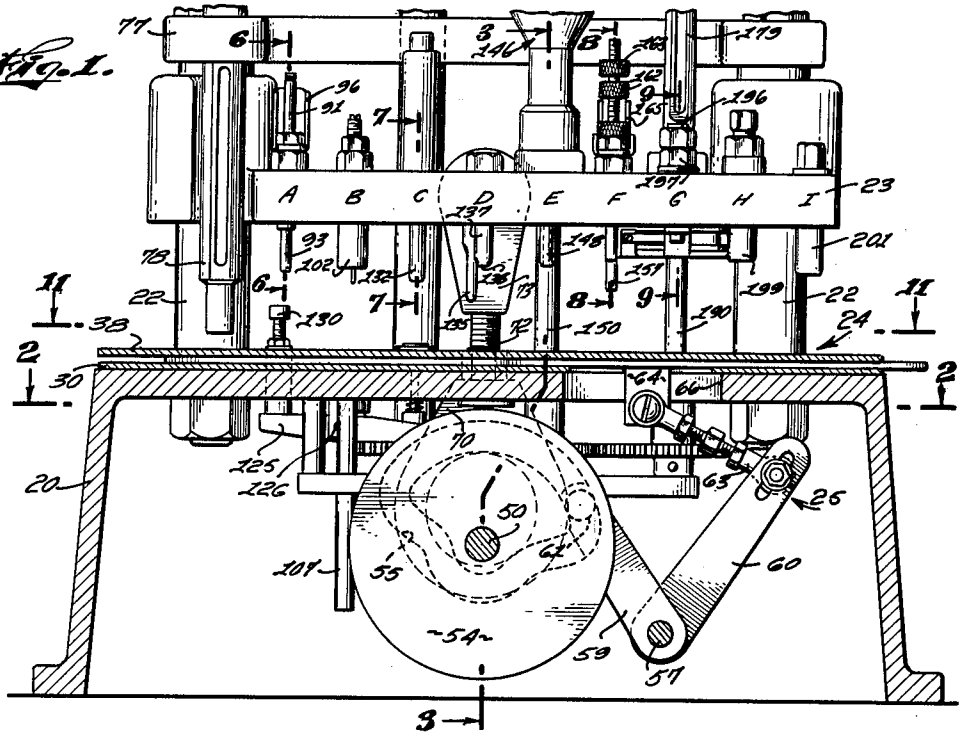
Oct. 27, 1964 L. E. LINDER 3,153,976

AMMUNITION RELOADING APPARATUS

Filed Oct. 17, 1961 3 Sheets-Sheet 1

Fig. 1.



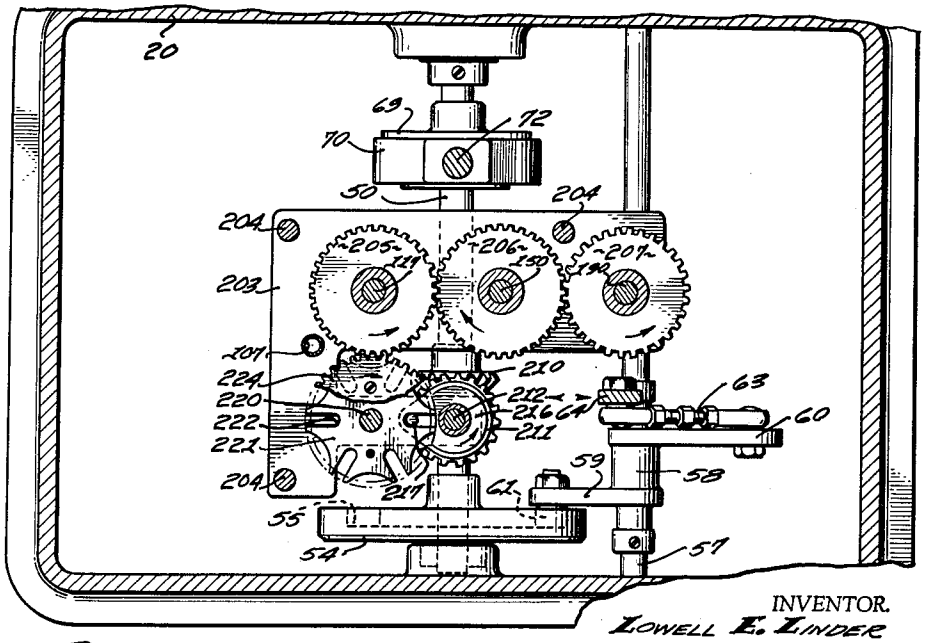


Fig. 2.

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AMMUNITION RELOADING APPARATUS

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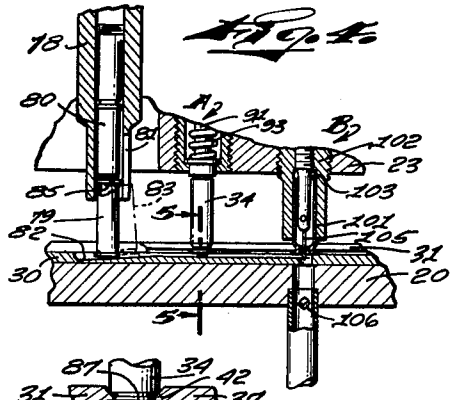


Fig. 4.

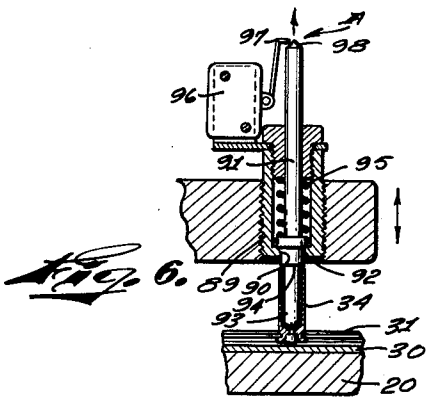


Fig. 6.

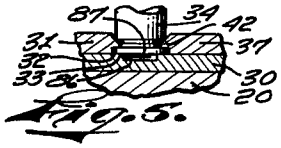


Fig. 5.

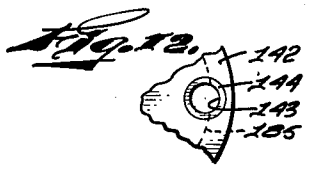


Fig. 12.

Fig. 3.

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AMMUNITION RELOADING APPARATUS

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Fig. 7.

