Oct. 19 1948. R. M. FLANAGAN 2,451,615

MACHINE FOR GAUGING AND ASSORTING CARTRIDGES ACCORDING TO HEIGHT OF PRIMERS

Filed July 21, 1944 5 Sheets-Sheet 1

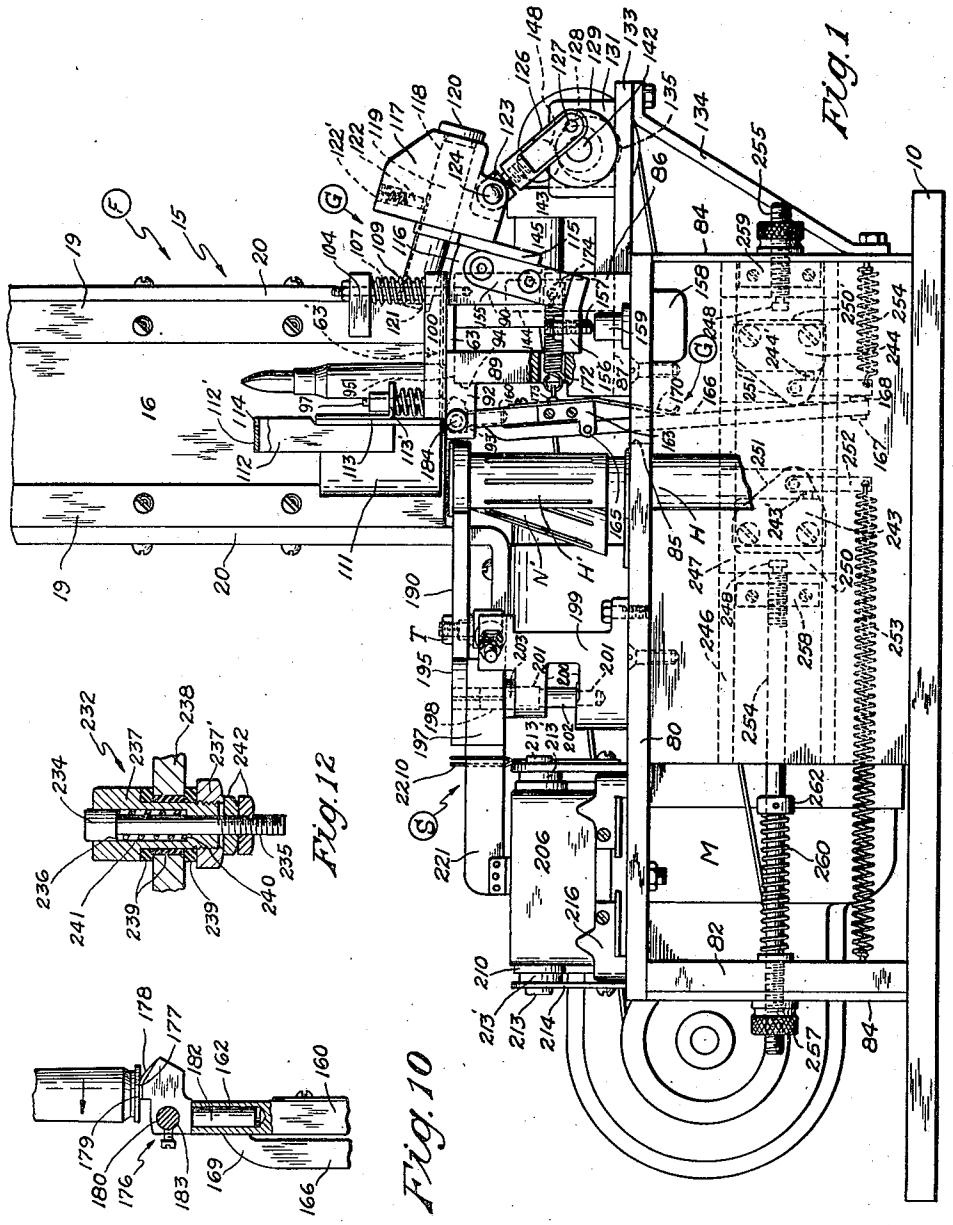


Fig. 1

Fig. 12

Fig. 10

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Filed July 21, 1944 5 Sheets-Sheet 2

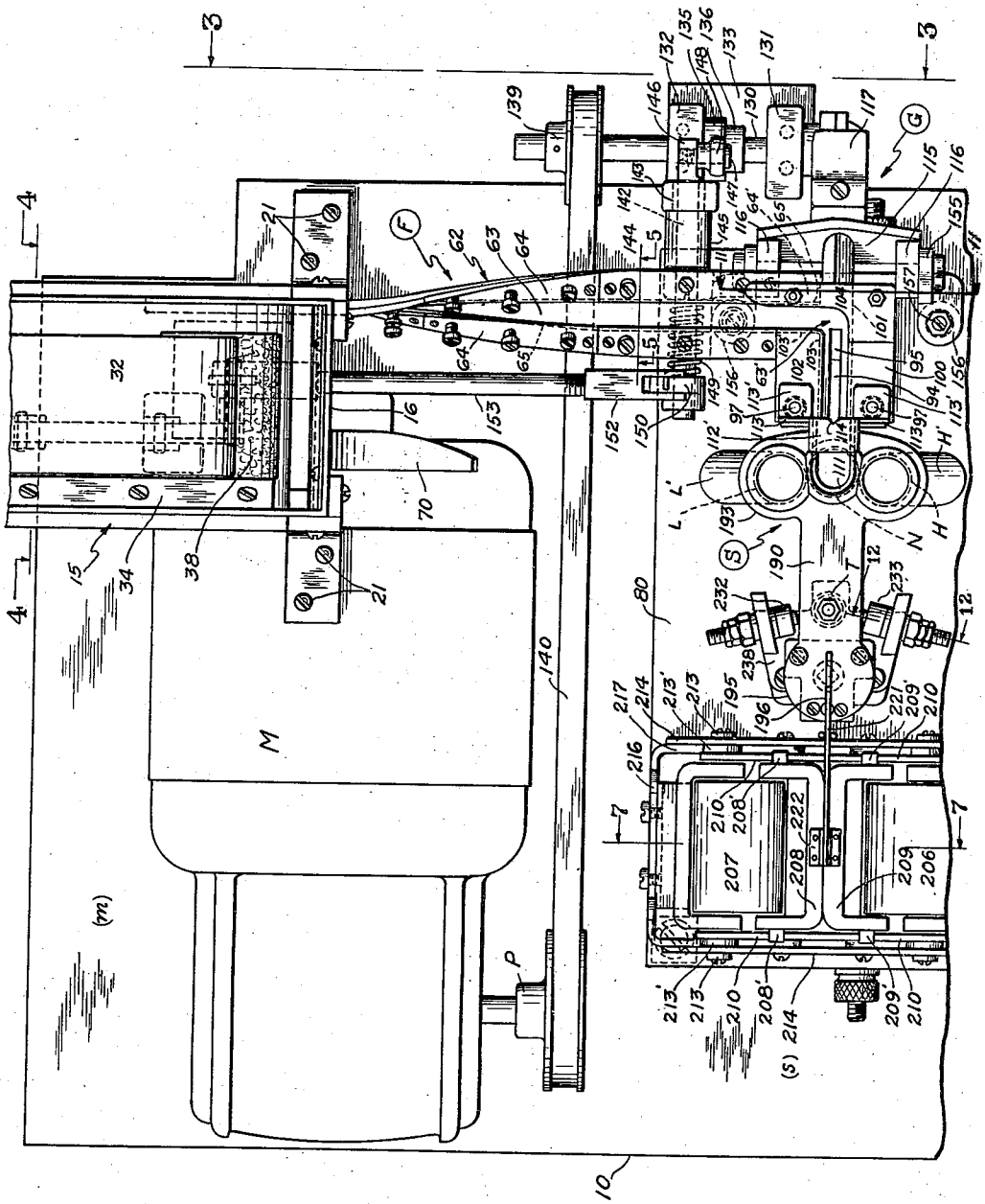


Fig. 2

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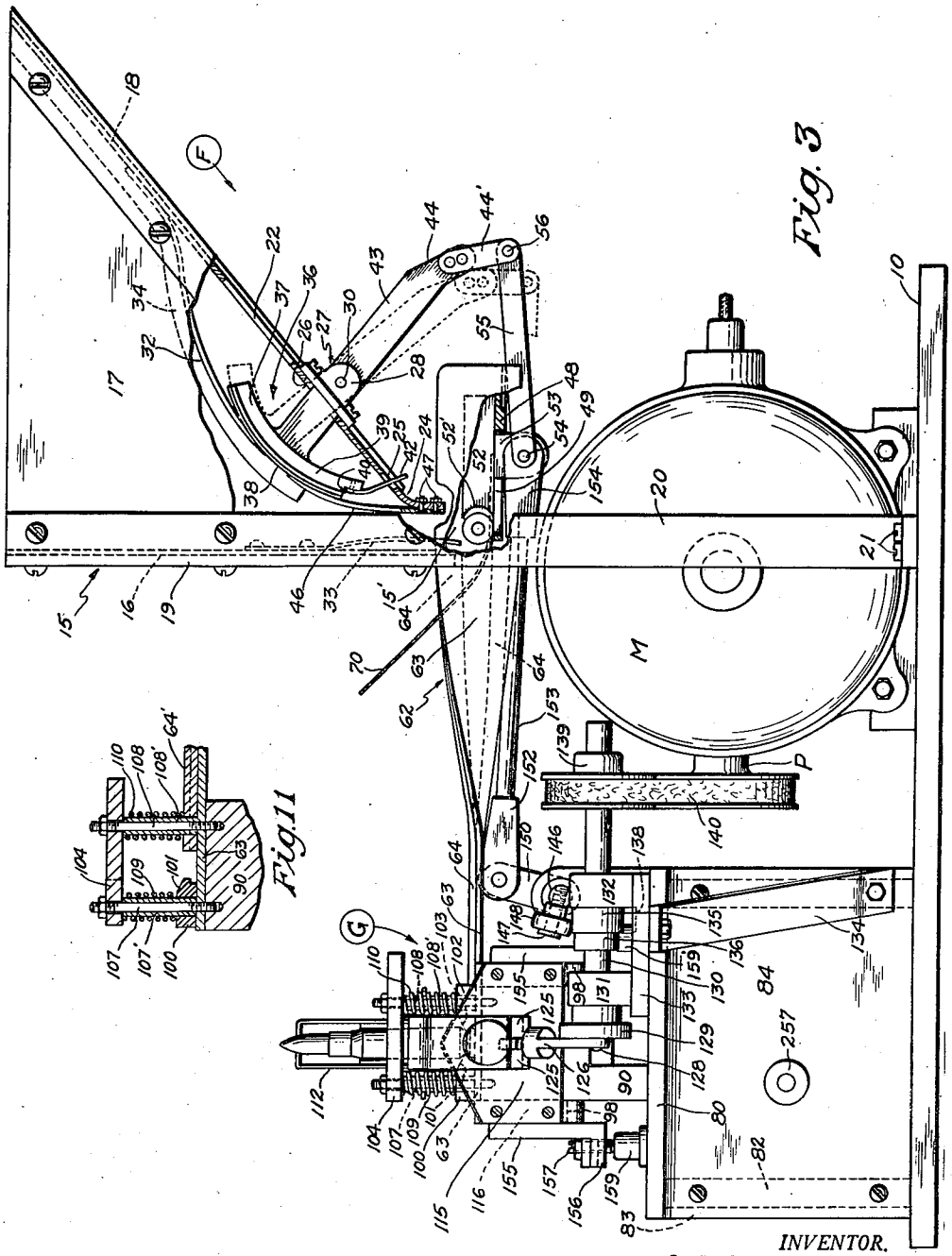


