Nov. 17, 1953 F. E. COSTELLO 2,659,263

AMMUNITION DECLIPPING MACHINE

Filed Aug. 17, 1950 5 Sheets-Sheet 1

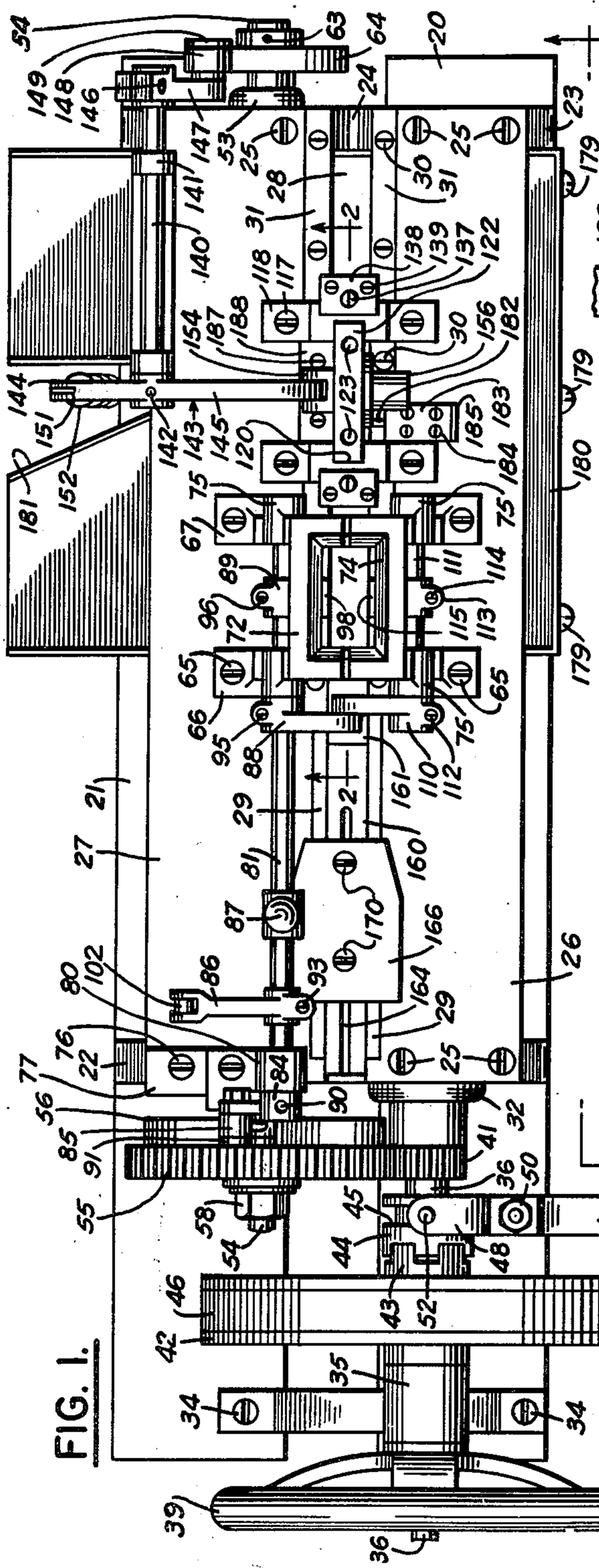

FIG. 1.

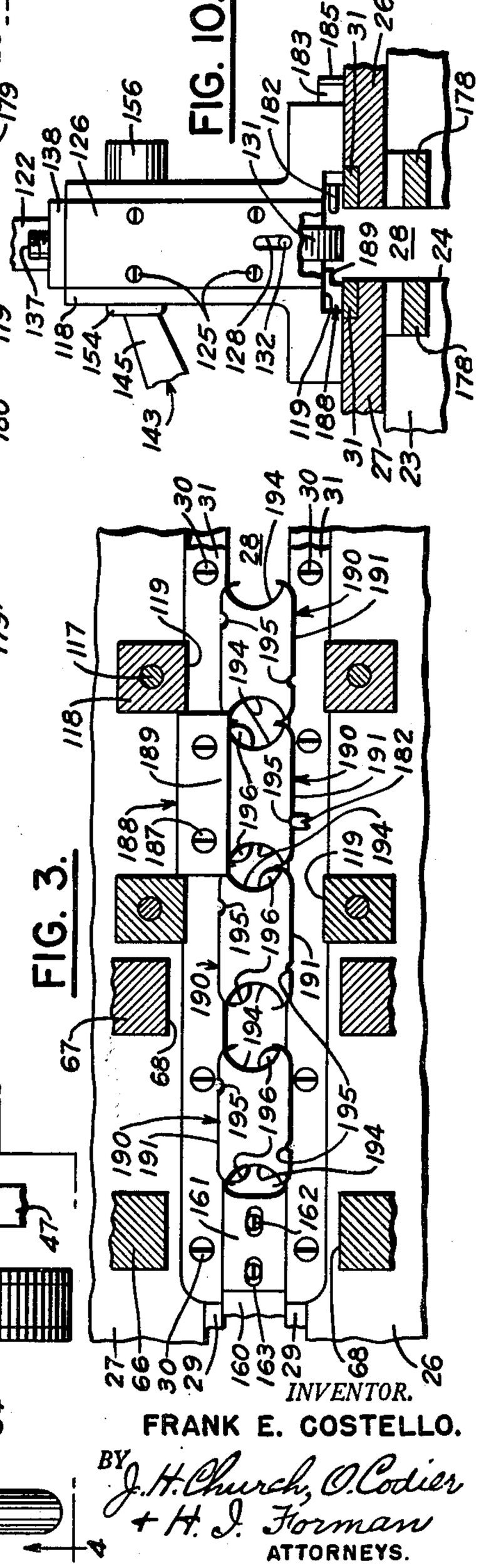

FIG. 10.



FIG. 3.

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AMMUNITION DECLIPPING MACHINE

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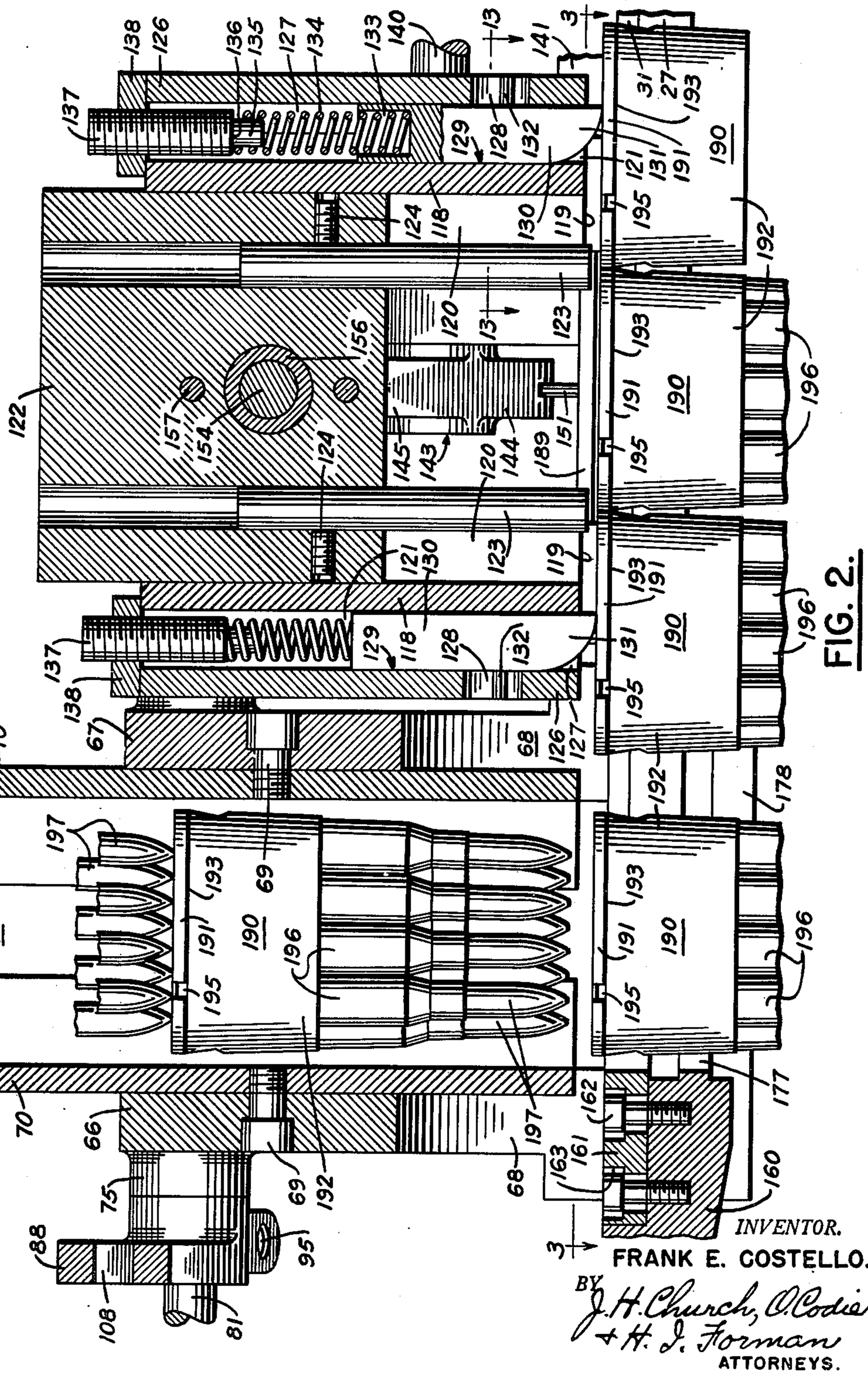


FIG. 2.