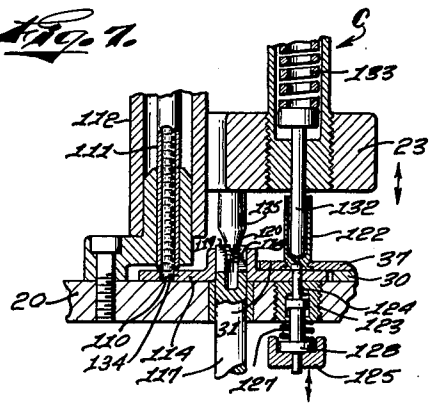


Fig. 8.

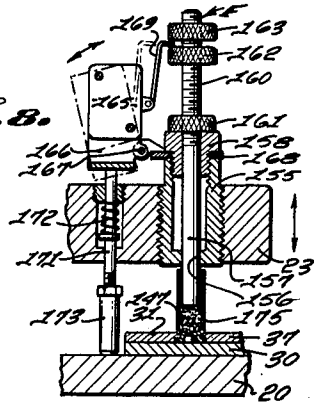


Fig. 9.

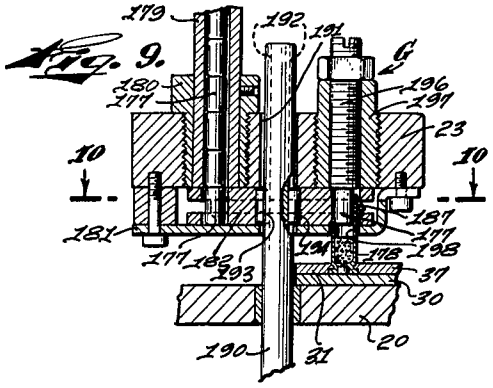
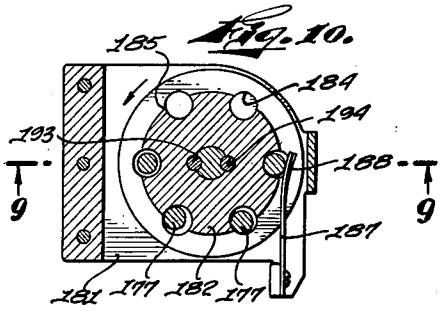


Fig. 10.



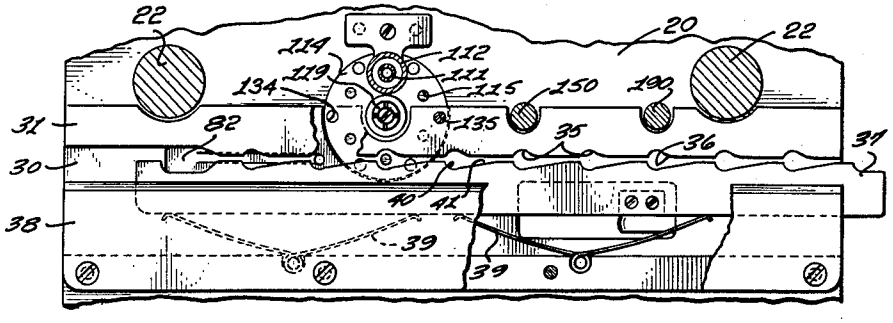


Fig. 11.

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United States Patent Office 3,153,976 Patented Oct. 27, 1964

3,153,976
AMMUNITION RELOADING APPARATUS

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Filed Oct. 17, 1961, Ser. No. 145,637
15 Claims. (Cl. 86—26)

This invention relates to apparatus for reloading ammunition and more particularly to such apparatus which can operate automatically at a high speed.

After a cartridge has been fired, the case, usually of brass, normally has very little damage and is suitable for reloading with slight reworking. Correspondingly, it has long been the practice to reload said cartridge cases to reduce thereby the cost of firing the gun.

In the past, different automatic reloading apparatus have been suggested and provided for use. However, for the most part such apparatus have been subject to deficiencies which reduce their practical operation output and impair their desirability.

It is an object of this invention to provide high speed ammunition reloading apparatus.

It is a further object of this invention to provide ammunition reloading apparatus which can accommodate without jamming used cartridge cases having irregularly projecting primers.

Another important object of this invention is to provide ammunition reloading apparatus which can rapidly and accurately dispense a proper amount of fresh gun powder into the cartridge case and check said powder.

A still further object of this invention is to provide ammunition reloading apparatus which is not subject to jamming because of accumulated grease from the new bullets inserted in the cartridge case in the reloading operation.

It is still another object of this invention to provide ammunition reloading apparatus which can operate more rapidly by reducing the movement required of the primer, powder, and bullet feed mechanisms in performance of their functions.

A still further object of this invention is to provide ammunition reloading apparatus which can be easily cleaned and maintained.

Another object of this invention is to provide ammunition reloading apparatus which may be quickly modified to accommodate different caliber or size cartridges.

Other and further objects of this invention will become apparent from the detailed description below in conjunction with the attached drawings wherein:

FIGURE 1 is a partially cut away front elevation of a preferred embodiment of the present invention taken along line 1—1 in FIGURE 3;

FIGURE 2 is a cross section of the base of the apparatus taken along line 2—2 in FIGURE 1;

FIGURE 3 is a partial cross section of the apparatus as taken generally along line 3—3 in FIGURE 1;

FIGURE 4 is a fragmentary cross sectional view taken along line 4—4 in FIGURE 3 illustrating details of the feed of the cartridge cases;

FIGURE 5 is a fragmentary cross sectional view taken along line 5—5 in FIGURE 4;

FIGURE 6 is a fragmentary view taken generally along line 6—6 in FIGURE 1 illustrating the details of the operation station where the used cartridge cases are checked;

FIGURE 7 is a fragmentary view taken generally along line 7—7 in FIGURE 1 illustrating details of the feed of the new primers;

FIGURE 8 is a fragmentary view taken generally along line 8—8 in FIGURE 1 illustrating details of a preferred powder check means;

FIGURE 9 is a fragmentary view taken generally along line 9—9 in FIGURE 1 illustrating details of the bullet feed mechanism;

FIGURE 10 is a cross sectional view of the bullet feed mechanism taken along line 10—10 in FIGURE 9;

FIGURE 11 is a partially cut away view of the case advance mechanism taken along line 11—11 in FIGURE 1; and

FIGURE 12 is a fragmentary view of the powder dispensing apparatus.

Briefly, the preferred embodiment of the present invention includes a base with a platen positioned over it for reciprocating vertical movement. The platen carries a series of tools and feed mechanisms for performing the desired functions to reload the cartridge. These tools are positioned equidistant apart at positions which will be referred to hereinafter as operation stations.