Fig. 3

Fig. 11

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MACHINE FOR GAUGING AND ASSORTING CARTRIDGES ACCORDING TO HEIGHT OF PRIMERS

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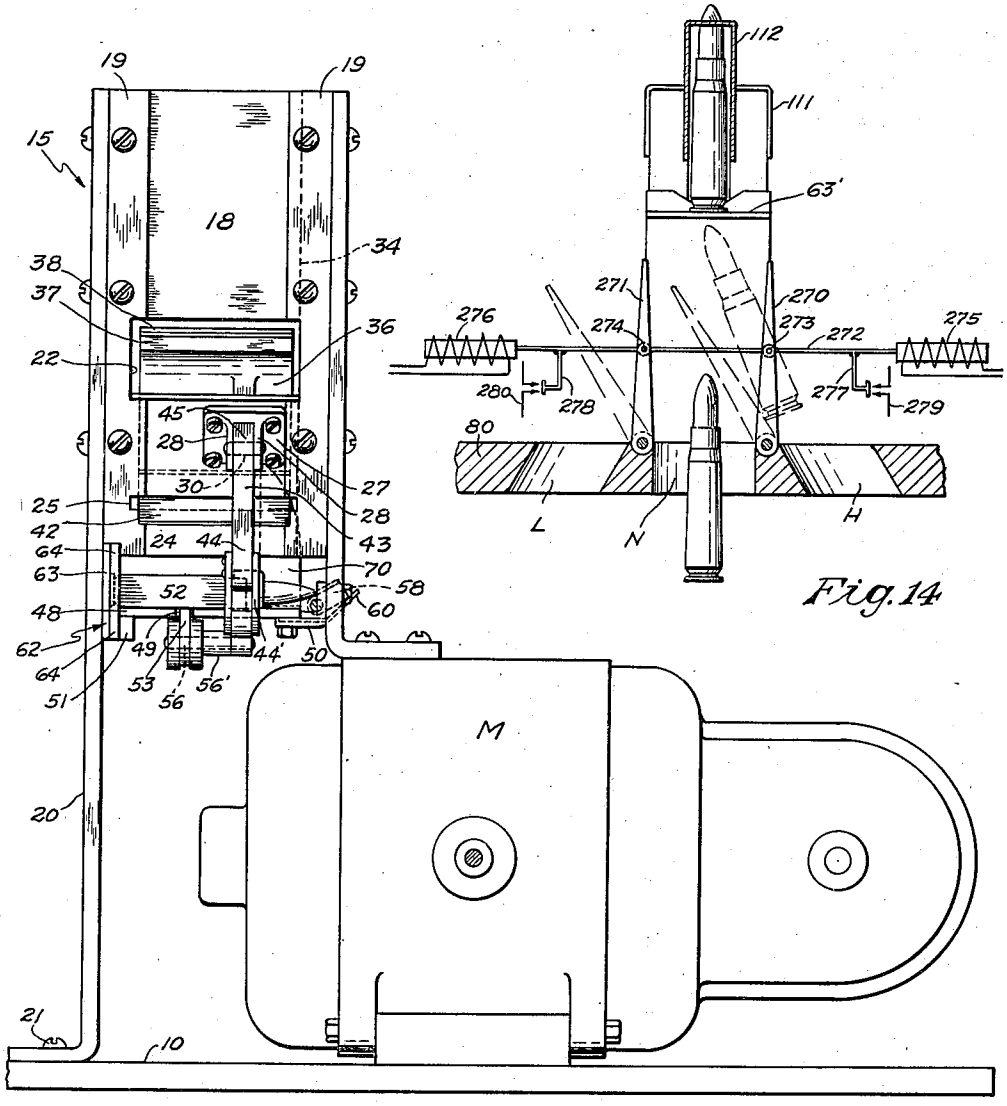


Fig. 14

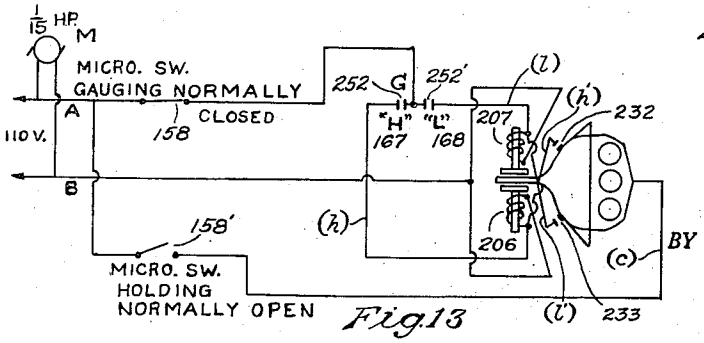


Fig. 13

Fig. 4

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MACHINE FOR GAUGING AND ASSORTING CARTRIDGES ACCORDING TO HEIGHT OF PRIMERS

Filed July 21, 1944 5 Sheets-Sheet 5

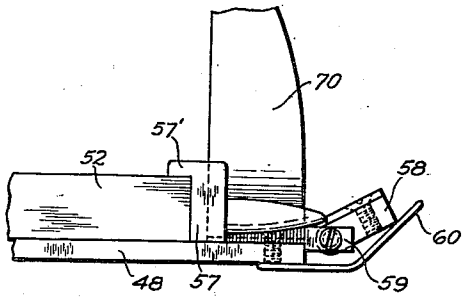


Fig. 6

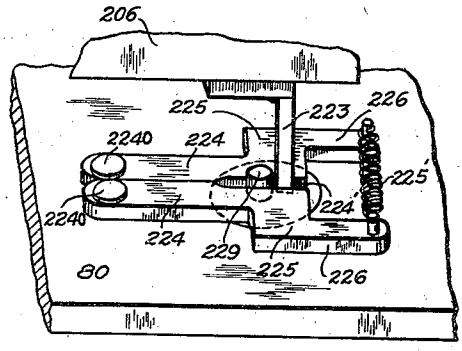


Fig. 9

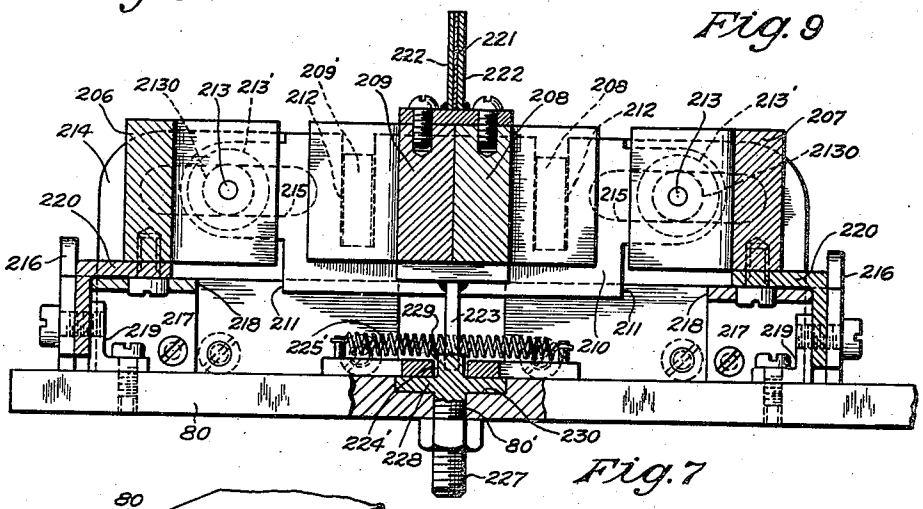


Fig. 7

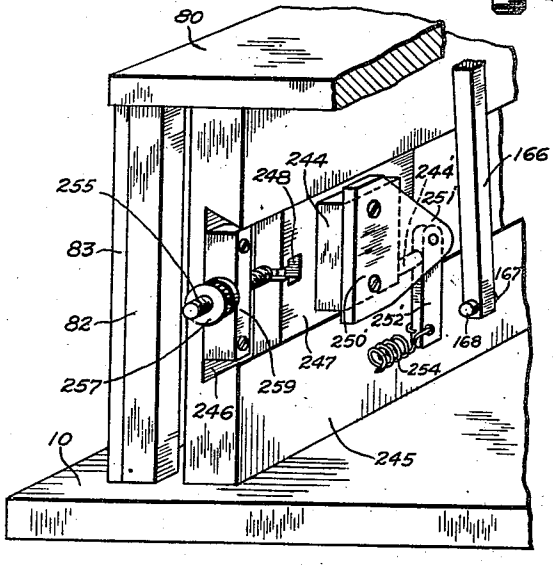


Fig. 8

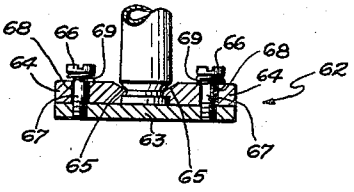


Fig. 5

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UNITED STATES PATENT OFFICE

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MACHINE FOR GAUGING AND ASSORTING CARTRIDGES ACCORDING TO HEIGHT OF PRIMERS

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Application July 21, 1944, Serial No. 545,969

8 Claims. (Cl. 209—88)

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The present invention relates in general to gauging, and, in particular, to a machine for automatically gauging ammunition components such as primer cups in the heads of cartridge cases.