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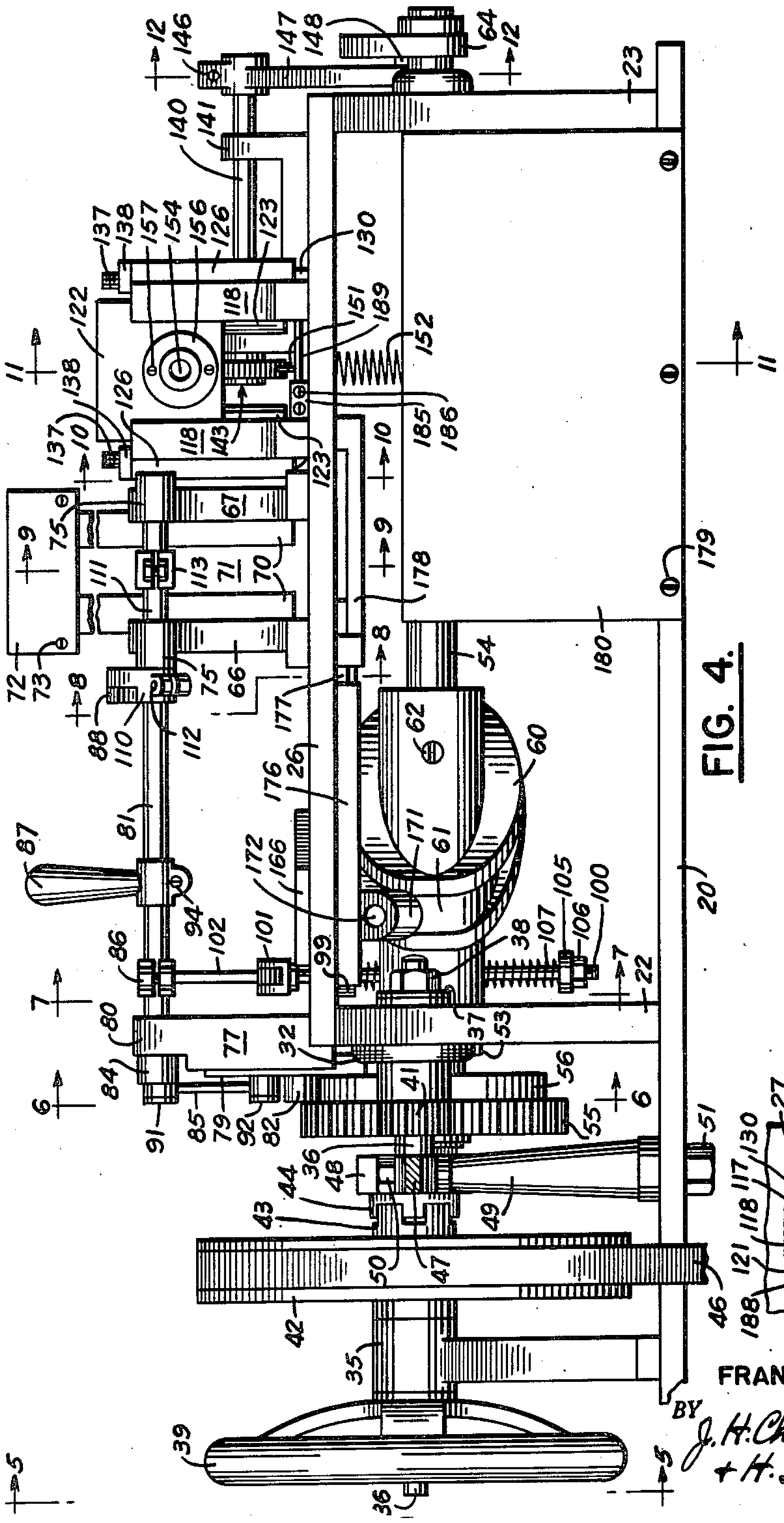

FIG. 4.

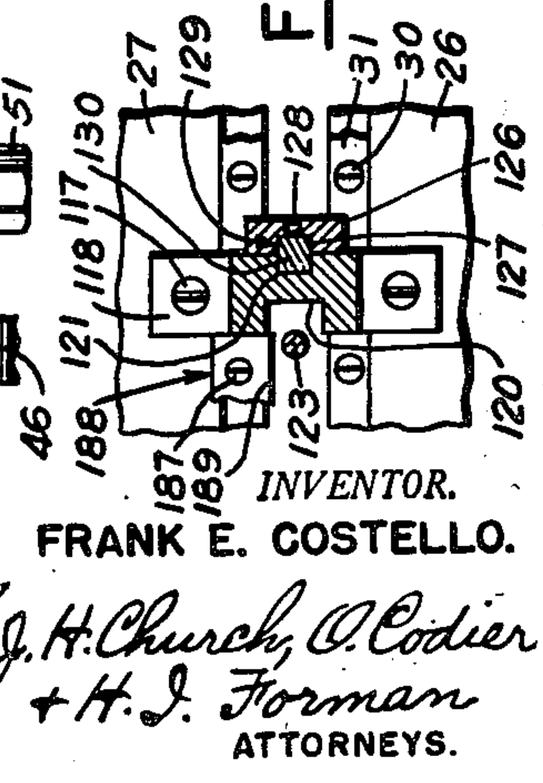

FIG. 13.

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AMMUNITION DECLIPPING MACHINE

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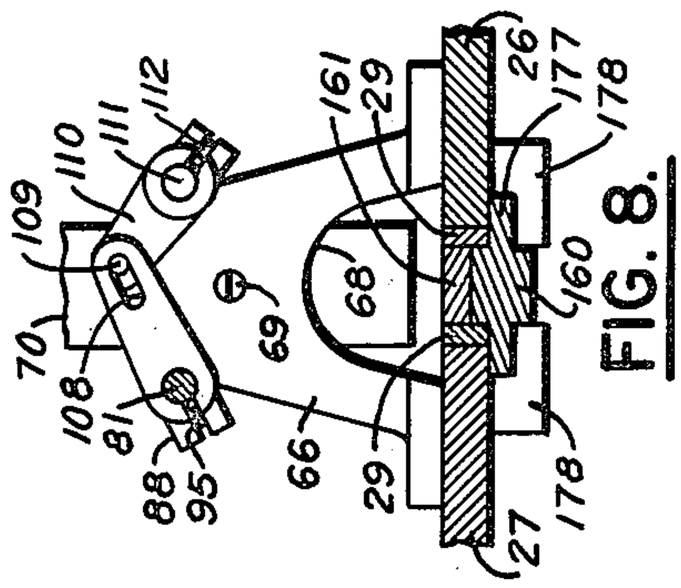


FIG. 8.

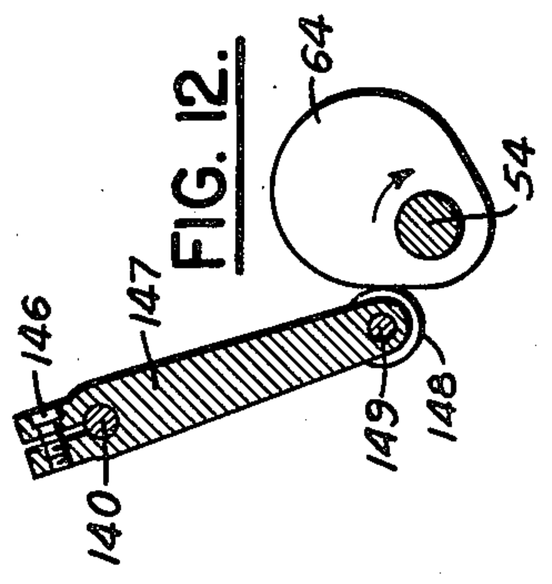


FIG. 12.