Located on the base of the apparatus is a guide means for receiving the cartridge cases which are fed to the left side of the apparatus. The guide means cooperates with advancement means to advance intermittently the cartridge cases sequentially from station to station and index said cases in each respective station as desired. The advancement means is inter-connected with the motion of the platen so that the cases are advanced only after the tools carried by the platen are clear of the cases.

As part of the reloading process, it is necessary to insert a new primer, a new charge of powder, and a new bullet, or slug, in the cartridge case, as well as, perform the other operations on the cases. For reasons explained below it is preferred that each mechanism for accomplishing each of these three specifically named steps include a circular plate or metering disk having regularly spaced accommodations for six primers, powder charges, or bullets. Thereby, with the means of a Geneva movement the said disks need only be rotated sixty degrees (60°) to feed the particular component of the reloaded cartridge.

Referring now to FIGURE 1 the overall operation of the preferred embodiment of the present invention will be broadly described. The cartridge cases are fed with their mouths up to the left side of the apparatus. Then the cartridges are advanced to the next respective station each time the platen is moved to its upper position. Then when the platen is returned to its lower position each cartridge case is worked upon according to the particular station at which it is located at the time.

In the preferred embodiment the cartridge case is moved through nine stations in the reloading operations. First the cartridge is moved to station A. There the case is checked to make sure that it is not unduly misshaped or of the wrong length.

At station B a die is provided which punches out the old primer and shapes the mouth of the cartridge case. From station B the cartridge is moved to station C where a new primer is inserted. With the new primer inserted, the cartridge case is moved to station D where the mouth of the cartridge case is belled.

From station D the cartridge is moved to station E where a charge of gun powder is dispensed into the case. Then at the next cycle the cartridge case is moved to station F where the amount of the charge is carefully and accurately checked when the platen returns to its lower position.

From the powder check station F the cartridge case moves to station G where the bullet is inserted to the proper depth. Then the cartridge is moved to station H where the case is crimped onto the bullet as desired before the cartridge is moved to station I which has a final sizing die to remove any irregular projections in the cartridge and thereby insure that the cartridge will fit the desired gun properly.

Referring now to the figures in more detail, the apparatus of the disclosed embodiment of the present invention will be described more specifically. The apparatus includes a base **20** having a pair of post guides **22** extending upwardly from the base. These post guides **22** carry a platen **23** extending therebetween on which various tools and other apparatus is located. As previously mentioned this platen **23** moves up and down in the operation of the apparatus. Details of the manner in which the platen **23** is so reciprocated will be deferred until later in this specification.

As mentioned above, the cartridge cases are moved across the base **20** sequentially to each of the operation stations. To this end a guide means indicated generally by the arrow **24** is provided extending from the left hand to the right hand side of the base **20**. As will become apparent in the description below, an advancement means indicated generally by the arrow **25**, closely cooperates with the guide means **24** to intermittently advance said cartridge cases as desired.

As can best be seen in FIGURES 1, 3, 5 and 11 the guide means **24** includes a bed plate **30** having a back rail **31** located thereon at a position immediately to the rear of the path taken by the cartridge cases across the base **20**. The back rail **31** is undercut along its forward edge in order to provide a shoulder **32** to grip in sliding relation the rim of the cartridge case. (See, for example, FIGURE 5 wherein said shoulder **32** is gripping rim **33** of case **34**.) The upper edge of the said shoulder **32** is tapered to correspond to the particular shape of the cartridge case. This arrangement insures that the various dies described below will be withdrawn from the cartridge case when the platen **23** is raised.

In order to index the various cartridge cases under the various stations, a plurality of index recesses **35** are formed in the back rail **31** at the proper positions. These recesses **35** are generally arcuate in shape although it should be noted that right hand corner **36** of each of the recesses has been rounded off in order to facilitate the advancement of the cartridges as herein described.

Forming part of the guide means **24** and the advancement means **25** is a cross slide **37** which reciprocates to the left and right in order to advance the cartridge cases properly. This cross slide **37** is held for sliding movement between the bed plate **30** and a front rail **38** and is urged rearwardly toward the back rail **31** by a pair of springs **39**. The action of the springs holds the cross slide **37** against the various cartridge cases retaining said cartridge cases in the indexed recesses **35**.

It will be noted that a plurality of generally arcuate index recesses **40** are provided at positions corresponding to various operation stations. The recesses **40** differ from the recesses **35** in that the area at the right side of each of the recesses **40** is ground off to form a camming surface **41**. With this arrangement the various cartridges remain in their respective recesses **35** as the cross slide **37** is moved to the left to prepare for the next advancement operation. In FIGURE 5 it can be seen that the cross slide **37** is undercut to form a shoulder **42** along the rear edge of the slide in order to assist in holding down the cartridge cases as the various dies are removed.

(See, for example, FIGURE 5 wherein the shoulder **42** engages the rim **33** of the case **34** opposite shoulder **32** of the back rail **31**.)

As mentioned previously, the cross slide **37** reciprocates back and forth to the left and right. This action is accomplished by the following structure. As disclosed in FIGURE 3 a motor **46**, through a pulley and V-belt arrangement, drives worm **47** which drives worm gear **48** journaled in bearings **49**. Splined to the worm gear **48** is a shaft **50** supported on bearings **51**.

Secured at the forward end of the shaft **50** is a face cam **54** having a continous cam groove **55** formed on its rear side. (See FIGURE 1 also.) This cam **54** rotates once every time the platen **23** is reciprocated up and down. Journaled on a rocker shaft **57** located just to the right of the face cam **54** is a bell crank **58** having a pair of arms **59** and **60**. The arm **59** has a cam follower **61** positioned in operative relation with the cam groove **55** of the cam **54**. The other arm **60** is connected by means of an adjustable connecting rod **63** to a depending flange **64** attached to the underside of the cross slide **37** and projecting down through an opening **66** in the base **20**.

As mentioned previously, the cross slide **37** not only moves to the right and to the left but it also moves forwardly as it passes around the cartridge cases on its return stroke. Therefore, the ends of the rod **63** are connected to the flange **64** and the arm **60** by spherical bearings in order to allow the cross slide **37** the required freedoms of movement.