In the manufacture of most types of ammunition, it is desirable that the finished cartridges of one caliber shall be substantially uniform both in size and shape, and in the arrangement of certain components relative to other components thereof. Uniformity in these respects not only guarantees cartridges having good ballistics, but also cartridges which can be depended upon to perform with characteristic uniformity under all conditions. There is, however, a further and more important reason why ammunition of one caliber such as .30 caliber ball, .30 caliber tracer or .30 caliber armor piercing must be accurately dimensioned and assembled to within extremely small tolerances; namely, that the loading, firing, extraction and ejection mechanisms of automatically operated firearms are substantially precision-built elements and are capable of operation continuously and without malfunctions only when handling precision-built ammunition.

One of the more common causes for malfunctioning of automatic firearms has been the inaccuracy with which the primer cups have been positioned in the heads of the cartridges. Obviously, a primer cup which has been seated too low in the head of the case and hereinafter termed a low primer, will not receive the full impact of the firing pin, and hence may cause hang fires or misfires. On the other hand, primers which have not been seated sufficiently in the head, called high primers, may cause prematures or may even jam the feeding mechanism of the firearm. It has been ascertained that for optimum performance, the primer should be substantially .004" below the head of the case with permissible tolerances of plus or minus .004".

The present invention discloses an improved means for gauging primers in cartridge cases, an object of the invention being to gauge primers automatically without the intervention of manual operations. A further object is to provide gauging means which automatically separates the gauged cartridges according to the heights of the primers. A still further object is to automatically feed cartridges to a gauging device which gauges the primers and then delivers the gauged cartridges into separate groups. A still further object is to provide an electromechanical gauging machine adapted to automatically gauge high,

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low and normal primers in the heads of the cartridge cases, and to separate and deliver the gauged cartridges into separate groups.

Other objects, features and advantages of the invention are described in greater detail in the following specification with the aid of the accompanying drawings.

Although the invention described herein and shown in the drawings is an embodiment especially suited to gauging primers in cartridge cases, it will be understood that the present invention is not limited by the embodiment shown, and that the invention may have other uses than those specifically described and may be modified in construction and operation to accomplish other uses all within the scope of the appended claims.

In the drawings:

Fig. 1 is a side elevation of the improved primer height gauging machine of this invention.

Fig. 2 is a fragmentary plan view of the machine shown in Fig. 1.

Fig. 3 is an end elevation in the direction of the arrows 3—3 of Fig. 2.

Fig. 4 is an end elevation in the direction of the arrows 4—4 of Fig. 2.

Fig. 5 is a section of the cartridge guiding track on line 5—5 of Fig. 2.

Fig. 6 is an enlarged fragmentary detail view of the pressure block shown in Fig. 4 for forcing the head of a cartridge against the cartridge guide track.

Fig. 7 is an enlarged elevation in section of the solenoid frame on line 7—7 of Fig. 2.

Fig. 8 is an enlarged perspective view of a fragmentary portion of the machine base showing a micro-switch carriage and the lower end of the gauging arm.

Fig. 9 is a perspective view of the selector arm adjusting means.

Fig. 10 is an enlarged fragmentry view of the head of the gauging arm showing the gauging finger.

Fig. 11 is an elevation in section on line 11—11 of Fig. 2 of a fragmentary portion of the rear end of the gauging table.

Fig. 12 is a sectional plan view in the horizontal plane of line 12—12 of Fig. 2 of a holding contact.

Fig. 13 is a diagram of the electrical circuit.

Fig. 14 is a schematic view of a modified form of selector means and of solenoid control means.

Referring to the drawings, the machine is seen to embody three distinct but cooperatively related subassemblies, namely the feeding mechanism, the gauging mechanism and the selector delivery

mechanism, these several mechanisms being indicated by the letters F, G and S respectively in the drawings. For the purpose of clarity, each subassembly will be described in detail separately, the cooperative relationship of the several mechanisms being brought out in the description of the operation of the entire machine.

The entire machine is supported on a base plate 10 which is a substantially flat, rectangular piece of metal such as cold rolled steel provided with rectangular notches in diagonally opposite corners which divides the base plate into an area *m* which is adapted to accommodate the feeding mechanism and power unit, the latter comprising a motor and reduction gear indicated generally at M; and the area *s* which is adapted to accommodate the gauging and selector delivery mechanism hereinafter described. In the embodiment shown, the motor M has a rating of 1725 R. P. M. driving a pulley P of the reduction gear at substantially 70 R. P. M. The specific power unit shown has been found to operate the gauging machine at an optimum speed, which far exceeds the speed with which primers may be gauged manually, but it will be understood that a motor gear reduction unit M having other speed and power characteristics may be used.

Feed mechanisms

The cartridges to be gauged are placed by hand in a feed hopper indicated generally at 15 which, as shown, comprises a substantially triangular, hollow receptacle constructed of a relatively thin metal front plate 16, a pair of metal side plates 17, and a rear or bottom plate 18, see Fig. 3, the plates being secured together along longitudinally intersecting edges by means of angle iron strips 19 fastened thereto. As shown, the rear or bottom plate 18 slopes upwardly at an angle of substantially 45° and constitutes the bottom of the hopper. The width of the hopper is slightly greater than the width of a standard cartridge case while the height of the hopper is such that its volume is sufficient to hold approximately two hundred cartridges. It will be understood, however, that the size of the hopper may be altered within the scope of the present invention as defined in the appended claims.

The hopper is shown fixedly supported on the base plate 10 by means of a pair of posts 20 of flat metal stock bolted at their upper ends to the front edge of the hopper and at their lower ends to the base plate 10 by suitable bolts 21.

The sloping bottom 18 is provided substantially midway of its length with a relatively large substantially rectangular opening 22, below which the lower portion 24 of the bottom plate 18 curves downwardly in a smooth arc such that its lower end lies in the substantially vertical plane of the front face 16 of the hopper. A relatively narrow transverse slot 25 is cut through the lower portion 24 of the bottom plate for the purpose hereinafter described. A longitudinally extending slot 26 is formed adjacent the upper edge of the plate 24 and, as shown in Figs. 3 and 4, a bracket member 27 having a pair of spaced parallel flanges 28 projecting rearwardly at substantially right angles therefrom is fastened over the slot 26 with the space between the flanges opposite the slot 26. Each flange 28 is provided with a horizontal hole constituting a bearing for supporting one end of a pivot pin 30 of a hopper agitator hereinafter described.

Secured to the bottom 18 of the hopper and extending over the opening 22 thereof is a relatively thin, curved liner plate 32 comprising brass or other suitable metal, the upper edge of which is secured adjacent the upper edge of the hopper bottom opening 22. The lower edge of the brass liner 32 is left free as clearly indicated in Fig. 3, while the curvature of the liner 32 is such as to provide a space beneath its under surface and the hopper bottom 18 within which a hopper agitator may operate as hereinafter described. Supplementing the curved liner plate 32 is a curved breast plate 33 secured on the inside of the front plate 16 of the hopper. It will be evident, as shown, that the lower end of the liner plate 32 and breast plate 33 are so disposed as to form a converging throat portion in the hopper for segregating the individual cartridges from the mass of cartridges in the hopper and delivering individual cartridges successively in a single layer to the lower or discharge end 15' of the hopper.

Suitable means are also provided in the hopper bottom to compensate for the taper of the cartridges whereby the cartridges are enabled to move downwardly in substantially parallel relationship to the bottom of the hopper and comprise a relatively narrow strip 34 of brass or other suitable metal which is substantially wedge shaped in cross section. The wedge strip 34 is suitably fastened, as shown, to the hopper bottom 18 along one edge thereof, the thick edge of the strip lying along the outer edge of the hopper bottom 18 corresponding to the left-hand side of the hopper as seen in Fig. 2.

To augment the movement, by gravity, of the cartridges down the hopper bottom, suitable means is provided comprising an oscillating agitator indicated generally at 36 in Fig. 3. The agitator comprises a substantially rectangular plate 37 shaped so as to provide a curvilinear surface which has a fiber cover piece 38 secured thereon. The forward edge 39 of the plate 37 is milled down as shown in Fig. 3 or otherwise tapered on both its upper and lower surfaces so as to provide a relatively thin lip portion having a recess 40, the latter being adapted to form a seat on the upper side of the plate 37 for one end of a thin substantially rectangular plate 42 of sheet brass or other flexible metal which is secured thereto by screws or other suitable means 50 as to lie substantially flush with the upper surface of the curvilinear plate 37. The opposite or lower end of the flexible plate 42 has bevelled corners and is adapted to slip through and to oscillate in the narrow transverse slot 25 in the lower portion 24 of the bottom plate 18. Formed on the underside of the agitator plate 37 nearer the right-hand edge than the left-hand edge thereof, see Fig. 4, and substantially intermediate its upper and lower ends is a rearwardly extending lever 43 having a pair of holes at its extreme lower end 44, and a hub portion 45 intermediate its upper and lower ends. The hub 45 is provided with a suitable hole to receive the pivot pin 30 which is supported in the flanges 28 of the bracket 27. By oscillating the lower end of the lever arm 43, the agitator 36 will be oscillated back and forth beneath the flexible liner plate 32. If the throw of the agitator is large, the aperture 22 provides clearance therefor. As shown, the lower edge of the liner plate 32 is adapted to ride on the upper end portion of the curved fiber surface 38 of the agitator plate and to this end may be tapered so as to preserve the continuity of the adjoining surfaces. Supplementing the upper curved liner plate 32 but spaced therefrom is a flexible sheet metal liner plate 46 which, as shown, is fastened

with suitable bolts 47 to the lower edge 24 of the bottom plate 18 on the inner face thereof. The upper free end of the flexible plate 46 curves upwardly so as to overlie the lower edge of the agitator surface 38 for all positions thereof. Thus, cartridges moving down over the upper curvilinear plate 32 are momentarily engaged frictionally by the curved, fiber surface 38 of the agitator 36 which, as shown, spans the space between the upper and lower liner plates 32 and 46 respectively, thereby urging the cartridges down into the constricting throat portion of the hopper to its discharge aperture 15'.

