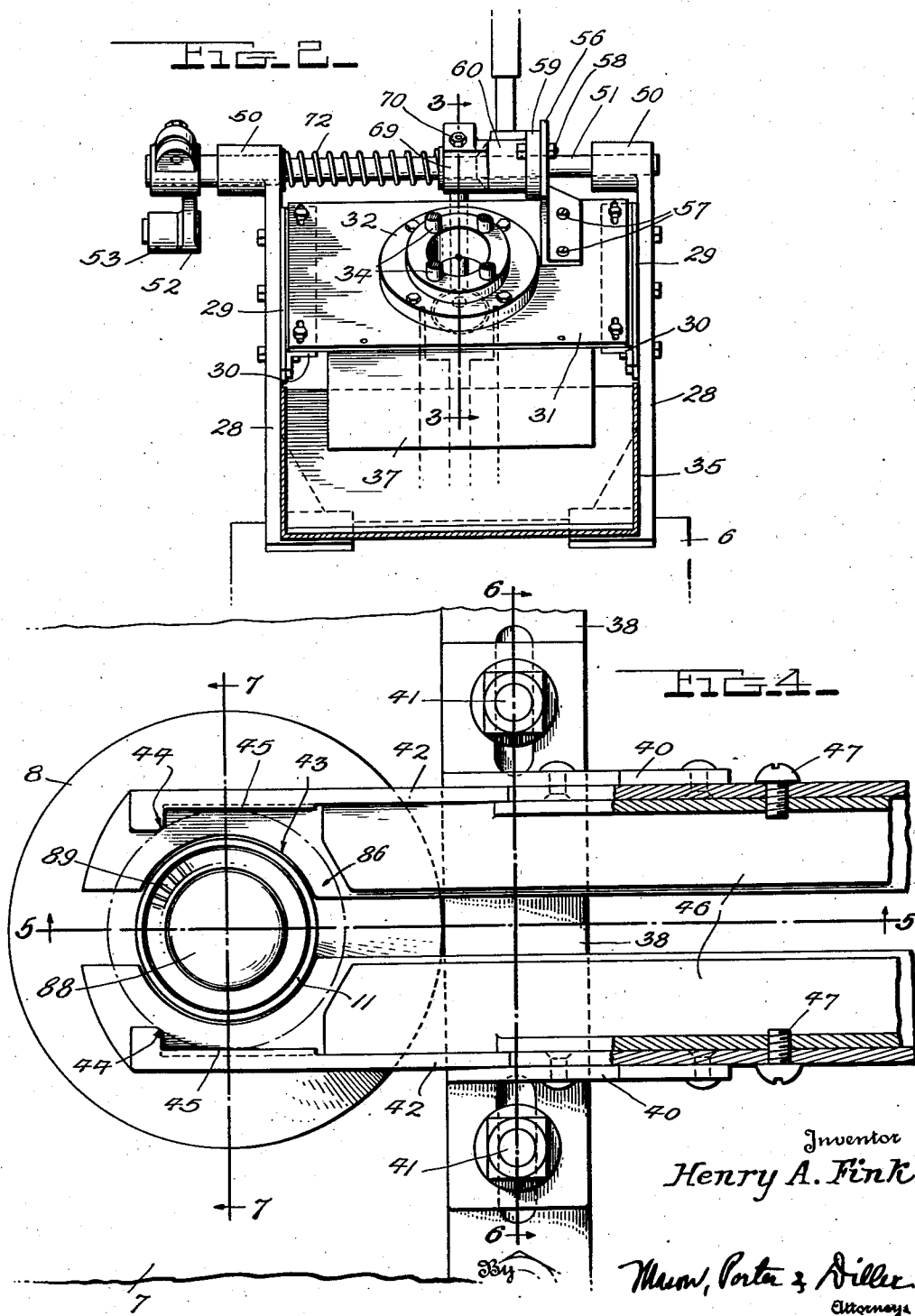
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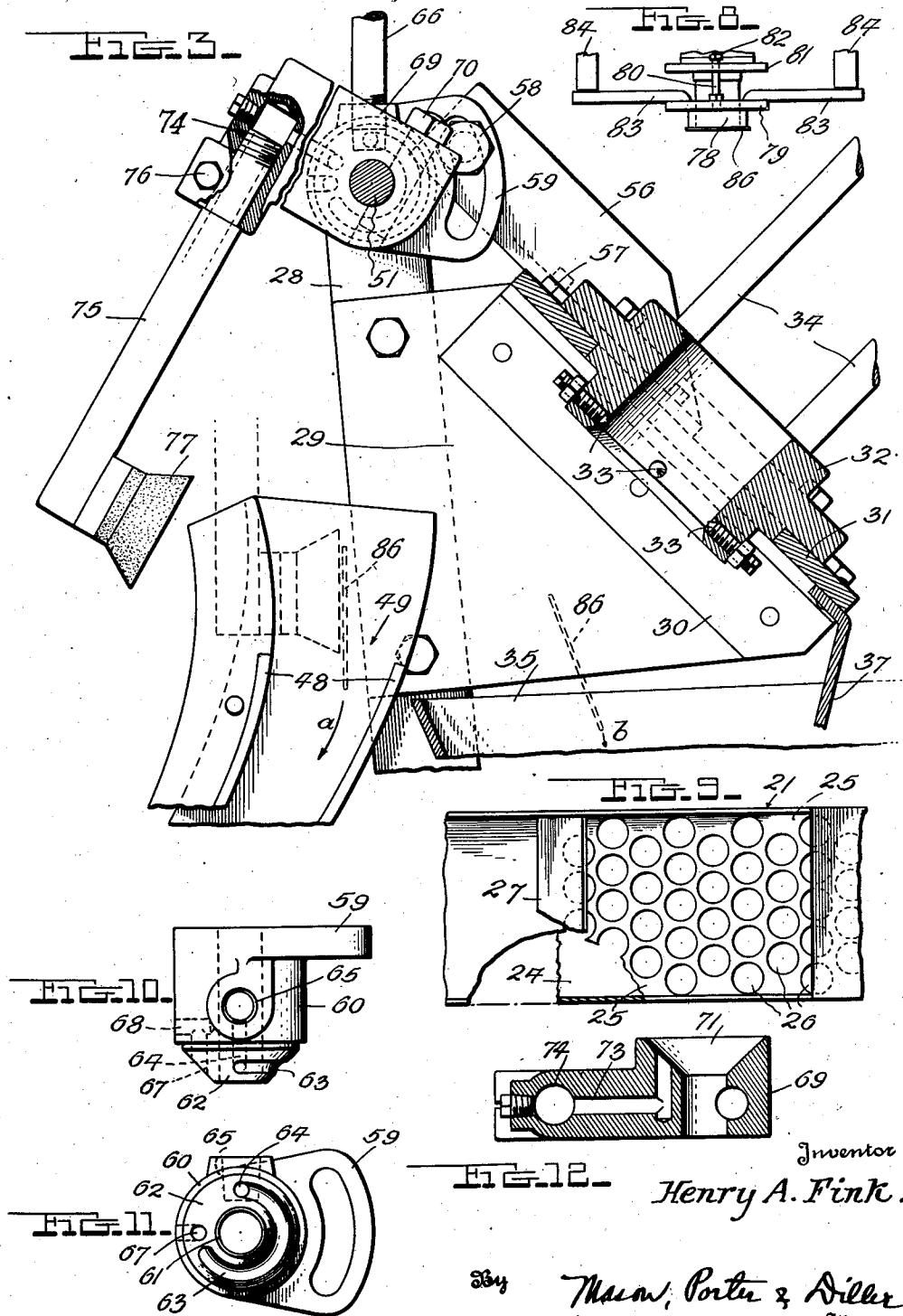