Before proceeding with details of the manner in which the cartridge cases are fed and the apparatus located at the varous operation stations, the manner in which the platen **23** is raised and lowered will be described. Referring to FIGURE 3 an eccentric **69** for a pitman drive is keyed to the shaft **50**. The eccentric **69** has a yoke **70** with journal **71** thereon. The yoke **70**, through connecting rod **72**, is connected to yoke **73** journaled with a bushing **74** on bolt **75** attached to the platen **23**.

With this arrangement, each time the shaft **50** is rotated the platen **23** is moved up and down through its cycle of motion. It will be noted that since the face cam **54** and the eccentric **69** are both keyed to the same shaft, i.e., shaft **50**, the motion of the platen and the advancement means are correlated.

Referring now to FIGURE 4 the manner in which the cartridge cases are fed to the aforementioned guide means **24** will be described. There it may be seen that, attached to fixed crossbeam **77**, is a case feed tube **78** through which has been delivered a plurality of cartridge cases, of which case **79** is the lowermost and case **80** is next above. These cartridge cases are fed to the apparatus with their butts down and their mouths up. The cross slide **37** moves the cases sideways to the right and therefore an opening **81** is provided in the feed tube **78** to allow this operation.

Immediately below the feed tube **78** the bed plate **30** has been recessed to form an inclined cam surface **82** extending upwardly to the right at an angle of 3 to 5 degrees to horizontal. This surface **82** is provided so that as the cross slide **37** moves the cartridge case **79** to the right, the lower end of the case will move first causing the case to tilt, or rotate, to a position perpendicular to the surface **82**. A cartridge case in such "tilted" position as indicated in phantom lines **83**.

The inclined surface **82** is provided for the following purpose. Not unfrequently the used primer of the previously fired cartridge cases will extend beyond the butt of the cartridge case. This is caused by improper installation of the primer which is then partially ejected from the cartridge case by the force of the gases at the time the cartridge is fired. A primer **85** in the butt of cartridge case **80** is shown thus partially extended to illustrate such a condition.

The mentioned above tilting caused by surface **82** has the effect of lowering the left side (as seen in FIGURE 4)

of the edge of the mouth of the case 79. This enables the edge of the mouth of the case 79 to clear the primer 85 as the cases are moved to the right toward the first station A.

Naturally such a projecting used primer must also be reckoned with as it is moved along the guide means. To this end a channel 86 is formed in the bed plate 30 to accommodate such a projecting primer. In FIGURE 5 it may be seen how projecting primer 87 of cartridge case 34 is received in the channel 86.

Shifting now to the details of the tools and apparatus at the various operation stations, FIGURE 6 discloses the details of the components at station A. At station A the cartridge cases are checked to make sure that they are the right length and do not have any trash within them. The tool at station A also functions to round out generally the mouth of the cartridge case if such is necessary.

To accomplish these ends, a cup 89 having a hole 90 at the lower end thereof is threaded into the platen 23. Slidably carried within the cup 89 is a rod 91 having an annular flange 92 at a mid point thereon with a finger 93, formed by the rod, depending below said flange. The finger 93 has a shoulder 94 at its upper end immediately below the flange 92. Spring 95 resiliently holds the finger 93 in the lower position shown in the FIGURE 6 with the shoulder 94 abutting the upper surface of the bottom of the cup 89.

At the upper end of the cup 89 is located a micro switch having its actuator arm 97 in operative relation with cone shaped upper end 98 of the rod 91. The micro switch 96 is normally located immediately behind the rod 91 as seen in FIGURE 1, however, in FIGURE 6 the micro switch has been rotated ninety degrees (90°) in order that its details might be more easily illustrated. The micro switch 96 is connected in series with the power circuit to the motor 46, and the micro switches described below which are used to check the amount of new gun powder dispensed into the cartridge cases and verify that the safety shield of the reloading apparatus is properly installed. Preferably the micro switch 96 is of the "reset" type. That is, when the rod end 98 actuates actuator arm 97 tripping the switch open, the switch stays open until a reset button is pushed. This prevents the machine from overriding the switch 96.

In operation, as the platen 23 moves downwardly the finger 93 enters the mouth of the cartridge case 34. The spring 95 has sufficient strength that the finger 93 will round out the mouth of the case without tripping switch 96 if the case is not too badly damaged. On the other hand, if the case 34 is too long, or if there is trash inside of the case, the rod 91 will be stopped by such obstructions before the platen 23 has reached the bottom of its movement. This will move the rod end 98 upwardly relative to the actuator arm 97 thus actuating micro switch 96. And, since the micro switch 96 is connected in a series with the power circuit of the present reloading apparatus the reloading machine stops. At that time the operator corrects the situation, resets switch 96 and restarts the machine.

Shifting now to station B, in FIGURE 4 there is shown at station B a cartridge case 101 which has just had its old primer removed. The components which accomplish this task include a female sizing die 102 which is formed so as to shape the upper edge 103 of the case 101 as the platen is moved to its lowermost position. Extending down through the center of the female die 102 is a male punch 105 which has passed through the butt of the cartridge case ejecting old primer 106 which then falls through a dump tube 107 to a waste receptacle not shown.

At the next operation station, that is station C, a new primer is inserted in the particular cartridge case. The details of the apparatus at this station may be best seen in FIGURES 1, 7, and 11. New primers 110, with

their respective anvil ends up, are fed by gravity through a primer feed tube 111 located toward the rear of the reloading apparatus. The feed tube 111 is rather thin and weak and therefore it has a guard tube 112 disposed around it.

Located below the primer feed tube 111 is a primer metering disk 114 having six primer delivery holes 115 therein spaced sixty degrees (60°) apart. The disk 114 must receive new primers 110 from the feed tube 111 and sequentially deliver said new primers to the position immediately below the particular cartridge case into which they are to be installed. Therefore, the disk 114 is mounted on a rotatable shaft 117 extending up through hole 118 in the disk 114. Upper end 119 of the shaft 117 is split into several sections and is bored and tapped with a tapered thread. Thereby a tapered-thread screw 120 may be used to expand such upper end 119 against the walls of the hole 118 of the disk 114. This arrangement provides a clutch so that a primer 110 won't be sheared off if it feeds improperly from the feed tube 111.

The shaft 117 is driven by apparatus within the base 20 which apparatus rotates the shaft sixty degrees (60°) each time the platen 23 moves through its cycle. A description of this means will be deferred until later in this specification because the same means rotates the powder and bullet feed mechanisms.