Suitably secured in a horizontal plane beneath the discharge opening 15' is a cartridge feeding and supporting member 48 comprising a substantially rectangular metal plate having a rectangular closed slot 49 along its longitudinal axis. The plate 48 is suitably supported along its left-hand side, see Fig. 4, on a rib 51 which is fastened to the bottom edge of a cartridge feed track 62 hereinafter described, which in turn is suitably fixed to the vertical legs 20 of the hopper. The opposite edge of the plate 48 is supported by one leg of a right angle bracket 50 which is secured to a hopper supporting post 20 on the right-hand side of the hopper 15.

Slidable on the upper surface of the supporting plate 48 is a cartridge feeder which comprises a substantially rectangular solid metal block 52, the forward edge of which is formed with a longitudinally extending arcuate groove 52' of suitable radius to partially embrace a cartridge case. Fastened to the underside of the feed block 52 is a depending lug 53 which is adapted to extend through the slot 49 of the supporting plate 48. A hole is made horizontally through the lower end of the lug 53 whereby fastening means such as a pin or threaded bolt 54 may be used to connect the lug to suitable reciprocating means hereinafter described. The bolt 54 also serves to connect the lug 53 to the forward end of a link 55; the latter is pivotally connected at its opposite end by a pin 56 and spacer bushing 56' to the lower end of a pair of links 44' which are fastened to the lower end 44 of the agitator arm 43.

A guide is provided on the upper surface of the supporting plate 48 for guiding the feed block 52 during its reciprocating movement and to hold the feed block 52 down on the plate 48. As shown in Fig. 6, the guide comprises a block 57 which is fastened on the upper surface of the plate 48 and provided with a right angle flange 57' which is adapted to overlie the right-hand edge of the feed block 52.

The opposite edge of the feed block is adapted to slidingly engage the inner wall of a rearwardly extended portion of the cartridge feeding track 62 hereinafter described.

It will be clear that by reciprocating the lug 53 of the feed block 52, the latter will be moved back and forth on the supporting plate 48. In its foremost position, the upper surface of the feed block 52 covers the discharge port 15' of the hopper, thereby prohibiting the discharge of a cartridge onto the surface of the supporting plate 48. However, when the feed block is moved to its rearmost position as shown in Fig. 3, it uncovers the discharge port 15' enabling a single cartridge to drop onto the supporting plate 48. When the feed block is again advanced, the cartridge on the plate 48 is engaged by the arcuate leading edge 52' of the feed block and pushed thereby into the feed track 62. Simultaneously, the agitator 36 is oscillated so as to urge the

cartridges in the hopper to slide down into the throat thereof in the manner described above.

To insure that cartridges will be moved against the feed track 62 and properly engage therein, suitable means is provided comprising a pressure block 58, see Fig. 6, which is substantially rectangular and provided at one end with a tongue adapted to be pivotally connected by a pintle to hinge members of a hinge plate 59 which is fastened on the upper surface of the supporting plate 48 adjacent the forward edge thereof. The pressure plate 58 is resiliently held in operative position by means of a U-shaped spring 60, the open ends of which are suitably secured to the underside of supporting plate 48. The opposite end of the spring is bent upwardly to engage the back of the pressure block so as to hold the latter in a semi-upright position. Thus, as the cartridges are advanced by the feed block 52 into the feed track 62, the noses of the cartridge bullets ride upon the inclined surface of the pressure block 58 which cams each cartridge transversely, slightly, to the direction in which it is being fed, thereby holding the head of the cartridge squarely against the substantially vertical wall of the feed track 62. Concurrent forward movement of a cartridge by the feed block 52 will readily engage the flange of the cartridge head beneath suitable lips of the feed track described below.

The latter is indicated generally at 62 and comprises a relatively thin but stiff strip of metal 63 provided on each edge with suitably spaced parallel guides 64, which, as shown in Fig. 5, are provided on their inner edges with overhanging lips or flanges 65. The flanges are suitably profiled so as to engage in the extraction groove in the head of a cartridge case to hold the case firmly in the feed track, the flange of the head being slidably engaged beneath the overhanging lips 65 of the track.

Resilient means are provided for securing the guides 64 to the feed track 63 to enable the guides to be displaced upwardly slightly in the event a burr or other foreign matter is clinging on the head of the case and thus prevent a jam and serious breakage of the parts. The resilient securing means shown comprise machine screws 66, the shanks 67 of which are adapted to pass freely through suitable holes 68 in the guides 64 and to be threadedly engaged in the feed track 63. A coil spring 69 is carried on each screw shank between the head thereof and the upper surface of the guides 64 to hold the guide firmly but resiliently on the feed track 63.

From the drawings, it will be clear that the cartridges are delivered from the feed hopper in a substantially horizontal position and are adaptable to be moved from this position to a substantially vertical position in which the cartridges are fed to the gauge mechanism G. To this end, the feed track is provided in its length with a substantially 90° twist. Moreover, a thin flexible orientating finger 70 is shown fastened at its lower end to the forward edge of the supporting plate 48 adjacent the pressure block 58, the opposite end of the finger being curved upwardly so as to support the bullets of the cartridges and thereby to augment the orientation thereof from their horizontal to their vertical position.

Gauging mechanism

The cartridges are fed from the feed track 62 in a substantially vertical position to the primer gauging mechanism, indicated generally at G.

Referring to Figs. 1 and 3, the gauging mechanism is supported on a table 80 which in turn is mounted on the base plate 10 by four vertical posts 82, one post being secured by suitable screws at each of the four corners of the table 80. Substantially vertical side plates 83, see Fig. 8, and end plates 84, Fig. 3, are mounted beneath the outer edges of the table 80 and to the posts 82 to enclose the space beneath the table.

The table top 80 is substantially rectangular and provided at one end with a gauge finger slot 85, see Fig. 1, which is substantially three-eighths of an inch in width and extends inwardly on the longitudinal axis of the table substantially three inches. Adjacent the inner or closed end of the slot are three holes having discharge tubes hereinafter identified by the letters H, L and N and arranged in triangular relationship, said tubes being of suitable diameter to freely pass a cartridge case. Two of the tubes, namely H and L, are located on opposite sides respectively of the gauge slot 85, the third tube N being on the longitudinal axis thereof but slightly in advance of the two tubes H and L.

Mounted on the table 80 over the gauge slot 85 is a substantially rectangular U-shaped frame member 86 having upstanding legs 89 and 90 and a base portion 87 which is provided with a substantially rectangular groove on its underside in longitudinal alignment with the gauge slot 85 of the table. Suitable fastening means are provided for securing the base 87 of the member 86 to the top of the table 80. The leg 89, see Fig. 1, is formed with a forwardly extending shelf 92 which is provided at its foremost edge with a horizontal hole 93 which is adapted to support the jewel bearings of a gauge finger hereinafter described.

As indicated in Fig. 1, a relatively narrow horizontal slot 94 is cut through the forward edge of the shelf 92 parallel to the longitudinal axis of the gauge slot 85 of the table 80. Moreover, the slot 94 is extended rearwardly in the form of a groove 95 of corresponding width in the upper surface of the leg 89, as shown in Figs. 1 and 2. Fastened on the shelf portion 92 of the frame on opposite sides of the slot 94 are a pair of posts 97 provided with screw threads on their upper ends for the purpose hereinafter described. Sweated or otherwise secured in apertures in the lower portion of the leg 90 and on opposite sides of the frame member 86 are a pair of laterally extending trunnions 98 as shown in Fig. 3.

It will be noted that the leg 90 is slightly shorter than the leg 89, this variation in height being substantially equal to the thickness of the bottom plate 63 of the feed track 62, the end of which lies in a substantially horizontal plane and is adapted to extend across the width of the U-shaped frame 86 at right angles thereto, the right-hand edge of the plate 62, see Fig. 1, being suitably secured to the top of the leg 90. The top surface of the feed track is thus brought substantially flush with the top of the grooved leg 89 and its slotted shelf portion 92 and forms a substantially smooth surface hereinafter referred to as the gauging table 63'.

Cartridges being delivered to the gauging mechanism G from the hopper 15 by the feed track 62 are adapted to make a substantially right angle turn on the gauging table 63' and to this end suitable guide means are provided comprising a guide block 100 which spans the two legs 89 and 90 and is provided with a hole at its forward end adapted to slide over the upstanding post 97. The

inner edge of the guide block 100 is bevelled, as shown in Figs. 3 and 11, and formed with an overhanging flange or lip 101 suitably profiled to engage in the extraction groove of a cartridge case. Opposite the guide 100 and arranged in substantially parallel spaced relationship thereto is a second guide block 102 which is similarly bevelled on its inner edge and provided with an overhanging flange 103. Moreover, the block 102 is shorter than the block 101, its rear end being bevelled and provided with an overhanging flange or lip 103' which is substantially at right angles to the flange 103 of its longitudinal inner edge. This overhanging flange 103' is adapted to be positioned substantially in alignment with the overhanging flange or lip 65 of the adjacent guide 64 of the feed track 62 and forms a continuation thereof. An extension 64' of one of the feed track guides 64 is located opposite the guide flange 103' to complete the cartridge feeding guide track on the rear end of the gauging table 63'.