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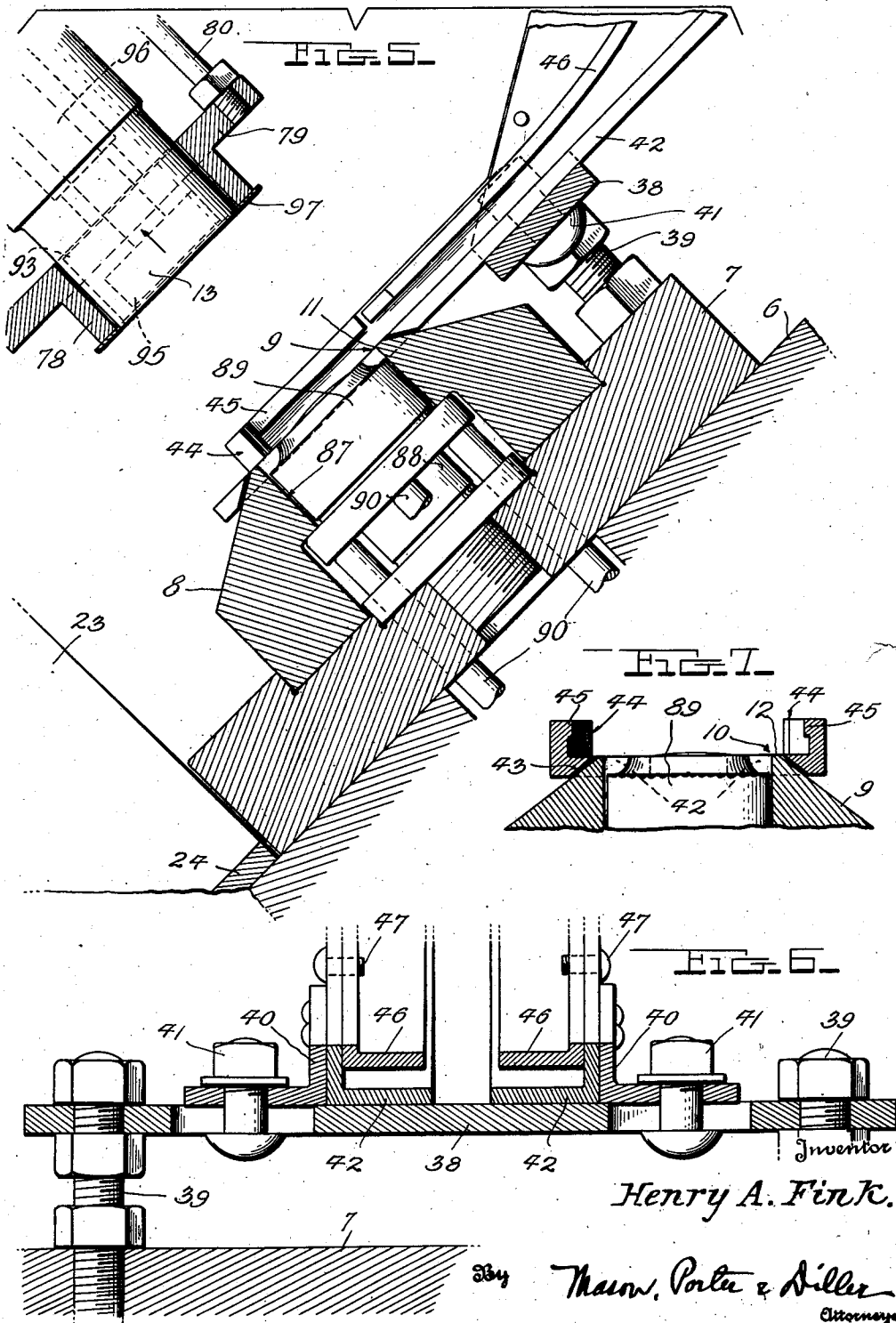
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