

Oct. 5, 1926.

Z. P. CANDEE

1,602,334

LOADING MACHINE

Filed Feb. 9, 1926

4 Sheets-Sheet 1

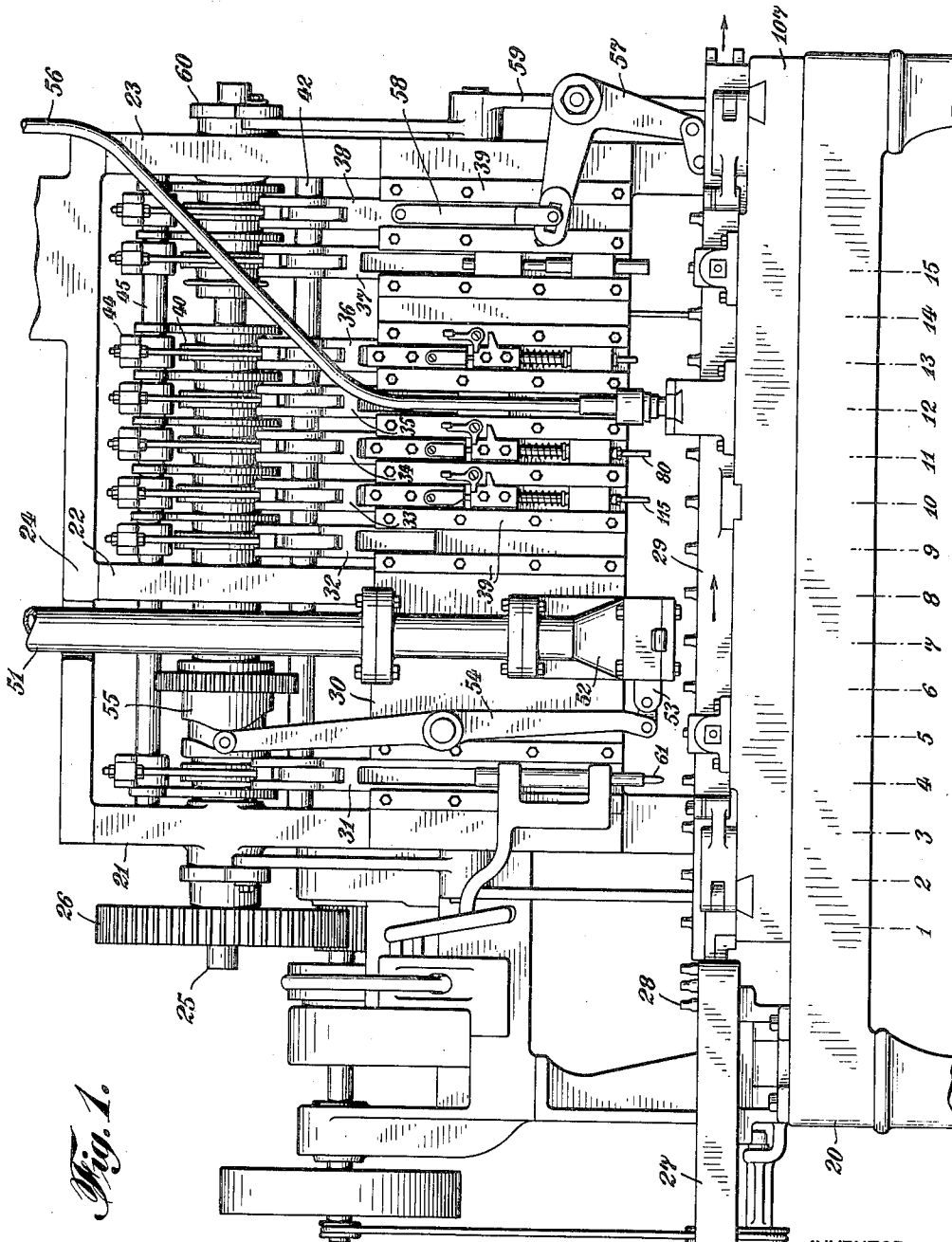


Fig. 1.

INVENTOR

Zenas P. Candee

BY

George H. Hall

ATTORNEY

Oct. 5, 1926.