Arranged above the guide blocks 100 and 102 and at the rear edge of the gauging table 63' is a substantially L-shaped cam block 104, the long arm of which extends in the direction of the feed track 62, the short arm extending at substantially right angles thereto. The inner edges of the arms of the cam block 104 lie slightly inside of the flange 65' of the guide extension 64' and the flange 101 of the guide block 100 respectively for the purpose hereinafter described. The cam block 104 is supported by means of a pair of posts 107 and 108, see Fig. 11, the lower ends of which extend freely through vertical holes in the guide block 100 and the track extension guide 64' and are screw threaded in the upper end of the leg 90. Suitable cylindrical sleeves 107' and 108' respectively are carried on the shanks of the posts, the lower ends of each sleeve being adapted to pass freely through the bored holes of the guide block 100 and guide block 64' and seat on the top of the feed track bottom plate 63. Each post carries a coil spring 109 and 110 respectively mounted betwen the undersurface of the cam block 104 and the upper surfaces of the guide block 100 and guide extension 64' respectively; and nuts at the upper end thereof.

In accordance with this construction, the cam block 104 may be fixedly secured in vertically spaced parallel relationship to the gauging table 63' whereas the guide blocks 100 and guide 64' are resiliently held in position thereon. Similar resilient fastening means are provided by the posts 97 for the forward end of both the guide block 100 and the guide block 102.

From the foregoing description, it will be evident that as the cartridges are fed from the feed track 62 onto the gauging table 63', the flange of a cartridge head is first engaged by the overhanging flanges or lips 103' and 65' of the guide block 102 and guide extension 64' respectively, while the upper body portion of the case is moved into engagement with the inner edge of the long arm of the cam block 104. As the cartridge continues to advance, the right angle of the cam block turns the cartridge into a path at substantially right angles to the direction in which it is being fed from the hopper. During its movement in this new direction, its flange is engaged by the lips 101 and 103 of the guide block 100 and 102 respectively. The movement of the cartridges in this new direction is accomplished by means of an automatic pusher or auxiliary feeder hereinafter described.

Referring to Figs. 1 and 2, the fixed posts 97

at the forward end of the gauging table 63' also constitute supports for a cartridge deflector hood which, as shown, comprises a semicylindrical tubular member 111 having a pair of vertical members 112 provided with a substantially rectangular web portion 112' spanning the upper end of the head; and flanged members 113 extending laterally from the sides of the tubular member, each member being provided with a right angle flange 113'. The latter are drilled vertically so as to fit loosely over the threaded ends of the posts 97 and are adapted to be secured thereon by suitable nuts threaded on the ends of the post. The transverse web portion 112' of the deflector hood is adapted to be positioned so as to extend slightly below the tip of the nose of a cartridge which is supported on the gauging table 63' and is provided with a notch 114 in which the nose of the cartridge is to engage. Thus, as a cartridge is being pushed forward over the gauging table by succeeding cartridges, its nose is momentarily held back by engagement in the notch 114 while its head is pushed forwardly. The cartridge will thereupon be deflected backwardly and subsequently slide head end first off of the end of the gauging table 63'.

The automatic pusher or auxiliary feed means for feeding the cartridges across the gauging table 63' over a primer gauging finger hereinafter described and off of the end of the table comprises a substantially rectangular cross head 115 fastened at its opposite ends by suitable fastening means to the edges of a pair of sector-shaped members 116 which, as shown, extend at substantially right angles to the plane of the cross head, each sector being provided with a horizontal hole at its apex of suitable diameter to make a nice rotating fit on one of the trunnions 98 of the leg 99. A substantially rectangular block 117 is fastened by screws or other means to the back of the cross head 115 substantially intermediate the ends thereof and is provided on its longitudinal axis with a drilled hole or sleeve 118. The latter is adapted to receive a pusher member which comprises a pin 119 having a head 120 at one end and a slightly bevelled face 121 at its opposite end. The pusher pin 119 is held in adjusted position in the sleeve 118 of the cross head by means of a resiliently mounted pin 122 and socket screw 122', the latter being threadedly secured in a tapped hole in the upper edge of the block 117. The lower rear corner of the block 117 is cut out to provide clearance for a pitman adjuster 123 which comprises a threaded shank having a flat apertured head adapted to be pivotally secured by means of a pin 124 between spaced parallel lips 125 formed on the underside of the block 117 The shank of the pitman adjuster 123 is threadedly secured in one end of a pitman 126 which is provided at its opposite end with a horizontally drilled and reamed hole 127 for connecting the pitman 126 to suitable reciprocating means hereinafter described.

It will be clear that by reciprocating the pitman 126, the cross head 115 will be oscillated to and from the gauging table 63', thereby advancing and retracting the pusher pin or pusher 119 to and from engagement with cartridges standing on the gauging table 63'. In accordance with the adjustability of the various parts of the pusher or auxiliary feed mechanism, each time the pusher pin 119 moves forwardly the cartridge nearest the forward end of the gauging table 63' will be moved into gauging position wherein its primer is properly located on top of a primer gauging finger supported in the table as hereinafter described.

The reciprocating means for actuating the pitman comprises a crank pin 128 eccentrically mounted on a rotatable disk 129 and adapted to engage in the hole 127 in the end of the pitman 126. The disk 129 is keyed or otherwise secured to the overhanging end of a rotatable shaft 130 which is mounted intermediate its ends in a pair of spaced roller bearing blocks 131 and 132 which are carried on a shelf 133. The latter is substantially rectangular but has a forwardly extending arm adapted, as shown, to extend along the edge of the table top 80 opposite the hopper and to be secured to the table by bolts so as to support the shelf thereon, the opposite end of which overhangs the end of the table. A bracket 134 fastened at its upper end to the underside of the overhanging end of the shelf extends downwardly diagonally from the end of the shelf and is secured at its lower end to the adjacent end plate 84 of the table. The bearing blocks 131 and 132 are suitably secured to the shelf adjacent the outer end thereof.

Keyed to the rotatable shaft 130 between the roller bearing blocks 131 and 132 is a cam disk 135 which is secured against endwise movement on the shaft by a collar 136. A suitable recess 138 is shown, see Fig. 3, in the top of the shelf 133 beneath the cam disk 135 to provide clearance therefor. The opposite overhanging end of the shaft 130 is provided with a pulley 139 which is keyed to the shaft, the pulley being driven by a belt 140 connected to the motor pulley P.

The function of the cam disk 135 is to transmit the rotational motion of the shaft 130 to a reciprocating motion for actuating the feed block 52 and hopper agitating mechanism described above. To this end, a shaft 142 is supported at substantially right angles to the shaft 130 in a U-shaped bracket comprising parallel spaced bearing blocks 143 and 144, the bracket being fixedly mounted on the inside edge of the shelf 133, as shown in Figs. 1 and 2. A single sleeve member 145 is shown mounted on the shaft 142 between the two bearing blocks. The shaft 142 is provided on its rear end with a flat 146 having a transversely drilled and threaded hole in which is adapted to be secured the shank portion of a machine bolt 147 which constitutes a rocker arm for a cam follower 148 which is rotatably mounted thereon.

It will be understood that the cam follower 148 is adapted to be held in operative engagement with the rotating cam disk 135 and to this end the opposite end of the shaft 142 is encircled by a coiled torque spring 149, see Fig. 2, one end of which is fastened to the adjacent bearing block 144; the opposite end of the spring has a short substantially straight portion adapted to clip over one edge of a crank arm 150 which is keyed or otherwise secured to the forward end of the shaft 142. Pivotally secured to the outer end of the crank arm 150 is one end of a pitman 152 having a longitudinally screw threaded bore in its opposite end in which is threadedly secured one end of a connecting rod 153. The opposite end of the connecting rod is threadedly secured in a second pitman 154 which is pivotally secured by the aforementioned pin 54 to the lower end of the depending lug 53 of the reciprocating feed block 52 described above.

Thus, when the motor M is energized and the pulley P rotates, it drives the shaft 130 by means of the belt 140 and pulley 139. As the shaft 130

rotates, the cam disk 135 rotates causing the cam follower 148 to rock up and down thereby oscillating the shaft 142 and arm 150 and transmitting reciprocating motion to the feed block 52 and oscillating motion to the agitator 36. Cartridges in the hopper are thereby discharged onto the plate 48 and are fed successively along the feed track 62 to the top of the gauging table 63'. Simultaneously the rotating disk 129 actuates the eccentric crank pin 128 so as to transmit oscillatory motion to the pivoted cross head 115 and to the pusher pin 119 carried thereon. The oscillatory motion of the pusher pin 119 thereupon advances successive cartridges intermittently along the gauging table 63', the primer of the cartridge being slidable over the groove 95 and slot 94 thereof to a predetermined position thereon at which its primer is adapted to be gauged by the hereinafter described gauging finger.

As seen in Figs. 1, 2 and 3, each sector 116 of the cross head has a bracket member 155 bolted on its outer face adjacent the lower end thereof, each bracket having a transversely extending foot portion 156. Each foot is provided with a tapped hole in which an adjustable switch operating stud 157 is threadedly secured, the lower end of the stud being adapted to extend through its respective foot 156. Fastened to the underside of the table top 80 immediately beneath each respective switch operating stud 157 is a micro-switch 158 and 158' respectively, see Figs. 1 and 3, of well known construction, each having an actuating pin 159 and 159' which extends upwardly through an aperture in the table top 80 and is adapted to be engaged and actuated by its respective switch operating stud 157.

In the embodiment shown, the micro-switch 158 hereinafter termed the gauging switch is set so that it is normally closed and is momentarily opened only when its pin 159 is engaged and pressed down by the adjustable stud 157. The micro-switch 158' on the opposite side of the table and hereinafter identified as the holding switch is set so that it is normally open but is momentarily closed when its pin 159' is engaged and pressed down by its respective stud 157. It will be evident that by adjusting the studs 157, one stud may be made to engage and actuate its respective switch prior to the actuation of the other and thus as the sectors 116 oscillate, the micro-switches may be actuated either simultaneously or with a predetermined time delay sequence for the purpose hereinafter described.