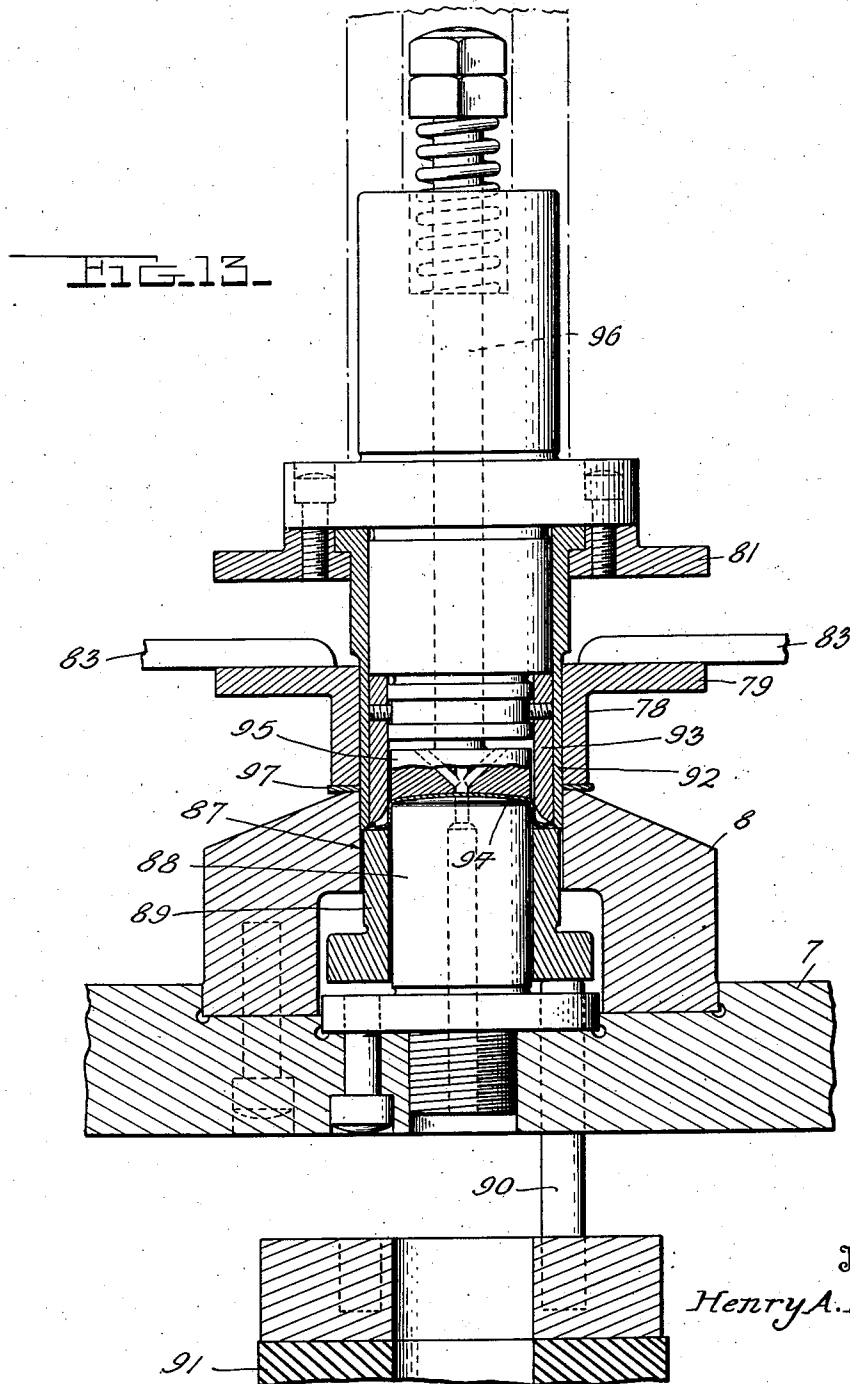
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BLANK FEEDING APPARATUS