In FIGURE 7, there is shown a cartridge case 122 which has just had installed in its butt end a new primer 110. Located just below the cartridge case 122 is a collet 123 carrying a primer installing finger 124 therein for sliding movement. The finger 124 is normally held in its lowered, or retracted, position by action of return spring 127 on flange 128 of the finger 124. Then the finger is raised to install the particular primer 110 by action of one end of walking beam 125 pivotally mounted on trunnions 126 secured to the base 20. (See FIGURE 1 also.) Located at the other end of the walking beam 125 is an adjustable upstanding rod 130. The rod 130 is located so as to be engaged by the platen 23 each time that the platen moves to its lowest position. This causes the finger 124 to be raised as previously described to install the new primer 110.

A great deal of upward force is used to install the primer 110 in the case 122. Therefore, an anvil 132, spring loaded by the spring 133, is carried by the platen 23 to counteract the force of finger 124.

It will be apparent that the new primers 110 must be very accurately located in order that they will be installed properly in the particular cartridge case. Therefore, as illustrated best in FIGURE 11, six index holes 134 are located in the metering disk 114 and are positioned to sequentially receive an index pin 135 attached to the platen 23. This index pin 135, which extends through a hole in the rear rail 31, depends sufficiently below the platen 23 that the pin engages and indexes the disk 114 before further motion of the platen raises the finger 124 sufficiently to contact the primer 110.

The cartridge case with the new primer installed is then removed to station D where the mouth of the cartridge case is belled outwardly to facilitate reception of the bullet at a later station. To this end the platen 23 carries at station D a belling die 137 which is essentially a depending rod having its lower end 138 rounded to accomplish the belling function.

The cartridge case, with its new primer installed and its mouth belled is then moved to station E where an accurately measured amount of gun powder is deposited into the cartridge case. As can best be seen in FIGURE 3, at the powder insertion station, the platen 23 is recessed on its upper side and receives in the bottom thereof a hardened bearing plate 141. Disposed in sliding relation with the bearing plate 141 is a gun powder metering disk 142 which has six powder delivery holes formed

therein sixty degrees (60°) apart similar to the primer delivery holes 115 in the primer metering disk 114.

Each of the delivery holes 143 is lined with a sleeve 144 of beryllium copper, brass or some other nonferrous material. The lining sleeve 144 is provided for two purposes. First, the metering disk 142 must be finely ground and polished in order to accomplish its intended purpose. This grinding leaves a residual magnetism in the disk. And if the hole walls are steel, magnetism, I have found, tends to cause a few flakes of gun powder to stick to the walls of the delivery holes. This causes inaccuracies in the amount of powder inserted in the cartridge cases. Naturally, the part 142 could be demagnetized after the above mentioned grinding operation, however, in practice the supplier of the said part sometimes forgets to demagnetize the part. With a brass lining or sleeve such as 144 residual magnetism is no problem. Also the disk 142 is very hard while beryllium copper and brass are rather soft. Therefore, it is easier to machine the beryllium copper or brass to accurately size the hole 143 than to machine the hole out of the hard steel.

Attached to the upper side of the platen 23 and engaging the disk 142 in sliding relation is a mount 145 on which is supported a gun powder hopper 146 filled with gun powder 147. The gun powder 147 is dispensed into a gun powder delivery hole 143 at a position near the rear of the platen 23. In three cycles of the platen 23, that delivery hole 143 is rotated around to the front of the platen where the delivery hole is aligned with a nozzle 148 and the powder falls into a waiting cartridge case such as case 149.

In order to rotate the powder metering disk 142 a shaft 150, having a pair of longitudinal semi-circular key ways 151, is rotatably mounted on the base 20. The shaft 150 extends up through the platen 23, the metering disk 142 and the mount 145 in a loose sliding fit since the shaft does not move up and down with the platen. The metering disk 142 is keyed to the shaft 150 by a pair of barrel keys carried by the metering disk 142 and riding in the key ways 151. The manner of operatively connecting the metering disk 142 with the rotatable shaft 150 is substantially the same as the manner of operatively connecting the bullet feed disk with its rotatable shaft described below. The connection of bullet feed disk to its rotatable shaft is disclosed in detail, therefore further details of keying the gun powder metering disk 142 to the shaft 150 are not illustrated.

Similarly to shaft 117 which intermittently rotates the primer metering disk 114, the shaft 150 is rotated sixty degrees (60°) each time the platen 23 goes through its cycle and all of said rotation takes place during the one-fourth of the platen cycle that it is near the top of its stroke. The means for rotating the shaft 150 as described is closely aligned with the means for driving the primer and bullet metering, or feed, mechanisms. Therefore the detailed description of said means will be delayed until after the bullet metering mechanism has been described.

After an accurate measure of powder has been dispensed into the particular cartridge case it is moved to the powder check station F. Details of the powder check station F can be best seen in FIGURE 8. Threaded into the platen 23 is a cup 155 having a hole 156 at the lower end thereof through which extends in sliding relation a rod 157. The rod 157 also extends through a collar 158 at the upper end of the cup 155.

The rod 157 is threaded at its upper end 160 and receives thereon three knurled nuts 161, 162 and 163 respectively. These nuts 161, 162 and 163 are to be selectively adjusted to different positions on the threaded portion 160 of the rod 157 and therefore the nuts should incorporate some sort of locking feature to hold them in the position to which they are adjusted.

Located in back of the rod 157 (to the left as seen in FIG. 8) is a reset type microswitch 165 attached to a bracket 166 which is hinged at 167 to a support 168 for a limited swinging movement between a position where actuator arm 169 of the microswitch projects between the nuts 162 and 163 and a position shown in phantom line where the actuator arm 169 is clear of said nuts.

For purposes of pivoting the microswitch 165 a rod 171 is slidably mounted in the platen 23 immediately below the switch 165. The rod 171 has a return spring 172 mounted thereon for resiliently urging the rod to its lower position. Located at the lower end of the rod 171 is an adjustable base 173 which is essentially a cylinder or cup threaded onto the rod 171.

The microswitch 165 is preferably of the "reset" type having internal electrical contacts which are opened when the arm 169 is moved toward the switch body. This switch 165 is connected in series with the power supply to the motor 46 and microswitch 96 as mentioned above. Therefore, when the switch 165 is actuated the machine will stop.