The primer gauging means per se is shown in Fig. 1 and in detail in Fig. 10 and comprises a composite arm consisting of a relative short post 160 provided at its upper end with a socket 162 and at its lower end with a pair of L-shaped face plates 163, the latter being fastened securely to opposite sides of the post 160 and provided with horizontal holes in their laterally extending ends. Pivotally supported between the laterally extending ends of the face plates 163 by a transverse pin 165 is a relatively long arm 166 provided with suitable contact points 167 and 168 at its lower end and on opposite sides thereof as shown in Figs. 1 and 3. The pivot point of the arm 166 is substantially one-third the way down from the top thereof, the top of the arm being provided with a knee portion 169 adapted to engage the adjacent side of the post 160. A suitable leaf spring 170 is shown fastened at its upper end to the post 160, the lower end of the spring being adapted to engage and exert a resilient force against the arm 166 at a point thereon below its pivot point so that the knee 169 of the arm 166 will be resiliently held against the upper end of the post 160. A coil spring 172 is shown secured at one end to a bracket 173 which is fastened to the post 160. As shown in Fig. 1, the coil spring 172 extends rearwardly through suitable apertures in the legs 89 and 90 of the U-shaped frame 86, and is fastened to the leg 90 by means of a plug member 174 which is seated in a counterbored hole in the outer face of the leg 90 and provided with an apertured tongue in which the end of the coil spring may be hooked. By pivotally mounting the arm 166 to the post 160 in this manner, the arm is enabled to "break" relative to the post in the event the pivotal movement of the latter becomes excessive and thus prevent injury to the micro-switches which are adapted to be actuated as hereinafter described by the contacts 167 and 168 at the lower end of the arm 166.

Secured in the socket 162 of the post 160 by means of a stud shaft 182 is a separable gauging finger or head 176 which comprises a piece of flat metal stock having a carboloy insert 177 suitably secured in its upper edge. The insert is substantially one-half the width of the finger 176 and extends above the upper edge thereof forming a relatively thin rib which comprises an upwardly inclined ramp 178 adjacent that end thereof which is first engaged by the cartridges being fed thereto by the pusher pin 119. The actual gauging surface of the rib 177 comprises that substantially flat portion 179 at the top of the ramp, the length of which is substantially less than the diameter of the primer cap aperture in the head of a cartridge case so as to enable the gauging surface 179 to contact the primer cap in the head of the cartridge case. A substantially horizontal hole 180 is formed in the rear part of the gauging head and constitutes a bearing for a shaft 183 hereinafter termed the pivot point of the gauging head and which extends therethrough, opposite ends of the shaft 183 being rounded and polished and adapted to be engaged by suitable jewel bearings 184 mounted in the horizontally drilled holes 93 in the shelf portion 92 of the frame member 86. In its assembled position, the gauging head 176 is located in the gauge slot 94 of the shelf 92 and is movable freely therein on its bearings 184, its swinging motion being in a substantially vertical plane coincident with the longitudinal axis of the gauging table 63'. The lower extremities of the gauge head, namely the post 160 and arm 166, thus swing about the pivot point 183 of the gauging head. Due to the relatively short distance between the gauging surface 179 on the gauging head and the pivot 183 as compared to the relatively long distance between the contact points 167 and 168 at the lower end of the arm 166 and the pivot point 183, it will be palpable that even a scarcely discernable movement of the gauging surface 179 will be multiplied many times so as to transmit relatively large movement to the contacts 167 and 168.

As shown, the post 160 and hence the arm 166 are spring biased or held in an abnormal position by means of the coil retaining spring 172. In the present embodiment, this abnormal position of the arm 166 corresponds to that position into which the arm 166 must be moved to enable the gauging finger to engage a low primer. In short, the gauging head will not be moved from its abnormal or initial biased position by a low

primer, but will be displaced from this position both by a primer of normal height or a high primer.

Referring to Fig. 1 of the drawings, it will be seen that the contact 168 of the arm 166 is normally displaced to the right or in its operative position for gauging a low primer whereas when gauging a normal primer or a high primer, the arm 160 will swing to a central or neutral position or to the left respectively, and, in the latter event, the contact 167 is swung into operative engagement with its respective micro-switch.

Selector and discharge mechanism

The respective positions taken by the contacts 167 and 168 of the arm 166 are used to operate suitable electromechanical mechanism for delivering a gauged cartridge into its proper discharge tube H, L or N.

The electromechanical mechanism is shown in Figs. 1, 2 and 7 and embodies, in general, a solenoid controlled pivotally mounted T-shaped selector arm 190 having three suitably disposed holes in its transverse portion 193, each hole having a short length of flexible tube L', N' and H' depending therefrom adapted to deliver a cartridge therein into one of the corresponding discharge tubes L, N or H of the table top 80. To this end, each tube of the selector arm 190 is adapted to be swung by the arm beneath the cartridge deflecting hood 111 of the gauging table 83' so as to receive the cartridge therefrom and deliver it into the proper discharge tube in the table 80.

The selector arm 190 is formed at its rear end with an enlargement 195 which is slotted longitudinally as at 196. The enlarged end of the selector arm is secured by means of suitable screws to the top of a carrier member 197, Fig. 1, which in turn has a slot corresponding to the slot 196 in the selector arm 190; and a substantially square hole 198 in the center thereof.

Suitable means for pivotally supporting the assembled selector arm 190 and its carrier 197 comprises a frame member 199 which is bolted to the top of the table 80 and has a pair of rearwardly extending vertically spaced horizontally disposed ears 200, each ear being drilled vertically to provide a bearing 201 for a shaft 202. The latter is rotatably supported in the bearings 201 and is provided with a spacer collar 203 which is suitably fastened to the upper end of the shaft and adapted to seat on the top surface of the upper ear 200. The upper end of the shaft is square in cross section and adapted to fit tightly in the square hole 198 of the selector arm carrier 197.

The selector arm is pivoted selectively from any one of its three possible positions corresponding to the height of the primer being gauged by means of a pair of solenoids and a single armature. The solenoids are of the usual construction comprising U-shaped laminated core members 206 and 207 respectively, and similarly formed armatures 208 and 209.

In the present embodiment, the two armatures 208 and 209 have been secured together so as to form a single core unit. For this purpose, suitable connectors are provided which comprise a pair of substantially flat rectangular brass plates 210, see Fig. 7, having square shoulders 211 in their lower edges at opposite ends thereof and a pair of vertical longitudinally spaced slots 212 in their upper edges. Each slot is adapted to receive a laterally extending tongue 208' and 209' respectively of the armature core unit 208—209. Each connector plate is also provided at its ends with a hole in which is fixed the shank of a pin 213, the head of which is spaced laterally from the side of the connector plate. Mounted with a loose fit on the shank portion of each pin between the side of the connector plate and the head of the pin is a suitable spacer disk or washer 213' having a hub portion 2130, see Fig. 7, substantially equal in diameter to the diamter of the head of the pin and adapted to make a sliding fit in slots of a suitable guide plate.

To enable the composite armature to move as a unit with respect to the fixed solenoid core members 206 and 207, a pair of guide plates 214 are provided for slidingly supporting each armature connecting plate 210. Each guide plate is substantially rectangular and provided with a pair of closed slots 215 arranged horizontally adjacent its upper edge and suitably spaced at opposite ends of the plate. The height of the slots 215 corresponds substantially to the diameter of the hub portion 2130 of the washers 213' of the connector plates 210, whereby these hubs are enabled to engage in the closed slots 215 and thus slidably support each connecting plate in the guide plates 214. The latter are secured in substantially fixed spaced parallel relationship on the table 80 by a pair of end plates 216, the opposite ends of each plate 216 being bent at substantially right angles to provide flanges 217 to which the ends of the guide plates 217 are bolted. The flanges 217 are also provided with inwardly extending stops 218 which, as shown in Fig. 7, are adapted to lie in the path of the advancing shoulders 211 of the connector plates to limit the extent of their sliding movement in the slots 215 of the corresponding guide plates 214. To fasten the assembled guide plates and end plates 216 to the top of the table, suitable right angle brackets 219 are provided which are adapted to be bolted on the inner walls of the end plates 216, the foot portion of the brackets being bolted to the table top 80. An additional right angle bracket 220 is fastened to each end plate 216 and provides supporting means for the respective solenoid cores 206 and 207 respectively.

It will be clear that both solenoids 206 and 207 are fixedly mounted within the assembled side and end plates and that the armature core unit 208—209 is slidable therein either toward the solenoid 206 or toward the solenoid 207 depending upon which solenoid is energized.

The slidable armature is adapted to be connected to the selector arm 190 by means of a relatively thin flexible strip of metal 221, one end of which is set on edge in the slot 196 of the selector arm carrier 197. The opposite end of the flexible metal strip 221 is fastened between the vertical legs of a pair of bracket members 222, the feet of which are welded or otherwise secured to the top of the armature core unit 208—209, hereinafter termed the armature, at substantially the center thereof.

As shown, the armature and selector arm 190 are resiliently held in a central or neutral position by means of a U-shaped wire spring 2210, Fig. 1, which is fastened at its lower end to the table 80. The upper ends of the spring are crossed over and engage on opposite sides of the flexible strip 221 thus resiliently holding it in its central or neutral position.

Suitable means comprising a stop pin 223, see Fig. 9, is provided for adjusting the position of the armature with respect to the solenoids 206 and 207 so that the center tube N' of the selector arm

190 may be positioned directly beneath the deflector hood 111 when the selector arm is in its neutral or central position as hereinafter described.

Referring to Figs. 7 and 9, the stop pin 223 is shown fixed to and depending from the underside of the armature at substantially the center thereof. The lower end of the pin is adapted to engage in a slot 224' formed between the parallel mutually engaging rearwardly extending reaches 224 of a pair of L-shaped fingers 225 which are pivotally secured to the top of the table 80 beneath the armature by pins 2240 in the rear ends of the reaches 224. A suitable tension spring 225' is suitably connected at its opposite ends between the forward spaced parallel ends 226 of the L-shaped fingers 225 and constrains the forward ends thereof to resiliently hold the separable reaches 224 together. Rotatably mounted in a vertical hole 80' of the table top 80 in axial alignment with the slot 224' of the reaches 224 is a stud shaft 227 having a disk 228 on its upper end, the disk being mounted in a counterbored hole 230 in the top of the table. Mounted eccentrically on top of the disk 228 is a substantially vertically upstanding pin 229 which is adapted to extend up through the slot 224' of the reaches 224 and to engage the opposite sides thereof. By rotatably adjusting the shaft 227, its disk 228 will be rotated thereby rotating the eccentric pin 229 which changes the position of the slot 224' of the contacting reaches 225 either to the right or left. As a result, the stop pin 223, which is engaged in the slot 224', will be displaced and cause the armature to be displaced a corresponding amount in the supporting guide members described above. The eccentric pin thus provides means for centering the slidable armature so as to adjust the selector arm 190 with relation to the discharge tubes.