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

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BLANK FEEDING APPARATUS

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12 Claims. (Cl. 164—88)

The invention relates generally to work feeders, and more particularly to work feeders adapted to feed blanks to a punch press, and it primarily seeks to provide a novel work feeding apparatus in which is provided means for preventing the feeding of superposed blanks into position between the cooperating punch and die, and means for directing the punched elements and the scrap away from the punching station in the same general direction over distinct conveying means.

While the invention is adaptable to more general uses, it is particularly designed for use in punch presses in which crown caps are punched and formed from individual larger circular blanks. According to the invention, the blanks are fed one by one from a stack by a reciprocating suction cup, means are included for directing the circular blanks to the punching station and for holding them in proper alignment at said station, and means are included for so feeding the circular blanks that whenever the suction cup pulls two circular blanks from the stock instead of the intended single blank, the extra blank will be caused to fall by gravity into a receiving trough so that only the individual blank actually attached to the suction cup will be fed into position over the die.

It is an object of the invention to provide a blank feeding suction cup which is reciprocated, and a collecting trough and a feed chute arranged in spaced relation under the path of travel of the suction cup and in such position that a second blank pulling away from the stack with the blank attached by suction to the cup will fall by gravity into the collecting trough, whereas the suction attached individual blank will be moved by the suction cup into position over the delivery chute and there dropped to be properly placed by the chute over the die.

Another object of the invention is to provide a feed-away chute equipment including an inclined bottom, and a scrap floor spaced above the bottom onto which scrap falls from the punch and onto which punched elements are delivered through the die, said scrap floor being provided with apertures large enough for the punched elements to fall therethrough onto the bottom but so small as to prevent falling through of scrap, thereby to retain the scrap on the scrap floor and assure that the punched elements will be delivered over the chute bottom and the circular scrap pieces delivered over the scrap floor.

Another object of the invention is to provide in an apparatus of the character stated, a circular blank placing chute having provision for properly aligning the circular blanks with the die

and including overhanging shoulder equipments effective to prevent upward bouncing and displacement of blanks at the punching station.

Another object of the invention is to provide in an apparatus of the character stated, a swingably mounted suction cup which swings over the spaced blank collecting trough and the blank delivering or placing chute, said cup being mounted on an arm secured to a rock shaft which is rockable in a stationarily mounted valve member and which includes a valve member movably engageable with the stationary valve member and cooperating therewith in controlling the suction in the cup so as to properly release blanks over said blank delivering and placing chute.

Another object of the invention is to provide in an apparatus of the character stated a novel scrap ring stripping means including a stripper sleeve slidably surrounding the punch and having lost-motion connection with the punch, and stop means engageable by said sleeve on the upward movement of the punch and effective to move the sleeve toward the end of the punch for stripping therefrom the scrap rings which are frictionally retained on the punch after punching operation.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims, and the several views illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a side elevation illustrating a punch press embodying the invention, parts being broken away and in section.