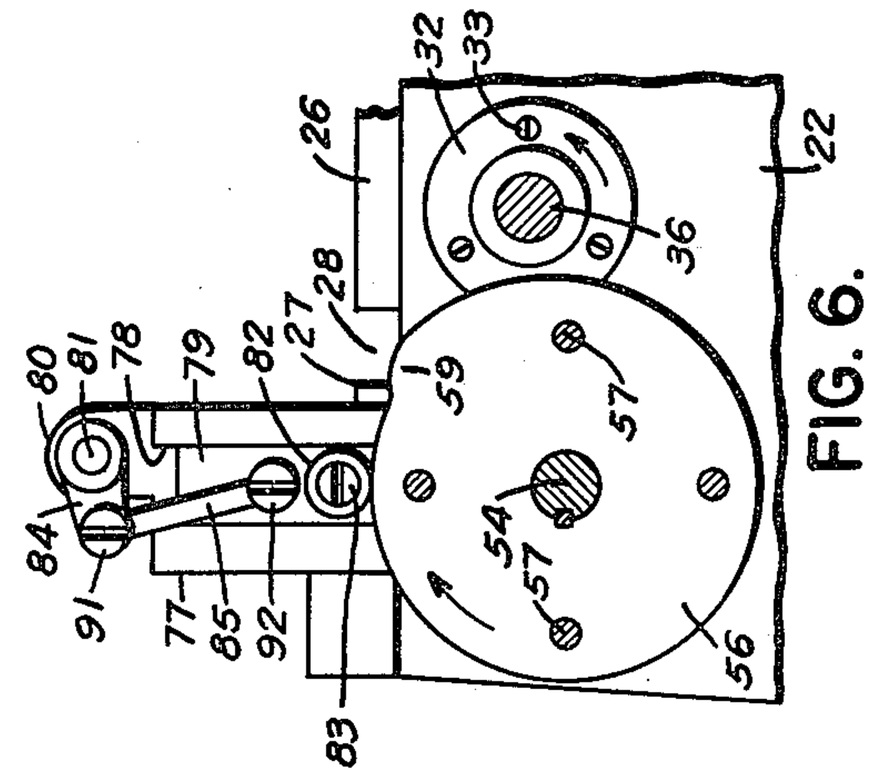


FIG. 6.

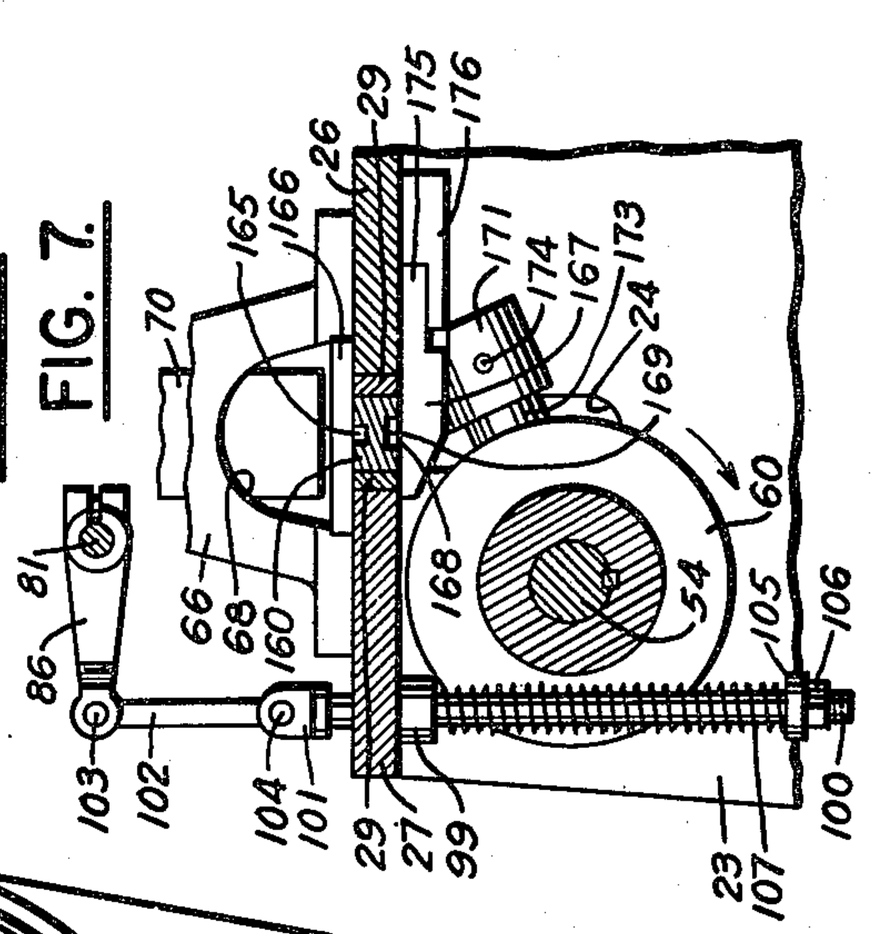


FIG. 7.

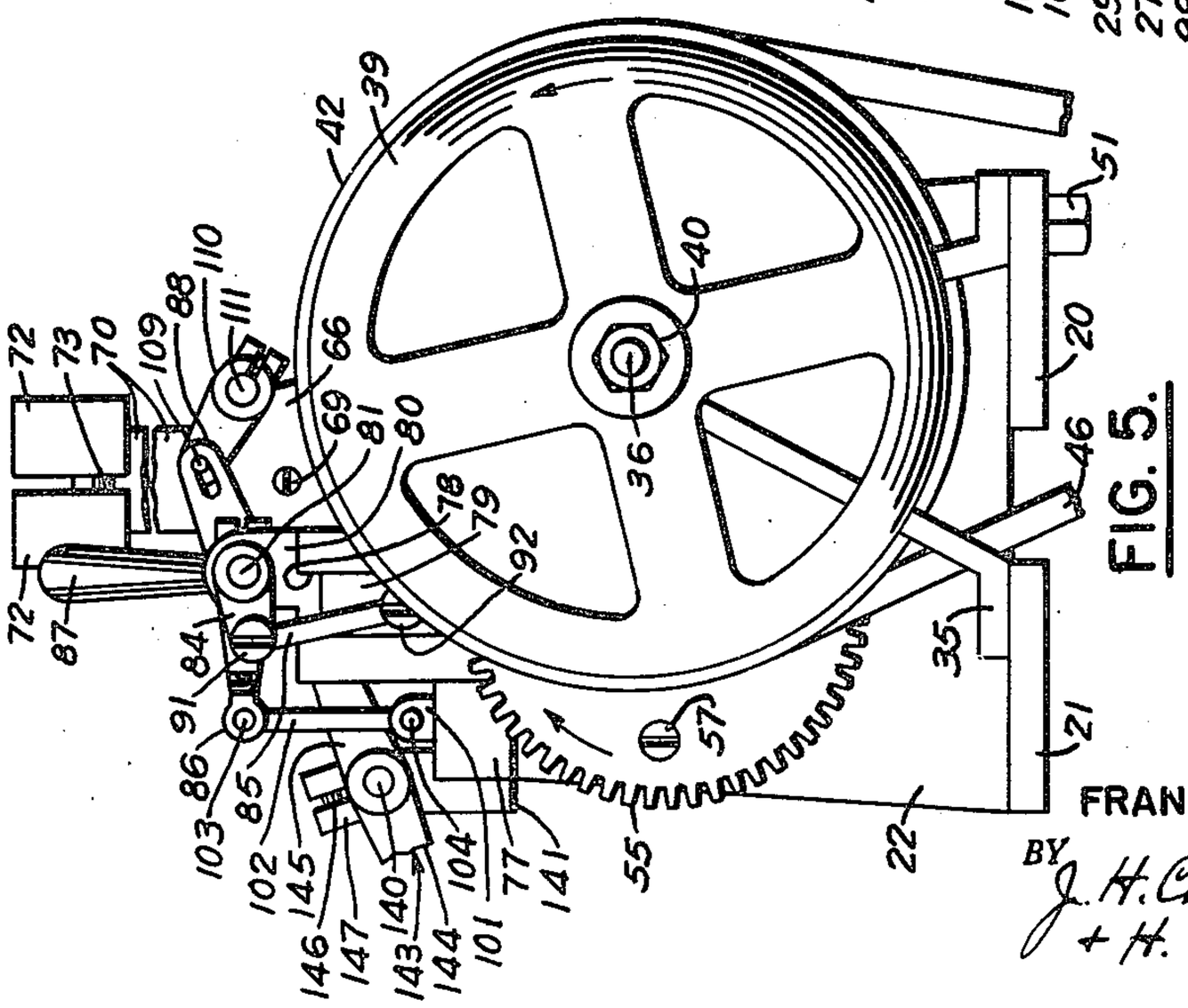


FIG. 5.