With this arrangement the powder 147 in cartridge case 175 is checked in the following manner. When the platen 23 is at its upper position the rod 171 is in its lowest position and gravity has urged the microswitch 165 to the position shown in phantom lines. At this point the rod 157 is in its lowest position relative to the platen 23. As the platen 23 moves downwardly the bottom of the rod 157 comes to rest on the powder 147 in the cartridge case 175 before the base 173 of the rod 171 engages the top of the machine base 20. Then after the bottom of the rod 171 engages the base 20, further downward movement of the platen 23 causes the microswitch 165 to rotate clcokwise as seen in FIG. 8. This moves the actuator arm 169 toward the nuts 162 and 163 on the rod 167. If there is the right amount of powder in the cartridge case 165, the end of the actuator arm 169 will be inserted between the nuts 162 and 163 and nothing will happen. However, if there is too much powder in the case, then the arm 169 will engage the nut 162 as the microswitch 165 is pivoted actuating the switch. Correspondingly if there is too little powder in the case 175 the arm 169 will engage the nut 163. In either case the microswitch 165 will be tripped and the machine will stop.

It can be seen that the above described arrangement enables the operator to rapidly adjust the reloading machines so that the amount of gun powder can be quickly and very accurately checked. In fact, on the machines which are presently being manufactured and distributed the powder charge may be checked within one tenth grain using Bull's Eye powder.

From powder check station F the cartridge case is moved to the bullet feed and insertion station G. The details of the mechanism for feeding the bullets and inserting them in the cartridge cases can best be seen in FIGURES 9 and 10. In FIGURE 9 the platen 23 is disclosed in the lower position where a bullet 177 has been inserted in a cartridge case 178 which has been positioned at the station G. Similarly to the gun powder feed, the bullets 177 are supplied through a bullet feed tube 179 mounted in a collar 180 threaded into the platen 23 near the rear side of the platen. The interior diameter of the hole through the collar 180 is dictated by the caliber of the particular bullets 177 being inserted.

A plate 181 holds a bullet metering disk 182 in slidable relation with the underside of the platen 23. The bullet metering disk 182 has six bullet dispensing holes 184 spaced sixty degrees (60°) apart as in the case of the primer and gun powder feed metering disks 114 and 142 respectively. These holes 184 are considerably oversized relative to the designed bullet caliber. This is because the bullets 177 have grease on them, which grease tends to accumulate in the holes. The grease would jam the machine by causing the bullets 177 to stick if the holes were only slightly larger than the bullets. Because of the oversized nature of the holes 184 the metering disk 182 has a reduced diameter portion 185 at its midsection exposing the side of all of the holes 184. A cantilever spring 187 is located so that its operating end 188 is en-

gaged by each respective bullet **177** as it is moved to the front position where it is ready to be installed in a cartridge case.

FIGURE 10 discloses the bullet feed mechanism before the platen **23** has fully reached its lower position where the bullet **177** is inserted in the cartridge case **178**. This was done in order that the manner in which the spring **187** holds the bullet **177** against the inward wall of the hole **184** may be illustrated. It should be noted that the lower portion of the operating end **188** of the spring **187** is curved away from the bullet **177**. This is done in order to allow the cartridge case **178** to cam the spring outwardly from the bullet **177** during the insertion step. (See FIGURE 9 also.)

In substantially the same manner as the gun powder metering disk **142**, the bullet metering disk **182** is intermittently rotated by a shaft **190** which is mounted for rotation on the base **20**. The shaft **190**, in loose sliding fit, extends up through a hole **191** in the platen **23**, as well as, a hole through the center of the metering disk **182** and does not move up and down with the platen and metering disk. In order to transfer the rotation of the shaft **190** to the metering disk **182** a pair of longitudinal semicircular key ways **192** are provided on the shaft and partially receive a pair of barrel keys **193** which are held in semicylindrical recesses **194** in the disk **182**. The keys **193** are captivated by the underside of the platen **23** and the plate **181** and therefore move with the disk **182** up and down with the platen.

In operation, the bullet feed and insertion mechanism works as follows. Commencing as shown in FIGURE 9 where anvil **196**, carried in collar **197** has seated the bullet **177** in the cartridge case **178**, the platen **23** begins to move upwardly. When the platen **23** nears the upper end of its stroke means within the base **20** cause the shaft **190**, and therefore the disk **182**, to rotate sixty degrees (60°) locating an empty hole **184** below the bullet feed tube **179** and a hole **184** with a bullet **177** in it over hole **198** in the plate **181**. At this point a new bullet **177** is deposited into the hole **184** now at the rear of the disk **182** and spring **187** holds the bullet **177** in the hole **184** against the inward wall of the hole so that the bullet will not fall out. Then the platen returns downwardly and inserts the bullet **177** in the new cartridge case which has been meanwhile positioned below the anvil **196**. The details of the aforementioned means for intermittently rotating the shaft **190** will be described below.

From station G the cartridge case, with a bullet inserted, is moved to operation station H where the mouth end of the cartridge case is crimped onto the bullet. To this end a crimping die **199** is provided (see FIGURE 1). The crimp may be either of the "tapered' type or the "rolled" type according to the particular crimping die used. The crimping die is conventional in the art and therefore a detailed description and illustration are not deemed necessary at this time.

From station H the cartridge is moved to station I which includes a final sizing die **201**. The sizing die **201** is essentially a female die of the shape of the final bullet. This die irons out any bulges which may occur in crimping imperfect or feather split cases. The die **201** is conventional in the art and therefore further detailed description and illustration are not deemed necessary.

From the station I the completed reloaded cartridge is advanced off of the right side of the base **20** and falls into some suitable receptacle (not shown).

As mentioned previously, the new primers, the gun powder, and the bullet feed metering disks **114**, **141** and **182** respectively are each intermittently rotated sixty degrees (60°) each time the platen **23** passes through the top of its stroke. At this time the means which rotate the respective shafts **117**, **150** and **190** to accomplish the above operation will be described. Referring now to FIGURES 2 and 3, there is located within the base **20** a plate **203** anchored in spaced relation to the underside of the top of the base by a plurality of spacer bolts **204**. Between the plate **203** and the base **20** are gears **205**, **206** and **207** which are attached to shafts **117**, **150** and **190** respectively and engage each other so that rotation of one gear will rotate the other two. It will be noted in FIGURE 3 that the shaft **150** incorporates a pair of bushings **208** which hold the gear **206** in proper orientation and provide bearings for the shaft. Similar bushings are provided on shafts **117** and **190** for the same purpose.

In order to rotate the shafts **117**, **150** and **190** the proper amount and at the proper time, a mechanism which is basically a Geneva movement is used. More particularly a bevel gear **210** on shaft **50** rotates a bevel gear **211** in 1:1 relation. The bevel gear **211** is keyed to vertical shaft **212** which is journaled in a plate **203** and the base **20** at journals **213** and **214** respectively. A thrust bearing **215** absorbs the thrust on the beveled gear **211**.