Figure 2 is an enlarged fragmentary vertical cross section taken on the line 2—2 on Figure 1.

Figure 3 is an enlarged fragmentary vertical cross section taken on the line 3—3 on Figure 2.

Figure 4 is an enlarged fragmentary horizontal section taken on the line 4—4 on Figure 1.

Figure 5 is an enlarged fragmentary vertical cross section taken on the line 5—5 on Figure 4.

Figure 6 is an enlarged fragmentary vertical cross section taken on the line 6—6 on Figure 4.

Figure 7 is an enlarged fragmentary vertical cross section taken on the line 7—7 on Figure 4.

Figure 8 is a fragmentary front elevation illustrating the scrap stripping sleeve and its mounting.

Figure 9 is a fragmentary plan view illustrating the punched element and scrap ring delivery chute structure, parts being broken away and in section.

Figure 10 is a detail plan view of the stationarily mounted valve member.

Figure 11 is a detail end elevation of the valve member illustrated in Figure 10.

Figure 12 is a detail cross section illustrating the valve member to which the suction cup carrying arm is attached.

Figure 13 is an enlarged fragmentary vertical longitudinal section of the parts shown in Figure 6, a crown cap being shown in the process of formation.

In the example of embodiment of the invention herein disclosed, the novel apparatus is illustrated as incorporated in a punching and forming press including a frame 5 whereon is supported the usual bed 6. The bed 6 supports a die block 7, and said block in turn supports the circular die 8 having a cutting edge 9 defining a punch receiving opening 10 which is surrounded by a flat shoulder 11. The die 8 also has a center clearance in which is mounted a center block and a ring member serving as a draw ring and a stripper member, and these parts will be described in greater detail hereinafter.

The reciprocable cutting and forming punch generally designated 13 which cooperates with the die 8 is guided as at 14 on the frame and depends from a cross head 15 which is pitman connected as at 16 to the crank 17 of a crank shaft 18 which is rotatably mounted in bearings 19 provided on the frame side arm extensions 20.

A punched element and scrap ring delivery chute structure generally designated 21 is supported as at 22 on the bed 6 and has its receiving throat 23 disposed to receive scrap rings and punched elements or crown cap blanks from above the die 8.

The chute structure 21 includes an inclined bottom 24 and a floor 25 spaced above said bottom and apertured as at 26. The apertures 26 are large enough to permit punched elements to fall therethrough but are small enough to prevent passage therethrough of the scrap rings received from above the die 8. See Figures 1 and 9. An inclined baffle wall 37 serves to knock down any punched elements or scrap rings which might tend to roll down the apertured floor 25 and cause them to slide flatwise.

A pair of frame standards 28 are suitably supported in spaced relation upon the bed 6. See Figures 1, 2 and 3. A bracket plate 29 is secured to each standard 28, and to each bracket plate is secured an angle member 30. The angle members 30 serve as a support for an apertured plate 31 and the plate in turn supports a blank stack ring 32 having adjustable keepers or supports 33 thereon effective to support a stack of circular blanks and yet permit suction cup withdrawal of said blanks, one by one, from the bottom of said stack. The usual stack posts 34 are provided and extend upwardly from the stack ring 32 so as to support and confine a relatively large stack of circular blanks.

A receiving trough 35 is secured as at 36 between the standards 28 and beneath the stack ring 32, and a guard plate 37 depends from the support plate 31 into said trough in position for cooperating with the bracket plates 29 in assuring against bouncing of blanks out of said trough.

A support bar 38 is adjustably secured as at 39 on the die block 7, and a pair of mounting angles 40 are laterally-adjustably secured on the bar as at 41. The mounting angles 40 have secured thereto a pair of laterally spaced L-shaped tracks or runners 42 which are shaped at their

under surfaces and adjacent their ends as at 43 to embrace the upper surface of the die 9 with their top surfaces on a level with the flat shoulder 12 of said die in the manner clearly illustrated in Figures 4, 5 and 7 of the drawings. At the position of the die the tracks or runners 42 are provided with circular blank centering stops 44 and overhanging shoulders 45, the former tending to perfectly align each blank delivered at the punching station in the manner indicated by the dot and dash lines in Figure 4, and the latter tending to prevent upward bouncing and displacement of said blanks at the punching station.

Upper, spaced L-shaped guard rails 46 are secured as at 47 to the tracks or runners 42 and closely overlie said members 42 near the die in the manner clearly illustrated in Figure 6, but are spaced a considerable distance from the members 42 at their other ends as at 48, thereby to provide a wide receiving pocket 49 at the receiving end of the circular blank placing chute structure formed by the members 42 and 46 and cause said chute structure to converge toward the circular blank delivery point at the punching station. See Figures 3, 5 and 6.