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AMMUNITION DECLIPPING MACHINE

Filed Aug. 17, 1950 5 Sheets-Sheet 5

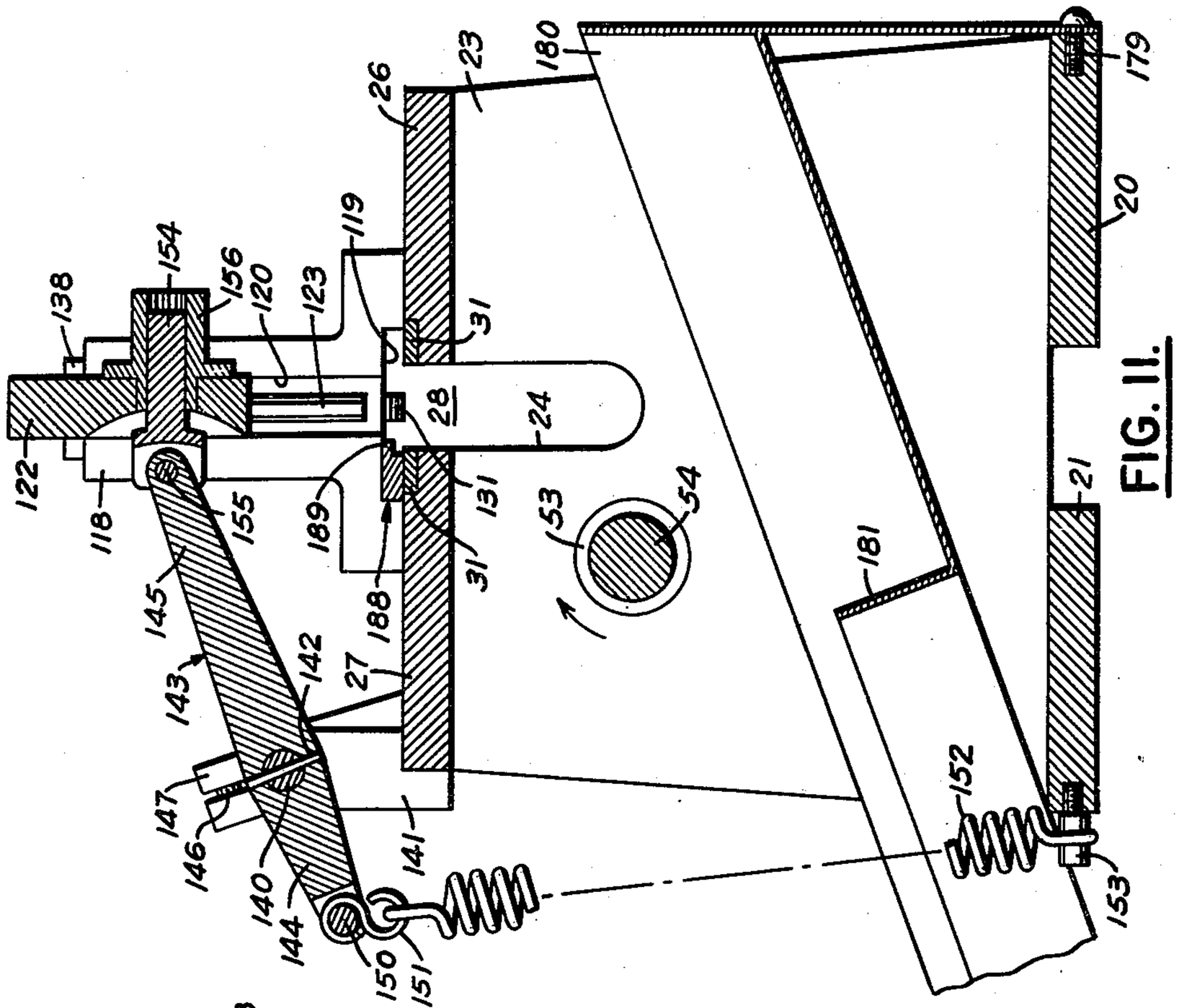


FIG. 11.

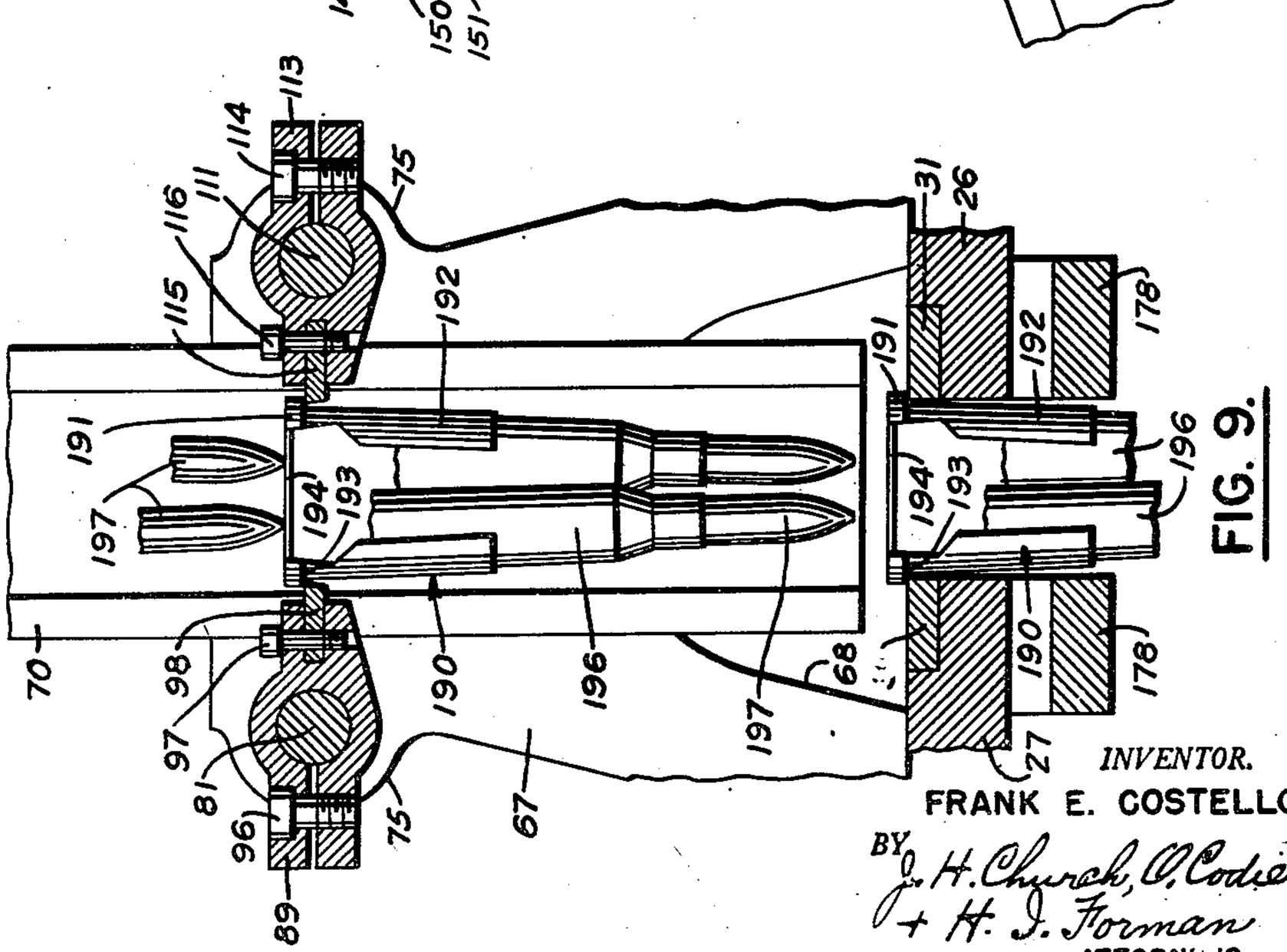


FIG. 9.

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Patented Nov. 17, 1953

2,659,263

# UNITED STATES PATENT OFFICE

2,659,263

## AMMUNITION DECLIPPING MACHINE

Frank E. Costello, Philadelphia, Pa.

Application August 17, 1950, Serial No. 180,020

6 Claims. (Cl. 86—47)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

My invention relates broadly to machines for acting on ammunition. In particular it is a machine for "declipping" ammunition rounds, i. e., removing the rounds from a specially formed, spring steel clip or other holder.

Those familiar with the art undoubtedly are acquainted with the manner in which ammunition rounds for such rifles as the Garand and the Springfield are held by their cartridge cases in groups, usually of five or eight rounds each, by the resilience of a spring steel clip or like holder. Following manufacture and clipping of the rounds, it sometimes becomes necessary, for repacking or salvage reasons, to declip them. Heretofore such declipping was performed manually with the use of jigs, fixtures, or the like; or it was performed in machines which, because of their unreliable action, required a comparatively great amount of time and supplementary manual handling. Both prior art methods, needless to say, were highly hazardous and inefficient.

I eliminate the hazards and inefficiency of the prior art methods and machines, and at the same time gain hitherto unobtainable quantative production by providing a machine which basically consists of a horizontally extending guideway, a horizontally reciprocatable feed slide mounted therein, a vertically arranged feed chute, and a vertically reciprocatable knockout slide.

Although not limited solely thereto this description will, for illustrative purposes, deal with a bench model of such a machine for declipping the eight round clip or caliber .30 ammunition as prepared for use in the well known Garand rifle.