Attached to the shaft **212** at a point just above the plate **203** is a crank arm **216** having an upstanding pin **217** thereon. This crank arm **216** and the pin **217** rotate with the shaft **212** at a constant speed.

Located just to the left of the shaft **212** (as seen in FIG. 2) is a rotatable shaft **220** having attached to it a cam plate **221**. The cam plate **221** has six radial slots **222** which are adapted to be sequentially engaged by the pin **217** and cause the cam plate **221** to be rotated sixty degrees (60°) every time the shaft **212** (by rotation of the shaft **50**) is rotated once. Just above the cam plate **221** is located a gear **224** which is keyed for a movement with the said cam plate. The gear **224** is mounted in engagement with the gear **205**.

The operation of the intermittent drive mechanism is as follows. Assume that the motor **46** is driving the shaft **50** at a constant speed and the platen **23** is being raised from its lowest position. At this point the pin **217** is one hundred eighty degrees (180°) from the position shown in FIGURE 2. Therefore there is no motion of any of the shafts **117**, **150** or **190** and their associated parts. As shaft **50** continues to rotate, raising the platen **23**, the crank arm **216** is also rotated until it engages one of the slots **222**. This occurs at a point approximately one-eighth of the cycle before the platen **23** reaches its uppermost position. That is, the pin **217** engages the slot **222** at a time when the shaft **50** must rotate forty-five degrees (45°) more before the platen reaches its uppermost position. During the next ninety degrees (90°) of rotation of the shaft **50** (and therefore crank **216**) the cam plate **221** is rotated sixty degrees (60°) which in turn rotates the shaft **117**, **150** and **190** sixty degrees (60°). At this point the particular slot **222** engaged by the pin **217** has been moved to a position where the pin disengages it. It should be noted that in moving the slot **222** engaged by the pin **217** sixty degrees (60°) a new slot **222** is positioned to be engaged by the pin the next time the pin comes around. Thus the operation continues.

For purposes of safety, a transparent screen **225** is removably positioned in a channel **226** at the front of the machine. The operator observes the operation of the machine through this transparent screen. For purposes of accessability the screen **225** may be removed, but the machine should not be operated with the screen removed. Therefore a microswitch **227** is located on the channel **226** and has its actuator arm (not shown) positioned so that the microswitch **227** is open when the screen **225** is not properly installed. The microswitches **96**, **165** and **227** are all connected in series with each other and the power supply to the motor **46**. Therefore, if any of the microswitches are open the power to the motor **46** is cut off and the machine will not run.

Although only one form of the present invention has been shown and described in detail, it will be apparent to those skilled in the art that such is by way of illustration only and that numerous changes can be made thereto without departing from the spirit of the true in-

vention. Therefore, the invention disclosed herein is to be limited solely by the scope of the appended claims and the equivalents thereof.

I claim:

1. An ammunition reloading machine comprising:
a base;
means for successively delivering a plurality of cartridge cases to one end of said base;
guide means on said base for restraining said cartridge cases to movement along a path on said base toward the other end of said base;
advancement means for sequentially advancing said cases along said path to a plurality of operation stations on said base;
a platen located above said base;
means to move said platen between a lower operating position and an upper position;
means interconnecting the motion of said advancement means with the motion of said platen so that the said cases are advanced only when said platen is near said upper position;
means on said machine at different ones of said operation stations to insert sequentially a new primer, gun powder and a new bullet in each of said cartridge cases;
and check means at one of said operation stations for checking the amount of gun powder inserted into each of said cartridge cases, said check means including:
a rod carried by said platen for vertical sliding movement, the lower end of said rod depending below said platen and being adapted to extend into the mouth of a cartridge case located below it when said platen is at its lower position, the upper end of said rod extending above said platen and being threaded;
a pair of nuts threaded on said rod upper end at closely spaced positions, said positions being in predetermined relation to said platen when said platen is in its lower position and the lower end of said rod is resting on a proper charge of gun powder in a cartridge case below it;
and sensing means mounted on said platen for sensing the relation of said nuts to said platen when said platen is in its lower operating position and stopping said reloading machine if the relation of the said nuts is other than said predetermined relation, said sensing means being mounted on said platen for limited swinging movement between an inoperative position and an operative position, said sensing means having means for engaging said base and swinging said sensing means into said operative position as said platen approaches said lower position.

2. The reloading machine set forth in claim 1 wherein the machine is driven by electrical power and said sensing means includes:
a micro switch electrically connected to the source of electrical power so as to cut off said power when the switch is actuated, said switch being pivotally mounted on said platen for movement between a first position and a second position, said switch having an actuator arm adapted to project between said nuts when said switch is in said first position and said nuts are in said predetermined relation to said platen, said switch being normally urged toward said second position;
and means for moving said switch from said second position to said first position as said platen reaches its lower position, whereby said actuator arm will engage one of said nuts and actuate said switch cutting off the power if said rod is not resting on a proper charge of powder when said platen reaches its lower operating position.

3. An ammunition reloading machine comprising:
a base;
means for successively delivering a plurality of cartridge cases to one end of said base;
guide means on said base for guiding said cartridge cases along a path on said base;
advancement means for sequentially advancing said cases along said path to a plurality of operation stations on said base;
a platen located above said base;
means to move said platen between a lower operating position and an upper position;
means on said machine at different ones of said operation stations to insert sequentially a new primer, gun powder and a new bullet in each of said cartridge cases;
said means for inserting a new bullet including;
a bullet metering disk having top and bottom surfaces with a circular side wall mounted on said platen for rotation about a vertical axis, said disk having formed therein a plurality of bullet delivery holes opening through the top and bottom surfaces of said disk, said disk sidewall being reduced at its center portion to expose said holes;
magazine means for holding a large number of bullets;
means for feeding bullets from said magazine means to said delivery holes at one position on said platen;
means for rotating said disk intermittently to sequentially locate said delivery holes each with a bullet therein at a second position on said platen, said second position being at one of said operation stations;
and anvil located immediately above said disk at said second position;
and means on said platen for urging a bullet located in each delivery hole against the wall of said delivery hole when said hole is in said second position.

4. The ammunition reloading machine set forth in claim 3 wherein said delivery holes are substantially larger than the bullets which they are adapted to deliver.

5. The ammunition reloading machine set forth in claim 4 wherein a means on said platen for urging the bullets against the wall of the delivery holes includes a spring projecting into the particular hole through said reduced portion.