At its upper end each standard 28 is provided with a bearing 50, and a shaft 51 is rockably mounted in the bearings 50 and has a crank 52 secured thereon. See Figures 1 and 2. It will be apparent by reference to Figure 1 of the drawings that the crank 52 is pitman connected as at 53 to a crank disc 54 which is adjustably secured as at 55 to the crankshaft 18, thereby to cause the shaft 51 to be rocked in timed relation to the reciprocation of the punch 13.

A bracket 56 is secured as at 57 on the support plate 31, and said bracket is provided with an anchor bolt 58 at its free end, said bolt being adapted to anchor the arcuately slotted extension 59 on the valve member 60 having a bore 61 surrounding the rock shaft 51. The valve member 60 is provided with a coniform end 62, and it will be apparent by reference to Figures 10 and 11 that said end is equipped with an arcuate recess 63. The valve member recess 63 is connected at one end to a suction duct 64 which leads into a bore 65 in the valve member 60. A pipe 66 connected with a suitable suction source (not shown) is secured in the valve member bore 65. The coniform valve member surface 62 also is provided with a relief port 67 which is connected to atmosphere through the duct 68 formed in said valve member.

A valve head 69 is secured as at 70 on the rock shaft 51 and includes a coniform end recess 71 which is held in tight contact with the coniform end 62 of the valve member 60 by a compression spring 72 which surrounds the shaft 51 between the valve head 69 and the adjacent standard bearing 50 in the manner clearly illustrated in Figure 2. It will be apparent by reference to Figures 3 and 12 that the valve head 69 is provided with a suction duct 73 which communicates between the coniform end recess 71 and a bore 74. A hollow suction arm 75 is secured as at 76 in the bore 74, and said arm carries a suction cup 77 at its free end. See Figures 1, 2 and 3.

Each time the arm is swung from the position illustrated in full lines in Figure 3 to a position in which the suction cup 77 will engage the lowermost circular blank of the stack supported on the adjustable keepers 33, the valve head duct 73 will communicate with the arcuate recess 63 in the end of the valve member 60 so as to render said cup active and cause it to attach itself to the

lowermost circular blank in the stack and pull the same away from the stack as the arm starts its movement back to the position illustrated in full lines in Figure 3. As the suction arm 75 approaches the dotted line position illustrated in Figure 3 the valve head duct 73 will move out of communication with the arcuate recess 63 so as to cut off the suction communication and will move into communication with the relief port 67 as it reaches said dotted line position, thereby releasing the suction held circular blank and permitting it to drop as indicated by the arrow *a* into the wide mouth 49 of the blank delivering and placing chute. Whenever two circular blanks are pulled by the suction cup 77 from the bottom of the stack, the delivery and placement chute and the receiving trough 35 are so placed that the second or superposed blank will fall by gravity into said trough in the manner indicated by the arrow *b* in Figure 3, thereby assuring that blanks will not be placed in superposed relation on the die 8. It will be obvious that the action of gravity in causing said second blank to fall into the receiving trough 35 will be augmented by centrifugal force as a result of the swinging movement of the suction arm 75.

As the individual circular blank falls through the placing chute and reaches the punching station it will come against the centering stops 44 and be accurately centered over the die in the manner indicated by dot and dash lines in Figure 4. The overhanging shoulders 45 will be effective to prevent upward bouncing and displacement of the blanks as they are centered by contact with the stops 44.

A stripper sleeve 78 surrounds the cutting and forming punch generally designated 13 at its lower end, and said sleeve is provided with an outwardly extended flange 79 having bolts 80 secured thereto and upstanding therefrom. The bolts 80 pass freely through apertures in a flange 81 secured to the punch, and the bolts are provided with stop heads 82 disposed above the flange 81, thereby to provide for a limited amount of free movement of the stripper sleeve 78 on the end of said punch. The stop heads 82 are so placed that they limit downward movement of the sleeve 78 so that when the punch is lifted out of contact with the die the lower end of the stripper sleeve will be disposed at or just slightly below the lower end of the punch 13. See Figures 1, 5 and 8.

Arms 83 extend laterally from the stripper sleeve 78 and are engageable on the upstroke of the punch with stops 84 fixedly secured as at 85 on the frame.