Under control of an automatically operating clip stop, a first clip carrying its rounds of ammunition is permitted to drop into the machine's guideway. The feed slide approaches the assembled cartridge clip and pushes it partially under the knockout slide so that one round of ammunition will be removed from the clip on a subsequent downstroke of the knockout slide.

While one round is being removed from the clip, the feed slide reciprocates back past the feed chute and a second cartridge clip is allowed to fall to the machine's guideway. By this time the knockout slide has completed its downstroke and has returned to its highest position. The separated round of ammunition is guided by a chute to a proper receptacle.

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The feed slide again reciprocates toward the knockout slide, pushing the second clip to the position previously occupied by the first clip, and advancing the first clip fully under the knockout slide. On the next down stroke of the slide, two more rounds are pushed from the clip, allowing the remaining five to drop therefrom by gravity, and one round will simultaneously be pushed from the second clip.

While the knockout slide is descending, the feed slide again reciprocates back past the feed chute and a third cartridge clip is allowed to fall to the machine's guideway. By this time the knockout slide has completed its down stroke and has returned to its highest position.

The feed slide again reciprocates toward the knockout slide pushing the third clip into the position formerly held by the second, pushing the second clip into the position formerly held by the first, and pushing the first clip to a new position.

On its next down stroke, the knockout slide removes one round from the third clip and two rounds from the second clip, thereby allowing the remaining five rounds in that clip to fall. A second clip thus becomes emptied of its ammunition rounds. As the cycle is repeated the empty clips are finally ejected from the machine one by one.

One object of my invention is to provide a safe, positive-acting declipping machine.

Another object is to provide a declipping machine capable of high quantity production.

A further object is to provide a declipping machine which is simple in design and construction, and easy to operate and maintain.

The foregoing and other objects and advantages of my invention will become apparent after an inspection of the following description and the accompanying drawings wherein:

Fig. 1 is a plan view of my machine without workpieces, various protective guards having been removed for purposes of clarity;

Fig. 2 is a longitudinal section taken along line 2—2 of Fig. 1 and shows various work pieces during progressive stages of operation of the machine;

Fig. 3 is a partial plan view taken along line 3—3 of Fig. 2;

Fig. 4 is a side view of the machine, without workpieces, taken along line 4—4 of Fig. 1;

Fig. 5 is an end view taken along line 5—5 of Fig. 4;

Fig. 6 is a sectional view taken along line 6—6 of Fig. 4;

Fig. 7 is a sectional view taken along line 7—7 of Fig. 4;

Fig. 8 is a sectional view taken along line 8—8 of Fig. 4;

Fig. 9 is an enlarged sectional view taken along line 9—9 of Fig. 4 and shows various workpieces in position;

Fig. 10 is a sectional view, without workpieces, taken along line 10—10 of Fig. 4;

Fig. 11 is an enlarged cross section, without workpieces, taken along line 11—11 of Fig. 4;

Fig. 12 is a sectional view taken along line 12—12 of Fig. 4; and

Fig. 13 is a cross section taken along line 13—13 of Fig. 2.

*Machine's basic structure*

As shown in Figs. 1, 4, 5 and 11, my machine is built upon similarly dimensioned front and rear base strips 20 and 21, respectively. A left vertical support 22 (see Figs. 1 and 4 to 6) and a right vertical support 23 (see Figs. 1, 4, 7, 10 and 11) are secured to the base strips by any convenient means, as by screws (not shown). These supports are parallel to each other and extend perpendicularly across the base strips. The supports are substantially trapezoidal in shape and identical in size. Vertical support 23, for a purpose which will later be evident, is provided with a U-shaped groove 24 (see Figs. 7 and 11) in its upper surface. Spanning the gap between the vertical supports, and secured to the coplanar top surfaces thereof as by screws 25, are parallel front top plate 26 and rear top plate 27 (see Figs. 1, 3, 4, 6 to 11, and 13). These top plates are so positioned upon the vertical supports 22 and 23 that a certain gap 28, continuous with U-shaped groove 24, exists between them for a reason which will later be explained.

Secured to the left portion (see Figs. 1, 3, 7 and 8) of the opposed inner faces of the top plates, as by screws (not shown), are feed slide guide strips 29. Clip guide strips 31 are secured by means of screws 30 to the right portions of the upper faces of the top plates so as to be flush with them on both top surface and the inwardly facing surfaces (see Figs. 1, 3, 9 to 11 and 13).

*Drive portion*

A flanged bushing 32 is mounted in left vertical support 22 by means of screws 33 (see Figs. 1, 4 and 6). Axially aligned with the bushing and secured to base strips 20 and 21, by means of screws 34, is a pillow block 35 (see Figs. 1, 4 and 5). Supported between the bushing and the pillow block is a flywheel shaft 36.

The flywheel shaft is secured within its supports by means of a washer 37 and nut 38 located at its right end (see Fig. 4), and by a hand wheel 39 and a nut 40 at its left end (see Fig. 5). Integral with shaft 36 is a pinion portion 41.

A circumferentially grooved flywheel 42 having a castellated hub portion 43, and a castellated clutch collar 44 having a circumferential groove 45, are mounted on shaft 36 between pillow block 35 and pinion 41 (see Figs. 1 and 4). The flywheel is prevented, by any convenient means (not shown), from axial movement on the shaft, but is free to rotate independent of the shaft. As shown in Figs. 1, 4 and 5, a flexible connector 46, preferably a V belt, extends around the flywheel and connects it to any convenient source of power, as an electric motor (not shown).

Castellated clutch collar 44 is splined to flywheel shaft 36 so as to rotate therewith and to



be capable of axially sliding thereon. Engagement and disengagement between flywheel 42 and clutch collar 44 is effected by means of a clutch lever 47 having the yoke portion 48.

Clutch lever 47 is supported by and pivots upon the conveniently located post 49 to which it is secured by means of a nut 50, the post being attached to front base strip 20 by means of the bolt 51. The yoke portion of the clutch lever straddles castellated clutch collar 44 and is engaged thereto by means of studs 52 (one of which is shown in Fig. 1) which travel in the clutch collar's groove 45.

Press-fitted in axial alignment in left and right vertical supports 22 and 23 are flanged bushings 53 (see Figs. 1, 4 and 11). Extending horizontally between the bushings is a cam shaft 54 (see Figs. 1, 4, 6, 7, 11 and 12) which is retained therein in any convenient manner.

A gear 55, to which a cam 56 is secured by means of screws 57, is keyed to the cam shaft and secured in position by means of a nut 58 (see Figs. 1 and 4 to 6). The rise of this cam is designated by reference character 59. On the right side of left vertical support 22, a wobble cam 60 having the groove 61 is keyed to the cam shaft and is held in place thereon by means of a set screw 62 (see Fig. 4).

Secured to the right end of the cam shaft by means of a pin 63 is the knockout slide cam 64. This cam, as will become evident later, has a certain angular relationship to wobble cam 60.

*Feed chutes and supports*

Centrally located above the gap 28 between top plates 26 and 27, and secured to them by means of screws 65, are feed chute supports 66 and 67 (see Figs. 1 to 5 and 7 to 9). As shown in Figs. 2, 3 and 7 to 9, the lower central portion of the chute supports is recessed at 68 for a reason which will become apparent later. Accommodated in a groove on the inner opposing faces of the supports, and held in place there in spaced relation to each other by screws 69, are channel-like feed chutes 70. These chutes are so positioned that the channels face each other and between them define an opening into which the assembled clips are fed to the machine. Between the chutes' opposing edges is the space 71.

At their upper ends, the feed chutes fit into complementary channel-like blocks 72 which are recessed internally to receive them and which are held together by means of screws 73 (see Figs. 1, 4 and 5). The recesses (not shown) in the blocks define the distance across the space 71 between the feed chutes (see Figs. 4 and 5). The sides and bottoms (see Fig. 1) of the channel-like blocks are shaped outwardly from bottom to top and, in combination, present an inverted bell-mouth opening 74 which is continuous at its smaller end with the opening defined by the feed chutes 70 earlier mentioned.

Each feed chute support is also provided with bilateral lobes 75 located near the support's upper end and spaced equidistant from the center of the feed chute (see Figs. 1, 2, 4 and 9), and each lobe is provided with a cylindrical recess which will be discussed later.

*Dovetail slide holder, clip release shaft, and clip release jack shaft*

Fastened to the left end of rear top plate 27 by means of screws 76 is a dovetail slide holder 77 (see Figs. 1 and 4 to 6). This slide holder contains a vertically positioned dovetail groove 78

(which accommodates a dovetail slide 79) and a recessed lobe 80 (see Figs. 5, 6). The recess in the lobe is in alignment with the recesses in the rear lobes of the feed chute supports and between them they support the horizontally positioned clip release shaft 81 (see Figs. 1, 2, 4, 5, 6, 8 and 9).

Dovetail slide 79 is provided, near its lower end, with a roller 82 which is secured in place by the shoulder screw 83 about which it is free to rotate (see Figs. 4 and 6). As those figures show, the roller rests upon cam 56, and the cam's rise 59 will impart vertical reciprocation to the dovetail slide.