The frame member 199 of the selector arm also carries two contact points 232 and 233 hereinafter termed holding contacts, these contacts being on opposite sides of the frame and adapted to engage opposite sides of the swinging selector arm 190. As shown in Fig. 12, the contact 232 comprises a cylindrical post 234 having a shank portion 235 provided with a shoulder 236. The post is adapted to have limited sliding movement in a cylindrical sleeve 237 which is mounted in a substantially horizontal plane by a bracket member 238 fastened to the frame member 199. Suitable washers 239 are shown for insulating the post from its sleeve.

A nut 237' threaded on the external threads of the sleeve 237 is adapted to fasten the sleeve rigidly in the bracket 238 of the frame member. The bore of the sleeve 237 is provided with an annular shoulder 240 which is normally spaced from the shoulder 236 of the post 234. A coil spring 241, carried on the shank portion 235 of the post 234 between the shoulder 236 thereof and the shoulder 240 of the sleeve resiliently holds the holding contact post 234 in the forward end of its sleeve, the post being enabled to slide rearwardly therein when the selector arm swings into engagement with the end thereof.

The shank portion 235 of the contact post 234 is screw threaded, as shown, and provided with a pair of nuts 242 for adjusting the normal position of the post within its sleeve 237 and for preventing the post from springing out of its sleeve due to the force of the compressed spring 241. Since both holding contacts are identical, the above description of the holding contact post 232 will suffice for the second contact post of holding contact 233.

Suitable means are provided for selectively energizing the solenoids 206 and 207 whereby the armature may be automatically moved to swing the selector arm 190 into the position corresponding to the height of the primer being gauged. The solenoid energizing means comprises a pair of micro-switches 243 and 244 adapted to be adjustably supported beneath the table 80 in cooperative relation with the contacts 167 and 168 respectively of the swinging gauge arm 166. To this end a substantially rectangular panel plate 245, see Fig. 8, is mounted on edge on the base plate 10 beneath the table 80, the upper edge of the panel plate being fastened by suitable bolts to the underside of the table 80. A dovetail track or groove 246 is formed horizontally in one face of the panel 245 throughout the length thereof and is adapted to slidably support a pair of micro-switch supporting carriages which comprise dove-tail blocks 247.

As shown in Fig. 8, each block 247 is provided at its outer end intermediate its bevelled sides with a vertical slot 248 which is substantially T-shaped in cross section. To the outer face of each carriage block 247 is secured one of the micro-switches 243 and 244 respectively, the actuator buttons 243' and 244' respectively being directed toward adjacent sides of the gauging arm 166. Screwed or otherwise fastened to the outer face of each micro-switch is a substantially sector-shaped bearing plate 250 and 250' respectively, each plate having a lobe portion 251 and 251' provided with a drilled hole. Pivotally supported at the lobe of each bearing plate is a depending lever arm 252 and 252', the inner edge of each arm being adapted to be held in contact with the actuating button of its respective micro-switch by a coil spring 253 and 254 respectively. The later are, as shown, connected at one end to the lower end of their respective lever arms 252 and 252' and at their opposite ends to a fixed part of the frame. It will be noted that the pivot point of each lever arm is above its point of contact with the button of its respective micro-switch so that the relatively large movement must be imparted to the lower end of each lever in order to actuate its respective micro-switch button.

Means for moving the micro-switch carriages or blocks 243 and 244 along the dove-tail track 246 for effecting adjustment of the levers 252 and 252' thereof with respect to the contacts 167 and 168 of the gauging arm 166 comprise rods 254 and 255, each of which is substantially identical, the rod 254 being however somewhat longer than the rod 255. The end of each rod is provided with a suitably shaped head to make a locking fit in the respective T-shaped slot in the adjacent end of its carriage block. Each rod is screw threaded throughout its length and extends at its opposite end through a smooth bored hole in the respective end plate 84 of the table 80, a knurled thumb nut 257 being fixedly secured on the outer end thereof.

The shank portions of the rods adjacent their inner ends are adapted to be threadedly engaged in horizontally drilled and tapped holes of brackets 258 and 259 respectively which are bolted to the bed of the dove-tail groove 246 of the panel 245 at opposite ends thereof. Thus, by turning the thumb nuts in one direction, the micro-switch carriage blocks will be drawn rearwardly in the dove-tail slot 246 while by turning the

thumb nuts in the opposite direction, the micro-switches will be moved forwardly in the slot.

A suitable coil spring 260 is carried on the shank of the long rod abutting at one end of the inner face of the adjacent end plate 34 and at its opposite end a collar 162 secured on the rod so as to provide means for taking up any backlash in the movement of the carriage 247 and to facilitate its sliding movement towards the gauging arm 166.

In accordance with this construction, the arms 252 and 252' of the respective micro-switches may be nicely adjusted with respect to the contacts 167 and 168 of the pivoted gauging arm 166.

Electrical circuit

A diagram of the electrical circuit for controlling the operation of the cartridge feeding gauging and selector discharging mechanisms described above is shown in Fig. 13. The main power lines are indicated at A and B across which the motor reduction gear unit M is connected. Connected in the line A is the micro-switch or gauging switch 158 which, as described above, is normally closed and adapted to be opened when its button 159 is engaged by the adjustable contact screw 157 of the oscillating cross head 115.

One side of the micro-switch or holding switch 158' is also connected in the line A and is normally open but adapted to be closed when its button 159' is engaged by an adjustable contact screw similar to the screw 157 and located on the oscillating cross head 115 at the opposite side of the gauging table from the screw 157. The line A is shown terminating at G in two contact points which correspond to the contacts 167 and 168 of the pivoted gauging arm 166. The contact 252 corresponds to the switch actuating arm of the micro-switch 243 which, in the present embodiment, is responsive to a high primer as indicated by the letter H in the diagram while the contact 252' corresponds to the micro-switch 244 which is responsive to a low primer as indicated at L.

As the gauging arm swings to the right or left in accordance with the height of a primer being gauged, its contact points 167 and 168 are moved into engagement respectively with the arm 252 of the switch 243 or the arm 252' of the switch 244. The circuit is completed through each micro-switch by conductors *h* and *l* respectively, which lead to the solenoids 206 and 207 respectively and back to the main line B. Moreover, each conductor *h* and *l* is provided with a lead *h'* and *l'* respectively connected to contacts corresponding to the holding contacts 232 and 233 on the selector arm frame. Either one of these holding circuits is completed by the single conductor *c* which is connected at one end to a terminal T on the pivoted selector arm 190 and at its opposite end to the other side of the holding switch 158'.

The operation of the cartridge hopper feeding device and the auxiliary feeding means for feeding the cartridges to the pivoted gauging finger has been described in detail above and is believed to be clear. The gauging of a primer cap and the subsequent selection and discharge of the gauged cartridges is as follows:

Assuming a cartridge having a high primer is positioned over the pivoted gauging head 176 of the gauging arm 166 and that the auxiliary feeding pusher pin 119 is about to advance and engage a cartridge on the gauging table so as to displace the high primer case from the table and move the next succeeding case to be gauged over the engaging finger; the gauging arm 166 will have been swung from its normal spring biased position which, as described above, is such that its contact 168 engages the arm 252' of the micro-switch 244, to its operative position, wherein its contact 167 engages and actuates the arm 252 of the micro-switch 243. Since the micro-switch 158 is normally closed, the circuit through the lines A, conductor *h*, solenoid 206 and line B will have been completed and the armature pivoted on its carriage in a direction such as to move the selector arm 190 counterclockwise as seen in Fig. 2, so as to throw the discharge tube H' beneath the cartridge deflecting hood 111 of the gauging table.

In order to retain and hold the selector arm 190 in the high primer discharging position while the high primer case is being displaced from the gauging table by the advancement of the next succeeding case, the contact pin 157' of the oscillating cross head 115 is so adjusted as to instantly engage the button 159' and actuate the micro-switch 158' as the pusher pin begins to move forwardly thereby completing a circuit through the lead A, the holding switch 158' and conductor *c* to the terminal T of the selector arm 190 and from thence through the holding contact 232, and lead *h'* back through the solenoid 206 to the line B. The selector arm 190 is thus held over in its "high primer" position until the high primer case has been finally pushed off of the gauging table and into the discharge tube H' of the selector arm from which the gauged cartridge is discharged into the aperture or tube H of the table 80. The circuit through the micro-switch 158 has in the meantime been opened by the adjustable contact pin 157 of the cross head 115. Thereafter, when the auxiliary feed pusher pin 119 is moved back to its original position, the micro-switch 158' is again opened freeing the selector arm 190 which is automatically swung back to its neutral or central position by the force of the spring 2210.

Simultaneously, the micro-switch 158 is closed and the circuit reestablished for gauging the primer of the next succeeding case. Should the primer be low, then the gauging head 176 is not engaged by the primer and remains in its spring biased position wherein the switch 244 is closed and the solenoid 207 energized whereby the selector arm is swung clockwise so that its discharge tube L' receives and discharges the low primer case into the tube L in the top of the table 80.

If the primer is of normal height, the gauging finger 176 and arm 166 are displaced from their normal position an amount such that the contacts 167 and 168 of the arm 166 are moved to an intermediate position in which neither contact engages its respective micro-switch closing arm. Thus, the solenoids 206 and 207 remain deenergized and the selector arm is held in its central or neutral position by its spring 2210, wherein its discharge tube N' receives and discharges the case having a normal primer into the tube N in the top of the table 80.

It will be understood, of course, that the holes or discharge tubes H, L and N in the top of the table 80 are adapted to direct the gauged cases into separate receptacles beneath the table.