While it will be obvious that the present invention may be employed in punching small circular discs from larger circular discs or blanks, the small discs to be formed into crown caps or other articles by a subsequent operation, it is preferred that there be incorporated in the punch and die equipments means for simultaneously forming crown caps as the cap discs are punched from the blanks 86 fed into position over the die 8 as indicated in dot and dash lines on Figure 4. Thus the die 8 is equipped with a center clearance 87 in which is fixedly mounted a center block or anvil 88 surrounded by a draw-ring or stripper member 89 as indicated in Figure 13. The member 89 is normally held elevated with its upper surface approximately at the level of the die surface 11 by a plurality of rods 90 projecting upwardly from a ring engaged at its under sur-

face by a yieldable support such as a rubber ring 91 or spring means.

The cutting and forming punch hereinabove generally designated 13 includes a cutter sleeve 92 for cooperating with the cutting edge 9 of the die 8, a forming ring 93 fixedly mounted within said sleeve, and a knockout pad 95 carried at the lower end of a spring lifted rod 96.

Each time the cutting and forming punch generally designated 13 descends during proper operation of the apparatus, the cutter sleeve 92 thereof will engage a circular blank 89 aligned over the die 8 in the manner indicated in dot and dash lines in Figure 4 and will pass through said blank and into the die 8 cutting out the central portion of said blank and leaving a scrap ring 97 on the surface 11 of the die. The punched central portion of the blank will be shaped over the center block or anvil 88 by the pad 95 and the ring 93 so as to form a crown cap 94. As the punch is withdrawn upwardly the stripper ring 89 will be moved upwardly to force the formed crown cap out of the die so that it will fall upon the apertured floor 25 and pass through an aperture therein onto the delivery chute floor or bottom 24 in the manner indicated in dotted lines in Figure 1. Should the formed crown cap tend to stick in the forming ring 93, the rod 96 will strip the same by engagement of the upper end thereof with a suitable fixed abutment (not shown) supported on the press frame structure.

The scrap ring 97 formed by the passing of the cutter sleeve 92 through the blank 86 will frictionally hug the sleeve 92 and move with the same on its upstroke. It will be obvious that as the sleeve 92 passes into the opening 10 in the die 8 the stripper sleeve 78 will be intercepted and held against movement by the die shoulder 11, and upon retraction of the punch will be held above the end of the punch sleeve 92 by the scrap ring 97 in the manner clearly illustrated in Figure 5. As the upward movement of the punch continues the stripper sleeve arms 83 will engage the fixed stops 84 in a manner for arresting upward movement of the stripper sleeve 78. By thus arresting upward movement of the stripper sleeve 78 while the upward movement of the punch continues, the scrap ring 97 will be stripped from the end of the punch and allowed to fall by gravity through the receiving throat 23 of the chute structure 21 onto the floor 25 which will deliver it to a take-away conveyor or a suitable collecting means. Obviously the bottom 24 of the chute structure also may deliver the formed crown caps 94 onto a take-off conveyor or into a suitable collecting receptacle.

While one form of the invention has been shown for purposes of illustration, it is to be clearly understood that various changes in the details of construction and arrangement of parts may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In apparatus of the character described, a blank stack, a suction cup movable to and from said stack to withdraw blanks one by one therefrom and swingingly actuated to effect a centrifugal force on any second blank inadvertently withdrawn, a collector trough and a delivery means arranged in spaced relation under the path of movement of said cup so that during movement of the cup a blank attached to the cup by suction and withdrawn from the stack will be moved over the trough to a position above the

delivery means and any second blank withdrawn from the stack with said suction attached blank will fall by combined action of gravity and centrifugal force into said trough before reaching the position of said delivery means, and suction control means rendering the cup active to attach itself to blanks at the stack and while moving from the stack to the delivery means and for relieving the suction over the delivery means to cause the suction attached blank to fall by action of gravity onto said delivery means.

2. Apparatus as defined in claim 1 in which the delivery means comprises an inclined chute having a large receiving mouth and converging guide track portions for guiding delivery of the individually fed blanks.

3. Apparatus as defined in claim 1 in which there is included a die and a cooperating reciprocating punch into position between which the delivery means places blanks removed from the stack by the suction cup, and means for operating the punch and the suction cup in synchronism, and in which the delivery means comprises a chute having stop shoulders at its delivery end disposed to accurately align blanks with the die, and overhanging shoulder portions at the position of the die tending to prevent displacement of the blanks by bouncing.

4. Apparatus as defined in claim 1 in which there is included a die and a cooperating reciprocating punch into position between which the delivery means places blanks removed from the stack by the suction cup, and means for operating the punch and the suction cup in synchronism, and in which the delivery means comprises a chute having stop shoulders at its delivery end disposed to accurately align blanks with the die, and in which there is included a delivery chute for delivering punched elements and scrap, and said last named chute including an inclined bottom and an inclined floor spaced above the bottom in position for receiving scrap and punched elements and having apertures therein for passing the punched elements onto the bottom to thereby separate them from the scrap.