The clip release shaft is equipped with a shaft link 84, a slide link 85, a forked return arm 86, a handle 87 for shaft 81, a feed link 88, and a clip stop 89. Shaft link 84 is pinned at 90 to the left end of the clip release shaft (see Figs. 1, 4 to 6). Slide link 85 is attached at its upper end to the distal end of the shaft link by means of a screw 91 about which it is free to rotate. The lower end of the slide link is attached to dovetail slide 79 by means of the shoulder screw 92 about which it is free to rotate (see Figs. 1, 4 to 6). Return arm 86 is adjustably secured to the clip release shaft by means of the clamp screw 93 (see Figs. 1, 4 and 7). Handle 87 is tightly secured to the clip release shaft 81 by means of the clamp screw 94 (see Fig. 4). Adjacent the left feed chute support 66 the feed link 88 is attached to the clip release shaft by means of the clamp screew 95 (see Figs. 1 and 2). Clip stop 89 is located in the space 71 between feed chutes 70 and is adjustably secured to the clip release shaft by means of the clamp screw 96 (see Figs. 1 and 9). Secured in a groove at the inner end of the clip stop, by means of screw 97, is a stop plate 98 (see Figs. 1 and 9).

*Clip holding and release system*

Located in rear top plate 27, under the free end of return lever 86, a flanged bushing 99 is so positioned that its flange abuts the lower surface of the top plate (see Figs. 4 and 7). Passing vertically through the bushing and slideable therein is a threaded spring stud 100. The spring stud, at its upper end, is threadedly attached and pinned (not shown) to a stud yoke 101. Extending from the stud yoke to the outer end of return arm 86 is a return link 102 (see Figs. 4, 5 and 7). The upper end of the link is secured to the forked end of the return arm by means of a pin 103 which is held in place by any convenient means (not shown). The lower end of the link is attached to the stud yoke by means of a pivot 104 which may also be held in place in any convenient manner (not shown).

The lower end of spring stud 100 is equipped with a spring seat 105, which is slidable thereon, and a nut 106 (see Figs. 4 and 7). Confined between the flange of bushing 99 and the spring seat is a coil spring 107 which constantly acts to push the lower end of the spring stud away from the rear top plate 27. Spring 107 also constantly acts to force roller 82, attached to dovetail slide 79, against cam 56 through the medium of spring seat 105, nut 106, spring stud 100, stud yoke 101, return link 102, return arm 86, clip release shaft 81, shaft link 84, slide link 85, and dovetail slide 79 (see Figs. 4 to 7). The amount of force exerted by the spring can be increased or decreased by changing the position of the spring seat up or down along the spring stud.

As shown in Figs. 5 and 8, feed link 88 is provided at its inner end with a slot 108. This slot



is engaged by a stud 109 located in a complementary feed link 110. The complementary feed link is secured to a clip release jack shaft 111 by means of a clamp screw 112 while the jack shaft is horizontally supported in opposing lobes 75 of the feed chute supports 66 and 67 parallel to the clip release shaft 81. The clip release jack shaft, like the main clip release shaft 81, is also provided with a clip stop 113 which is located opposite the clip stop 89 and is secured to the jack shaft by means of clamp screw 114 (see Figs. 1, 4, 9). As in the case of clip stop 89, a stop plate 115 is secured in a groove by means of screw 116 to clip stop 113 (see Fig. 9).

*Knockout slide supports, knockout slide and keepers*

Centrally located in horizontal spaced relationship above gap 28 between top plates 26 and 27 and secured to them by means of screws 117, are knockout slide supports 118 which face toward each other (see Figs. 1, 2, 3, 4, 10, 11). For reasons which will later be explained, the bottom surface of the slide supports is recessed at 119 in the region overlying the gap. The opposing inside faces of the slide supports are provided with a groove 120 which extends in a vertical direction, and the outer faces of the supports are provided with another groove 121 which also extends vertically.

Accommodated within the first mentioned groove 120 is knockout slide 122 which carries the punches 123 held in place by the set screws 124.

Secured to the outside faces of the slide supports by means of screws 125 are keeper plates 126 which are provided with grooves 127 and slot 128 (see Figs. 2 and 10). When the keeper plates are in position on the slide supports, grooves 121 and 127 are complementary to each other, forming a substantially square and vertically extending open-ended chamber 129 which slidably accommodates a keeper 130.

As shown in Fig. 2, the keepers have shaped lower ends 131 which face toward the machine's feed chutes and the outside surface of each keeper is provided with a stop pin 132 which, at assembly, slidably engages slot 128 in the keeper plate to limit downward movement of the keeper.

Located in the upper end of each keeper is a blind recess 133 which accommodates one end of the coil spring 134. The other end of the coil spring fits around a stem 135 and against the shoulder 136 of a threaded adjusting stud 137. This stud engages with the cap plate 138 held in place atop the coplanar top surfaces of the slide supports and the keeper plates by means of screws 139 (see Figs. 1 and 2).

It can easily be seen that the keepers are constantly urged downward by action of spring 134, and that the downward pressure of the keeper can be increased or decreased according to the in or out position of the threaded adjusting studs 137. However, when no workpiece is under the keeper, the downward movement of the keeper is arrested when pin 132 reaches the lower extremity of slot 128 in the keeper plates 126.

*Reciprocation of knockout slide*

Reciprocation of the knockout slide results from rotary oscillation of the slide shaft 140 which is horizontally supported near each of its ends by the bushed bracket 141 above rear top plate 26 (see Figs. 1, 2, 4, 5, 11, 12). The bracket is secured to the rear top plate by any well known means, as by screws (not shown).

Secured to the left end of slide shaft 140 by means of a pin 142 is a slide lever 143 having a short, forked arm 144 and a longer arm 145 (see Figs. 1, 5 and 11). Secured to the right end of the slide shaft by means of a clamp screw 146 is the cam arm 147 which carries at its extremity a roller 148 which is secured in place by the shoulder screw 149 upon which it is free to rotate. Roller 148 is in contact with slide cam 64 secured to cam shaft 54 (see Figs. 1, 4 and 12). Rotation of the cam shaft causes pendulum-like swinging of the cam arm. This swinging results in oscillation of the slide shaft 140.

The short, forked arm 144 of slide lever 143 carries a circumferentially grooved stud 150 which is secured in place by any convenient means (not shown). The stud is fitted with an S shaped hook 151 to which is attached the upper end of a slide return spring 152. The lower end of the spring is anchored around a circumferentially grooved stud 153 which is threadedly attached to rear base strip 21 as shown in Fig. 11. As that figure shows, short forked arm 144 of slide lever 143 is constantly being pulled downward, this action causing a constant tendency in long arm 145 to be raised and in the roller 147 to be held against slide cam 64.

Long arm 145 is attached to a yoked stud 154 by means of the pin 155 which is secured in the stud in any convenient manner (not shown). The yoked stud in turn is slidably engaged in the flanged bushing 156 which is secured to knockout slide 122 by means of screws 157 (see Figs. 2, 4).

*The feed slide and its guides*

Located in the gap 28 between front and rear top plates 26 and 27, at the left end of the machine, is the feed slide 160 (see Figs. 1, 2, 3, 4, 7, 8). The feed slide is just wide enough across to slide freely between feed slide guide strips 29 and clip guide strips 31 attached to the front and rear top plates (see Figs. 1, 3, 7, 8), and is just slightly greater in thickness than that of the top plates. This construction enables the feed slide to reciprocate along the length of the machine between the upper and lower surfaces of plates 26—27, as will later be described.

The upper surface of the slide contains, at its right end, a specially shaped insert 161 which is adjustably secured there by means of screws 162 in the insert's oblong slots 163 (see Figs. 2 and 3). At its left end, the upper surface of the feed slide contains a groove 164 into which fits the tongue 165 on the lower surface of a slide plate 166. This plate is attached to a roller plate 167 which is located against the slide's lower surface and which has a tongue 168 fitting into a groove 169 on that lower surface (see Fig. 7). Screws 170 which transfix the slide hold the slide plate and the roller plate against the feed slide, and permit reciprocation of the feed slide lengthwise of the machine between the upper and lower surfaces of the two top plates.

Roller plate 167 has a lobe 171 into which is fitted the stud 172 of a roller 173, the stud being retained by set screw 174. Roller 173, in turn, engages with groove 61 in wobble cam 60. Attached to the undersurface of front top plate 26 by means of screws (not shown), and positioned to slidably support a projecting portion 175 of the roller plate, is a feed slide hanger 176. The length of this member 176 from left to right (see Fig. 4) is great enough to provide support all during the reciprocal travel of the feed slide.

The right end of the feed slide is provided with an integral forked, winged portion 177 which is slidably supported against the lower surfaces of the front and rear top plates by means of the feed slide tracks 178. These tracks are secured to the underside of each of the top plates by means of screws (not shown). The feed slide tracks, like the feed slide hanger, are long enough to provide support for the winged portion during the full movement of the feed slide.