6. The ammunition reloading machine set forth in claim 5 where said spring is curved away from the bullet at its lower edge so as to be cammed away from the bullet when the bullet is inserted in a cartridge case.

7. In an ammunition loading machine having means for inserting into cartridge cases primers, gun powder and bullet:
a base;
guide means on said base for guiding said cartridge cases along a generally horizontal path on said base, said guide means including a base plate having an upper surface for engaging and supporting said cases from below;
delivery means for delivering cartridge cases in a column with the butt end of the cartridge cases down, said delivery means delivering said cases to a first point on said guide means where the lowermost cartridge case butt end rests on said base plate upper surface;
advancement means on said base for engaging the lowermost cartridge case in said column of cartridge cases and moving it from said first point to a second point on said guide means;
and tilting means located at the lower end of the delivery means for receiving the lowermost cartridge case in the delivery means and causing the lowermost cartridge case to tilt as said cartridge case is moved from said first point to said second point and cause the trailing side of the edge of the mouth of the said lowermost case to tilt downwardly away from the cartridge case butt end immediately above

so that the trailing side of the cartridge case edge will clear any projecting primer located in said next above cartridge butt end.

8. In an ammunition reloading machine having means for inserting new primers, gun powder and bullets in cartridge cases having used primers therein:

a base;

guide means on said base for guiding a plurality of cartridge cases along a generally horizontal path across the top of said base, said guide means including a bed plate;

delivery means for delivering cartridge cases to be reloaded to said guide means, said delivery means delivering said cartridge cases in a column with their butt ends down, said delivery means delivering said cartridge cases to a first point on said bed plate;

advancement means for engaging at its butt end the lowermost cartridge case in said column and moving it along said path from said first point toward a second point on said path;

said bed plate having formed thereon at said first point an upwardly facing surface, said surface extending from said first point towards said second point at an acute angle to the column of cases, whereby as said lowermost cartridge case is advanced from said first point it is tilted to a position perpendicular to said surface and the trailing side of the edge of the mouth of the said cartridge case will clear any projecting used primer in the butt end of the cartridge case immediately above.

9. An ammunition reloading machine comprising:

a base;

delivery means for delivering to said base at one point thereon cartridge cases having used primers therein, said delivery means delivering said cartridge cases in end-to-end relation in a vertical column with their butt ends down;

guide means on said base for guiding said cartridge cases along a path across the top of said base from said one point to a second point spaced from said first point, said guide means including a bed plate having an upwardly facing surface to engage and support the underside of said cartridge case butt end, said bed plate being formed with a short upwardly facing inclined surface at said first point immediately below said column of cartridge cases, said inclined surface extending upward from said first point toward said second point at an acute angle to the column of cases, said inclined surface being short in length and terminating a substantial distance from said second point, said bed plate being formed to support only a portion of the cartridge case butt ends on either side of the cartridge primer to accommodate thereby any projecting used primers;

advancement means cooperating with said guide means for moving said cartridge cases along said path, said advancement means engaging the butt end of the lowermost cartridge in said column and moving it sideways relative to said column from said first point toward said second point, whereby as said last mentioned cartridge case is advanced from said first point it is tilted to a position perpendicular to said inclined surface and the trailing side of the edge of the mouth of the cartridge case will clear any projecting used primer in the butt end of the cartridge case immediately above.

10. The ammunition reloading machine set forth in claim 9 including:

removal means for sequentially removing old primers from the cartridge cases, said removal means being located on said path between said point of termination of the inclined surface and said second point;

and said bed plate has a channel formed in the upper surface thereof, said channel extending from said inclined surface to a point on said path where said

removal means removes the old primers, whereby said channel accommodates any used primer projecting from the butt end of any cartridge case.

11. In ammunition reloading apparatus, the combination of:

a base;

means on said base for receiving cartridge cases and supporting them with their mouths up and various positions on the base;

a platen located above said base;

means to move said platen between a lower operating position and an upper position;

check means carried by said platen at a first position for checking the amount of powder in a cartridge case located on said base immediately below said check means, said check means including:

a rod carried by said platen for vertical sliding movement, the lower end of said rod depending below said platen and being adapted to extend into the mouth of a cartridge case located below it when said platen is at its lower position, the upper end of said rod extending above said platen and being threaded;

a pair of nuts threaded on said rod upper end at closely spaced positions, said positions being in predetermined relation to said platen when said platen is in its lower position and the lower end of said rod is resting on a proper charge of gun powder in a cartridge case below it;

and sensing means mounted on said platen for sensing the relation of said nuts to said platen when said platen is in its lower operating position and stopping said reloading machine if the relation of said nuts is other than said predetermined relation, said sensing means being mounted on said platen for limited swinging movement between an inoperative position and an operative position, said sensing means having means for engaging said base and swinging said sensing means into said operative position as said platen approaches said lower position.

12. In ammunition reloading apparatus, the combination of:

a base;

means on said base for receiving cartridge cases and supporting them with their mouths up at various positions on the base;

a platen located above said base;

means to move said platen between a lower operating position and an upper position;

and check means carried by said platen at a first position for checking the amount of powder in a cartridge case located on said base immediately below said check means, said check means including:

a rod carried by said platen for vertical sliding movement, the lower end of said rod being adapted to extend into the mouth of a cartridge case located below it when said platen is at its lower position, said rod having an upper portion;

and sensing means mounted on said platen for sensing the relation of said upper portion of said rod when the platen is in said lower position, said sensing means including an operating arm, first and second elements located on one of the group consisting of said operating arm and said rod upper portion, said first and second elements projecting toward the other of said group, a third element located on the other of said group, said third element projecting toward said first and second elements, said sensing means being mounted on said platen for limited swinging movement between an inoperative position and an operative position where said third element projects between said first

and second elements when said platen is in its lower position and the lower end of said rod is resting on a proper charge of gun powder in a cartridge case below it, said sensing means having means for engaging the base and swinging said sensing means into said operative position as said platen approaches said lower position, said sensing means including means for generating a signal if said third element engages said first and second elements when said sensing means is moved into said operating position.

13. The combination set forth in claim 12 wherein said first and second elements are mounted on said rod upper portion and said third element is mounted on said operating arm.

14. The combination set forth in claim 12 wherein said sensing means includes an electrical switch and said movement of said operating arm opens and closes said switch.

15. The combination set forth in claim 13 wherein said sensing means includes an electrical switch and movement of said operating arm opens and closes said switch.

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