5. In apparatus of the character described, a blank stack, an oscillatable hollow arm having a suction cup at its free end disposed to move in an arc to and from said stack to withdraw blanks one by one therefrom, a collector trough and a delivery means arranged in spaced relation under the path of movement of said cup so that during movement of the cup a blank attached to the cup by suction and withdrawn from the stack will be moved over the trough to a position above the delivery means and any second blank withdrawn from the stack with said suction attached blank will fall by action of gravity and centrifugal force into said trough before reaching the position of said delivery means, and suction control means rendering the cup active to attach itself to blanks at the stack and while moving from the stack to the delivery means and for relieving the suction over the delivery means to cause the suction attached blank to fall by action of gravity onto said delivery means.

6. Apparatus as defined in claim 5 in which there is included a die and a cooperating reciprocating punch into position between which the delivery means places blanks removed from the stack by the suction cup, and means for operating the punch and the suction cup in synchronism, and in which the delivery means comprises a chute having stop shoulders at its delivery end disposed to accurately align blanks with the die,

and overhanging shoulder portions at the position of the die tending to prevent displacement of the blanks by bouncing.

7. Apparatus as defined in claim 5 in which the suction control means includes a stationary valve member having an arcuate clearance connected with a suction source, and a valve member movable with the suction cup carrying arm and having a duct therein disposed to communicate between the hollow of the arm and said arcuate clearance during oscillation of the arm and to move out of communication with said arcuate clearance and into communication with atmosphere as the suction cup comes into position over the delivery means thereby to release a suction attached blank from the cup and permit it to fall to said delivery means.

8. Apparatus as defined in claim 5 in which there is included a die and a cooperating punch, crank and pitman means for operating the punch into position between which the delivery means places blanks removed from the stack by the suction cup, said cup carrying arm being fixed on a rock shaft crank and pitman connected to the punch operating crank shaft to operate in synchronism with the punch, and in which the suction control means includes a stationary valve member and a second valve member rockable with the rock shaft, said valve members having complementary endwise engaging coniform faces the stationary one of which is provided with an arcuate clearance connected with a suction source and the movable one of which has a duct extending therethrough communicating with the hollow of the arm and disposed to communicate between the hollow of the arm and said arcuate clearance during oscillation of the arm and to move out of communication with said arcuate clearance and into communication with atmosphere as the suction cup comes into position over the delivery means thereby to release a suction attached blank from the cup and permit it to fall to said delivery means.

9. In apparatus of the character described, a die, a reciprocable punch cooperating with said die, and a delivery chute for delivering blanks into position between the punch and die, said chute comprising a pair of laterally spaced L-shaped tracks arranged at least in part on an incline and having at their delivery ends stop shoulders effective to engage blanks sliding over said tracks to stop movement thereof and center them over said die.

10. In apparatus of the character described, a die, a reciprocable punch cooperating with said die, and a delivery chute for delivering blanks into position between the punch and die, said chute comprising a pair of laterally spaced L-shaped tracks arranged at least in part on an incline and having at their delivery ends stop shoulders effective to engage blanks sliding over said tracks to stop movement thereof and center them over said die, and overhanging shoulders effective to tend to prevent upward displacement of the blanks by bouncing as they come against said stop shoulders.

11. In apparatus of the character described, a die, a reciprocable punch cooperating with said die, a delivery chute for delivering blanks into position between the punch and die, said chute comprising a pair of laterally spaced L-shaped tracks arranged at least in part on an incline and having at their delivery ends stop shoulders effective to engage blanks sliding over said tracks to stop movement thereof and center them over

said die, and an L-shaped guard rail attached to and spaced above each L-shaped track for guiding blanks moving over the L-shaped tracks toward the die, each said guard rail diverging away from the track with which it cooperates in the direction extending away from the die thereby to provide a wide receiving mouth at the end of the chute remote from the die, and means for dropping blanks one by one into said mouth.

12. In apparatus of the character described, a die, a reciprocable punch cooperating with said die, a delivery chute for delivering circular blanks into position between the punch and die, said chute comprising a pair of laterally spaced L-shaped tracks arranged at least in part on an

incline and having at their delivery ends stop shoulders effective to engage blanks sliding over said tracks to stop movement thereof and center them over said die, a stripper sleeve mounted for a limited amount of sliding movement on the punch and disposed to normally gravitate at least to the bottom of the punch, and stop means engageable with the sleeve on upward movement of the punch when the sleeve is held above the punch end by a scrap ring hugging the same after a punching operation for forcing the sleeve downwardly and effecting a stripping off of said ring from the punch.

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