Attached to the forward surface of front base strip 20 by screws 179, and extending any convenient distance across the front of the machine, is a discharge chute 180 which slopes downward from front to rear (see Figs. 1, 4 and 11). This chute is cleft at 181 in order to guide the ammunition rounds around spring 152. After the rounds are separated from the clips, they fall to discharge chute 180 which guides them to a proper receptacle (not shown), the empty clips being discharged out the right end of the machine as will be described later.

*Detent*

Located on the front top plate 26 between knockout slide supports 118 is the spring loaded detent 182 (see Figs. 1, 3 and 10). The detent is slidably contained in a housing 183 which is secured to the top plate by means of screws 184, and its projecting end is so positioned that it extends somewhat into the path taken by the ammunition round clips 190, and will releasably engage a notch located in the clips so as to hold the clip in position under the knockout slide's punches 123. A coil spring (not shown) located in a shouldered recess (not shown) within the detent housing tends constantly to urge the detent into the path of clip 190 but, at the proper time, will yield to allow the detent to travel away from gap 28. The outermost position of the detent is limited by a shoulder (not shown) located on that part of the detent within the housing. The coil spring is held within the housing by means of end plate 185 which is fastened to the housing by means of screws 186.

*Stripper*

Located on rear top plate 27 between the knockout slide supports 118, and secured there by means of screws 187, is the stripper 188 (see Fig. 11). The stripper contains a projecting portion 189 which overhangs gap 28 between the front and rear top plates and, while not interfering with the horizontal movement of the clips, will prevent the clips thereunder from rising vertically out of place when knockout slide 122 ascends after its downward, working stroke.

*8 round clip*

The workpiece which is illustratively dealt with in the drawings consists of a specially formed spring steel clip 190 having, for purposes of its operation in the Garand rifle, a head portion 191 and resilient side portions 192 (see Figs. 2 and 9). The head and side portions form at their juncture a shoulder 193. The distance across the head portion is somewhat greater than the distance across the gap 28 between the front and rear top plates, and the distance across the side portions is slightly less than the width of gap 28. It is thus possible for clip head 191 freely to slide along the gap under influence of feed slide 160. The head end of the clip is provided with an arcuate cut-out 194 at each end and with small notches 195 (see Figs. 2 and 3).

Restrained in clip 190 by the resilience of its side portions are two staggered rows of ammuni-

tion rounds, each round consisting of a cartridge case 196 with its assembled bullet 197. As Figs. 2, 3 and 9 indicate, the base ends (not shown) of the cartridge cases fit into the clip, while the bullet ends project therefrom.

*Operation without workpieces*

In order to convey a clear picture of the operation of my inventive machine, I shall briefly describe its functioning before the workpieces are placed therein.

Assuming the clutch collar 44 (see Figs. 1 and 4) to be disengaged from the castellated hub portion 43 of the flywheel 42, the clutch lever 47 will be at its extreme left position (not shown). A source of power such as an electric motor (not shown) is energized and the grooved flywheel connected thereto through belt 46 is caused to rotate in a counterclockwise direction as viewed from the machine's left end (see Fig. 5). Because the flywheel "floats" on its shaft 36, that shaft does not yet rotate.

The clutch lever 47 is moved to its furthermost position on the right (see Figs. 1 and 4), pivoting on the post 49 and causing the lever's yoke portion 48 to move the clutch collar into engagement with the castellated hub portion of the flywheel. Consequently, the rotation of the flywheel is imparted to the flywheel shaft 36 because of the splined engagement between the shaft and the clutch collar.

Pinion 41 (see Figs. 1 and 4) is integral with the shaft and also rotates in a counterclockwise direction, as viewed from the left (see Figs. 5 and 6). This causes clockwise rotation of gear 55, its attached cam 56, and the cam shaft 54 to which they are secured (see Figs. 1, 4 to 6). Wobble cam 60 and knockout slide cam 64, which are also secured to the cam shaft, are likewise turned in a clockwise direction as viewed from the machine's left end (see Figs. 7 and 12). Rotation of cam 56 causes intermittent vertical reciprocation of dovetail slide 79 within its support 77 through the medium of roller 82 which is rotatably secured to the slide and constantly held against the cam by coil spring 197, as earlier described.

By means of slide link 85 and shaft link 84 (see Figs. 1, 4 to 6) the reciprocation of the dovetail slide is converted into rotary oscillation of clip release shaft 81 about its axis (see Figs. 5 to 9). Feed link 88 (see Fig. 8) and clip stop 89 (see Fig. 9), through their attachment to this shaft, are also given intermittent rotary oscillation. The motion of the clip release shaft is transmitted to clip release jack shaft 111 containing a second clip stop 113 by means of the engagement between the feed link 88 and complementary feed link 110 (see Figs. 1, 4, 5, 8). Coaction between the two shafts causes the clip stops 89 and 113 to have simultaneous, but directionally opposite, intermittent rotary oscillation about their axes. In other words, referring to Fig. 9, the shafts 81 and 111 simultaneously rotate either toward or away from each other, causing stop plates 98 and 115 to be raised to a "holding" or lowered to a "release" position.

Because of the constant rotation of wobble cam 60, and its engagement to roller plate 167 by means of roller 173 and groove 61, feed slide 160 undergoes intermittent horizontal reciprocation.

Intermittent vertical reciprocation of the knockout slide 122 results from periodic rotary oscillation of slide shaft 140 in the following manner. Attached to the outer end of the shaft is



cam arm 147 which contains roller 148 that is held against knockout slide cam 64 by means earlier described. The constant rotation of the knockout slide cam causes intermittent pendulum-like swinging of the cam arm. Attached to the left or inner end of slide shaft 140 is slide lever 143 to which is imparted the intermittent rotary oscillation of the shaft. The movement of this shaft is synchronized with the vertical reciprocation of the feed slide by means of the engagement between the slide lever and the yoked stud 154 (see Fig. 11).

To summate the foregoing details of the "dry" (i. e. without workpieces) operation of my machine, and to mention the various functions in chronological order, these actions take place: Starting with feed slide 160 at the left end of its travel (see Fig. 1), at which time clip stops 89 and 113 are in "holding" position (see Fig. 9) and knockout slide 122 is in its uppermost position (see Fig. 2), the feed slide begins moving toward the right. It reaches the limit of its travel in that direction, dwells momentarily, then starts back to the left limit. As it continues in that direction, the knockout slide descends, then ascends. When the feed slide, still traveling toward the left, has cleared feed chutes 70 the clip stops are momentarily turned to their "release" position then back to the "holding" position. The feed slide reaches the left limit of its travel, which is its starting position, dwells there momentarily, and then the cycle is repeated.

*Operation with workpieces*

Although my machine need not of necessity be placed in any one particular starting position, the discussion of its operation with workpieces will be facilitated by beginning the description with the understanding that certain relationships exist between the machine's components. With clutch collar 44 disengaged, handwheel 39 can be turned in either direction, but preferably counterclockwise as viewed from the left end, until roller 82 on dovetail slide 79 is resting at the bottom of rise 59 of cam 56 (see Fig. 6). When this relationship exists, feed slide 160 will be at the left end of its travel, clip stops 89 and 113 will have turned to their uppermost "holding" position (see Fig. 9), and knockout slide 122 will be at the top of its stroke (see Figs. 2, 4, 11).

Clips 190 containing the ammunition rounds are introduced into feed chutes 70, bullet ends downward, through the bell-mouthed opening 74 formed by complementary channel-like blocks 72 at the top of the chutes. Since the dimension between stop plates 98 and 115 is not great enough to allow the clip's head portion 191 to pass, the descent of the first clip down the chute is stopped as the clip's shoulder 193 abuts the stop plates (see Fig. 9). The succeeding rounds then build up, one upon the other, until the capacity of the chutes is reached.

Handle 87 attached to clip release shaft 81 is swung in a clockwise direction as viewed from the machine's left end (see Fig. 5). This action causes clip stops 89 and 113 to rotate downward to their "release" position. Stop plates 98 and 115 separate sufficiently to allow the vertical stack of workpieces within feed chutes 70 to drop downward. The lowermost cartridge clip enters gap 28 until the clip's shoulder 193, being too wide to pass through the gap, abuts the upper surface of the top plates.

When the handle 87 is released, action of coil spring 107 causes the clip stops to return to their

"holding" position (see Figs. 2, 4, 7 and 9). Stop plates 98 and 115 catch under the shoulder 193 of the lowermost clip in the chute and raise its weight, together with that of all clips thereabove, off the round located in the gap 28 so as to free it for subsequent sliding movement along the gap.

Flywheel 42 is caused to rotate, through its belt connection 46 to the source of power (not shown), and clutch lever 47 is moved to engage clutch collar 44 with the flywheel's castellated hub 43 (see Figs. 1 and 4).