A modification of the article selecting means is shown schematically in Fig. 14 and comprises a pair of substantially flat relatively stiff rectangular plates 270 and 271 pivotally mounted at their lower ends on the top of the table 80 and on opposite sides respectively of the central aperture N therein. A suitable operating element such as

a link 272 is pivotally connected to the plates at points 273 and 274 thereon and is adapted normally to hold the plates 270 and 271 in a substantially vertical position on the table.

Moreover the link 272 is constructed and arranged to be reciprocated substantially parallel to the table 80 so as to swing the plates simultaneously through substantially the same vertical angle as indicated by the dotted lines.

In the present embodiment, the link 272 is reciprocated by means of solenoids 275 and 276 which are suitably connected to the opposite ends respectively of the link and are adapted to be energized in the manner described above. The link 272 is shown provided with depending elements 277 and 278 which are adapted to be moved into engagement and from engagement with suitable holding contacts 279 and 280 respectively in the manner and for the purpose already described.

In operation, when a cartridge having a properly seated primer is discharged from the gauging table 63', the solenoids remain deenergized. The selector plates 270 and 271 remain in their normal position, as shown in Fig. 11, so that the cartridge being delivered from the table 63' is enabled to fall downwardly directly into the central aperture N of the table 80. When, however, a primer is too high or too low, the proper solenoid is energized in the manner described above, thereby swinging the respective selector plate 270 or 271 into the path of the cartridge being discharged from the gauging platform. The plate which lies in the path of the cartridge will present a sloping surface which extends across the central aperture N and will deflect the cartridge striking the sloping surface into the respective aperture H or L of the table 80.

What is claimed is:

1. In an article gauging machine comprising a frame having article receiving means; article supporting means mounted on said frame; electrical gauge contacts; article gauging means constructed and arranged to move said gauge contacts when engaged by an article on said supporting means; means for feeding articles into engagement with said gauge; selector means electro-magnetically displaceable from a normal position in response to the movement of said gauge contacts to distribute the articles being gauged into the respective receiving means of said frame; means to adjust the normal position of said selector with respect to said article receiving means comprising a pair of arms held in juxtaposition by pivots at corresponding ends of the arms and a tension spring adjoining said arms at the opposite ends thereof, said arms having oppositely disposed relief recesses in adjacent edges to form a slot between said arms; a finger projecting from said selector into said slot; an eccentrically mounted pin extending into said slot; and means for rotating said pin to displace said slot and hence said selector finger to effect an adjustment of said selector.

2. An automatic gauging and assorting machine comprising a frame having article discharge ports; an article supporting gauge table; means for delivering articles onto said gauge table comprising a hopper having an agitator; a feed track connecting said hopper to said gauge table and a reciprocable feed block adjacent the mouth of said hopper for delivering articles successively from said hopper into said feed track; article gauging means comprising a gauge having a lever arm pivotally supported on said gauge table and contacts on said lever arm; auxiliary feed means to move articles being fed onto said gauge table intermittently across said table into engagement with said gauge and to move the gauged articles off said table; article selector means comprising a horizontally pivoted arm having apertures to receive gauged articles removed from said gauging table by said auxiliary feed means, said selector arm being actuable to deliver the gauged articles of specified measurements into the corresponding discharge ports of said frame; and electromechanical means actuated by the displacement of said contacts in response to pivotal movement of said lever arm when said gauge is engaged by an article to actuate said selector arm, said electromechanical means comprising a solenoid having an armature, micro-switches adapted to be engaged by the displacement of said contacts to energize said solenoid and to displace said armature and a resilient arm connected at one end to said armature and at its opposite end to said selector arm to pivot said selector arm in response to the displacement of said armature.

3. In an automatic gauging and assorting machine the combination comprising a frame having article discharge ports; an article supporting gauge table; means for delivering articles onto said gauge table comprising a hopper having an agitator; a feed track connecting said hopper to said gauge table and a reciprocable feed block adjacent the mouth of said hopper for delivering articles successively from said hopper to said feed track and onto said gauge table; article gauging means comprising a gauge having a lever arm pivotally supported on said gauge table and contacts on said lever arm; auxiliary feed means arranged to move articles being fed onto said gauge table intermittently across said table into engagement with said gauge and to move the gauged articles off said table; means to actuate said auxiliary feed means, said actuating means being arranged to reciprocate said feed block; article selector means having apertures to receive gauged articles removed from said gauging table by said auxiliary feed means, said selector means being actuatable to deliver the gauged articles of specified measurements into the corresponding discharge ports of said frame; electromechanical means actuated by the displacement of said contacts in response to pivotal movement of said lever arm when said gauge is engaged by an article to actuate said selector means; and means controlled by said auxiliary feed means to hold said selector means in its actuated position opposite that article discharge port of said frame for articles having specified measurements corresponding to those of the gauged article being removed from the table by said auxiliary feed means.

4. An automatic gauging and assorting machine comprising an article supporting track; article gauging means comprising a lever arm having a noncoaxial gauging surface at its upper end and contacts at its lower end; means adjacent the upper end of said arm to pivotally support said arm adjacent the end of said track whereby relatively infinitesimal movement of said gauging surface is multiplied to impart a relatively large movement to the lower end of said arm; article feeding means constructed and arranged to move articles intermittently along said track first into gauging position over said gauging surface and then off the end of said track; article selector means movably supported adjacent the end of said track adapted to receive gauged articles being re-

moved therefrom and to deliver said articles into separate receptacles corresponding to the specified measurements of said articles; electromechanical means responsive to movement of said lever arm when said gauging surface is engaged by an article to move said selector means, said electromechanical means comprising a micro-switch, a lever carried by said micro-switch adapted to be engaged by one of the contacts on the lower end of said lever arm to multiply the movement thereof so as to actuate said micro-switch, and a solenoid having an armature connected to said selector means, said solenoid being energized by actuation of said micro-switch thereby effecting displacement of said armature and movement of said selector means; and means controlled by said article feeding means to retain the selector in a displaced position when placed in such a position by actuation of said micro-switch until the article feeding means has operated to feed an article off the end of said track.

5. An automatic gauging and assorting machine comprising an article supporting track; article gauging means comprising a lever arm having a noncoaxial gauging surface at its upper end and contacts at its lower end; means adjacent the upper end of said arm to pivotally support said arm adjacent the end of said track whereby relatively infinitesimal movement of said gauging surface is multiplied to impart a relatively large movement to the lower end of said arm; article feeding means constructed and arranged to move articles intermittently along said track first into gauging position over said gauging surface and then off the end of said track; article selector means movably supported adjacent the end of said track adapted to receive gauged articles being removed therefrom and to deliver said articles into separate receptacles corresponding to the specified measurements of said articles; electromechanical means responsive to movement of said lever arm when said gauging surface is engaged by an article to move said selector means, said electromechanical means comprising a micro-switch adapted to be engaged and actuated by one of the contacts on the lower end of said lever arm; a solenoid having an armature connected to said selector means, said solenoid being energized by actuation of said micro-switch thereby effecting displacement of said armature and movement of said selector means; and a micro-switch supported on said frame having a contact adapted to be engaged by said feed means to maintain said solenoid energized thereby to hold said selector means in its displaced position until the gauged article is removed from said track by said feed means.

6. An automatic gauging and assorting machine comprising an article supporting track having a gauging position and a discharge position; article feeding means constructed and arranged to move articles intermittently along said track into gauging position and then to said discharge position; article selector means movably supported adjacent the discharge position to receive and divert the discharged articles in accordance with the magnitude of the characteristic being gauged; and electromechanical selector positioning means including a swingably mounted gauging arm having means engageable with the article to position the arm in accordance with the characteristic being gauged; a pair of normally open-circuited electrical contact devices oppositely positioned and adapted to be selectively closed in response to swinging of said gauge arm beyond a predetermined limit in either direction of movement; a pair of solenoids each connected through one of said pair of electrical contact devices and adapted to be energized in response to closing of its respective contact device; armature means operatively connected to said selector means constructed and arranged to be attracted by an energized solenoid, said armature being normally spring-urged to an intermediate position; a normally open holding circuit bypassing said electrical contact means, said holding circuit being completed through either solenoid by movement of the armature in response to energization of that solenoid; and switch means operatively interconnected with said feeding means to open said holding circuit after each discharge of an article from the discharge position of said track, whereby the article selector will be permitted to return to a normal position corresponding to the intermediate position of the armature means.

7. In an automatic gauging and assorting machine having feed means to present an article to a gauging position and thereafter to feed said article to a discharge position; a gauging member engageable with the article when in gauging position and having an arm swingably positioned in accordance with a characteristic of said article; electrical switch devices at opposite predetermined positions of said arm each arranged to close a circuit from a source of power when contacted by said arm; an electromagnetic device in circuit with each switch device; selector means operatively connected to said electromagnetic devices whereby said selector may be moved to a position corresponding to the position of the gauging arm, said selector means being arranged in its various positions to direct articles from the said discharge position to an appropriate receptacle; a holding circuit including switch means arranged to be closed by movement of the selector in response to energization of one of the electromagnetic devices bypassing said electrical switch devices and completing a circuit between said one of the electromagnetic devices and a source of power; and switch means operated by said feed means to interrupt said holding circuit after the article has been discharged.

8. An automatic machine for gauging and assorting ammunition in accordance with primer height comprising a gauging member having a gauging surface engageable with the cartridge primer; mounting means for said gauging member adapted to multiply movement of the gauging surface; a track adapted to support a cartridge in a predetermined position over said gauging surface; feed means to move cartridges intermittently along said track first to a position over said gauging surface and then off the end of said track; selector means movably supported adjacent the end of said track adapted to receive cartridges moved off the end of the track and to deliver same into receptacles corresponding to specified primer height; electromechanical selector positioning means responsive to movement of said gauging arm comprising solenoid means operatively connected to the selector and selectively energized in accordance with the position of said gauging member; selector holding means comprising electrical circuit elements completing a bypass circuit to the solenoid means in response to movement of the selector to maintain the selector in position until a cartridge has been discharged from the track; and switch means oper-

ated by the feed means to break said bypass circuit and release the selector holding means after the cartridge has been discharged.

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