Rotating wobble cam 60 causes feed slide 160 to move toward the right (see Figs. 1, 3 and 4). Insert 161, secured to the feed slide, contacts the first cartridge clip and slides it to the right through recesses 88 and 119 in the feed chute support and the knockout slide support, respectively, and under the nearer keeper 130 until one end of the clip is in alignment with the left punch 123 carried by knockout slide 122. With the clip properly positioned, the feed slide starts back toward the left and the knockout slide begins to descend, punches 123 entering the clip's arcuate cutout 194 and pushing one ammunition round from the clip. The remaining seven rounds are thus slightly rearranged but are still held within the clip by its resilience. Its work done, the knockout slide ascends from the clip as the feed slide progresses toward the left. When it is "clear" of the feed chutes, the clip stops again separate, this time by mechanical action, and a second clip is deposited in gap 28, and the weight of the succeeding clip is removed from the second clip by the return of the clip stops to their "holding" position.

Again the feed slide has concluded its travel to the left and has commenced traveling to the right. The second clip is contacted by the feed slide's insert and is pushed to the right along the gap. Before the feed slide's movement to the right is completed, the second clip contacts the first clip. Feed slide 160 keeps moving to the right until the first clip is pushed into alignment with both punches of the knockout slide. When that happens, detent 182 will have engaged notch 195 in the clip's head and one end of the second clip will be in the position previously occupied by the first, i. e. one end (adjacent the first clip) will be aligned with one punch of the knockout slide.

With the clips properly positioned, the feed slide starts again to the left end of its travel as the knockout slide descends. On this stroke two additional ammunition rounds are removed from the first clip, allowing the remaining five to fall out by gravity, and one round is removed from the second clip.

By action previously described, a third cartridge clip is deposited in gap 28 and again the feed slide begins its travel toward the right. The slide's insert contacts the third clip and pushes it along toward the other two clips. The third clip abuts the second, which already abuts the first and, as the feed slide continues its movement, the third clip is placed in the position just formerly occupied by the second and the second is placed in the position occupied by the first. The first clip is moved to a new position in which its end abutting the second clip is still in alignment with one punch in the knockout slide, although the first clip has been emptied of its rounds.

As the machine continues its operation, repetition of the previously detailed steps takes place. Finally, the emptied clips are pushed along to the end of gap 28 from where they fall into an awaiting receptacle (not shown), the previously ejected ammunition rounds having also been guided to another container (not shown) by chute 180.



*Conclusion*

From the foregoing description it will be apparent that I have provided a safe, positive-acting declipping machine; that I have provided a declipping machine capable of high quantity production; and that I have provided a declipping machine which is simple in design and construction, and easy to operate and maintain.

The illustrative embodiment of my invention described herein has been chosen for explanatory purposes only. Those skilled in the art will understand that many variations and modifications of my inventive concept are possible without departing from its original spirit and scope. For that reason I do not wish to be limited to the one specific form here illustrated and described, but instead only by the scope of the claims appended hereto.

I claim:

1. In a machine for declipping cartridges from clips holding them under spring pressure, the combination of a vertical feed chute for supplying the clipped cartridges in proper position to other stations in the machine, clip release means selectively imposing a barrier within said feed chute for regulating the supply of clipped cartridges from the chute, a horizontal guideway extending from beneath said feed chute to other stations in the machine for directing movement of the clipped cartridges from the chute to those other stations, a horizontally reciprocating feed member operating parallel to said guideway to move the clipped cartridges predetermined distances to predetermined positions therealong, a vertically reciprocating knockout slide bearing a punch which is axially aligned with the cartridge therebeneath and which extends on its downstroke past the uppermost surface of the guideway beneath it, and means for operating said reciprocating feed member so that whenever said punch is moved to its most extended position it will register with the heads of the cartridges on the ends of adjacent pairs of clips being urged along said guideway, whereby the punch will force the so contacted cartridges out of their clips to loosen the remaining cartridges and start their fall from the clips by force of gravity.

2. In a machine for removing ammunition cartridges, each comprising a bullet, a cartridge case and contents thereof, from clips holding them under spring pressure, the combination of a vertical feed chute for supplying loaded clips with bullet ends downward to the machine, clip release means selectively imposing a barrier within said feed chute for admitting the loaded clips one by one from the chute to the next station in the machine, cam controlled means for operating said clip release means at proper intervals, a horizontal guideway extending from beneath said feed chute to other stations in the machine for directing movement of the loaded clips from the chute to those other stations, a horizontally reciprocating feed slide and plate operating parallel to said guideway to move predetermined distances to predetermined positions therealong, a vertically reciprocating knockout slide bearing at least two vertically acting punches which are axially aligned with the cartridges therebeneath and which extend on their downstrokes past the uppermost surface of the guideway beneath

them, and cam controlled means for operating said reciprocating feed slide and plate so that whenever said punches are extended to their lowermost position they register with the heads of the cartridges on the ends of adjacent pairs of clips being urged along said guideway, whereby the punches force the so contacted cartridges out of their clips to thus loosen the remaining cartridges and enable them to drop from the clips by force of gravity.

3. In a machine for removing cartridges from clips holding them under spring pressure, the combination of a vertical feed chute for supplying the clipped cartridges in correct position to the machine proper, clip release means selectively imposing a barrier within said feed chute for regulating the supply of clipped cartridges from the chute, a horizontal guideway extending from beneath said feed chute to other stations in the machine for directing movement of the clipped cartridges from the chute to those other stations, a horizontally reciprocating feed member operating parallel to said guideway to move the clipped cartridges predetermined distances to predetermined positions therealong, spring stressed vertically acting keepers for retaining the clipped cartridges in proper alignment as they are moved along the guideway, a vertically reciprocating knockout slide bearing a punch which is axially aligned with the cartridge thereabeneath and which extends on its downstroke past the uppermost surface of the guideway beneath it, and means for operating said reciprocating feed member so that whenever said punch is moved to its most extended position it will register with the heads of the cartridges on the ends of adjacent pairs of clips being urged along said guideway, whereby the punch will force the so contacted cartridges out of their clips to loosen the remaining cartridges and start their fall from the clips by force of gravity.

4. A cartridge declipping machine, including, a guideway along which clips to be unloaded of their cartridges are made to move, a reciprocating feed member operating parallel to said guideway to move the clips predetermined distances to predetermined positions therealong, a reciprocating punch member located perpendicular to said feed member and guideway and slidable into and out of the clips in axial alignment therewith so as to engage an end of at least one cartridge and push cartridges so contacted out of the clips, cam-operated mechanism for reciprocating said punch member, a clutch controlling the connection and disconnection between said cam-operating mechanism and a source of power, and means for operating said reciprocating feed member so that whenever said punch is moved to its most extended position it will register with the heads of the cartridges on the ends of adjacent pairs of clips being urged along said guideway, whereby the punch will force the so contacted cartridges out of their clips to loosen the remaining cartridges and cause their fall from the clips by force of gravity.

5. A cartridge declipping machine, including, a guideway along which clips to be unloaded of their cartridges are made to move, a reciprocating member operating parallel to said guideway to move the clips predetermined distances to predetermined positions therealong, a detent resiliently mounted so as removably to engage an accommodating recess therefor in each clip moving along said guideway thereby temporarily to locate the clip in a predetermined position, a reciprocating punch member located perpendicular to said reciprocating member and guideway in registry with each clip positioned by said detent and slidable into and out of the clip in axial alignment therewith so as to engage an end of at least one cartridge and push cartridges so contacted out of the clip, cam-operated mechanism for reciprocating said punch member, a clutch controlling the connection and disconnection between said cam-operating mechanism and a source of power, and means for operating said reciprocating member so that whenever said punch member is moved to its most extended position it will register with the heads of the cartridges on the ends of adjacent pairs of clips being urged along said guideway, whereby the punch will force the so contacted cartridges out of their clips to loosen the remaining cartridges and cause their fall from the clips by force of gravity.

6. A cartridge declipping machine, including, a guideway along which clips to be unloaded of their cartridges are made to move, a reciprocating feed member operating parallel to said guideway to move the clips predetermined distances to predetermined positions therealong, a reciprocating punch member located perpendicular to said feed member and guideway and slidable into and out of the clips in axial alignment therewith so as to engage an end of at least one cartridge and push cartridges so contacted out of the clips, a cam shaft, a cam secured to and rotatable with said cam shaft, a follower for said cam, a cam arm to one end of which said follower is supportingly attached, a slide shaft to which the other end of said cam is attached, a lever having a first end connected to said punch member and between its first and second ends being connected to said shaft, a spring secured between said lever's second end and another part of the machine for customarily holding said lever so that it keeps said punch member away from said clipped cartridges but yielding to permit said cam and slide shaft to move said lever and thereby move said punch member into contact with said clipped cartridges, and means for operating said reciprocating feed member so that whenever said punch member is moved to its most extended position it will register with the heads of cartridges on the ends of adjacent pairs of clips being urged along said guideway, whereby the punch member will force the so contacted cartridges out of their clips to loosen the remaining cartridges and cause their fall from the clips by force of gravity.

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