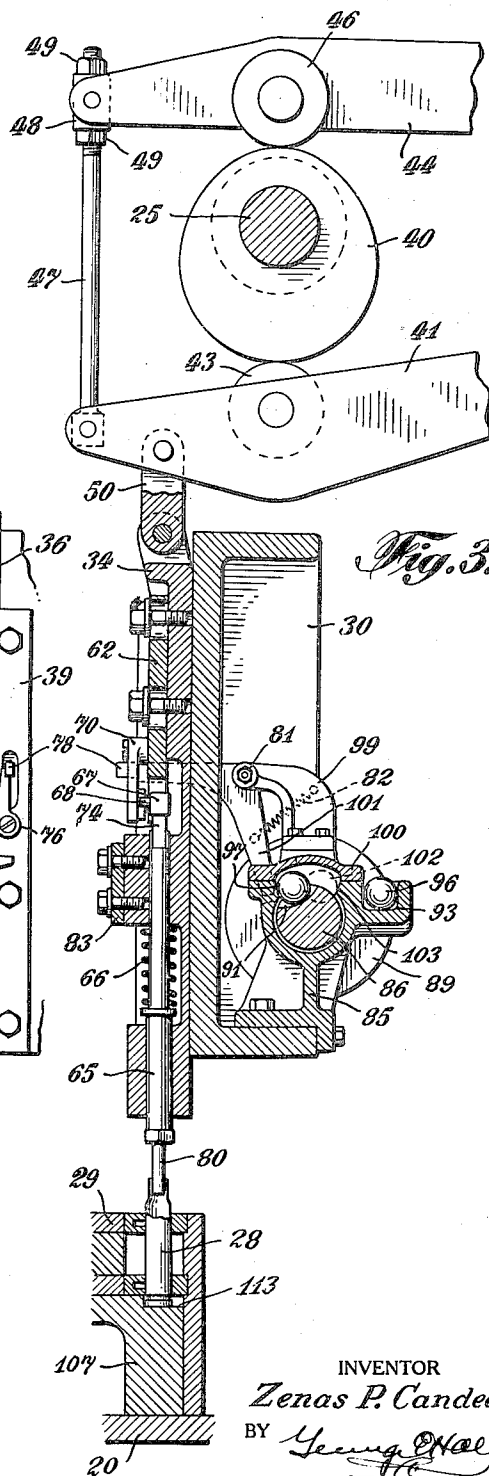
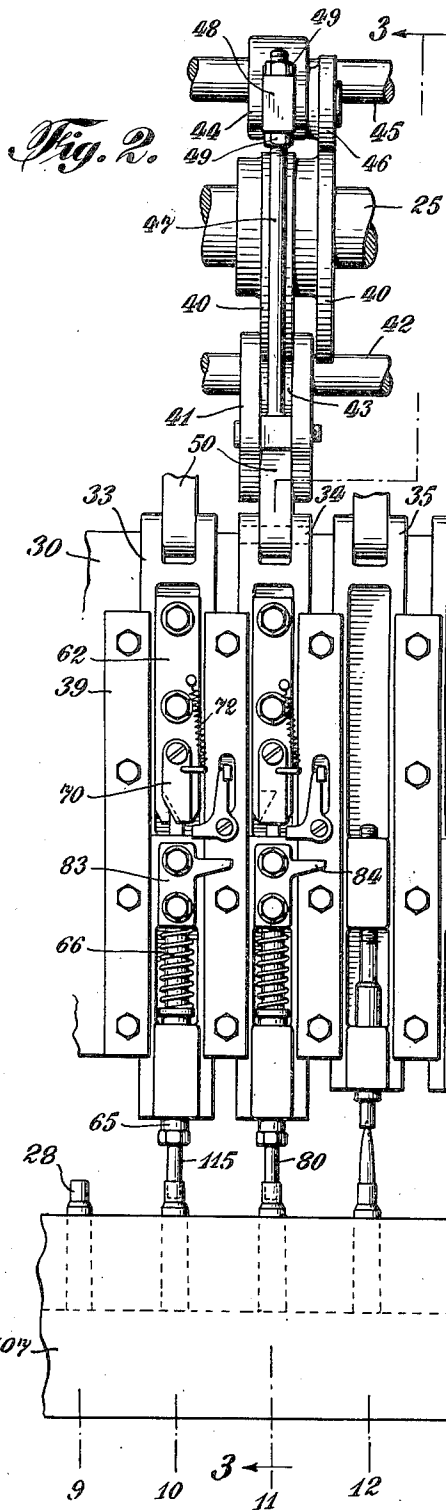
Z. P. CANDEE

1,602,334

LOADING MACHINE

Filed Feb. 9, 1926

4 Sheets-Sheet 2



INVENTOR
Zenas P. Candee
BY *Young & Hale*
ATTORNEY

Oct. 5, 1926.

Z. P. CANDEE

1,602,334

LOADING MACHINE

Filed Feb. 9, 1926

4 Sheets-Sheet 3

Fig. 4.

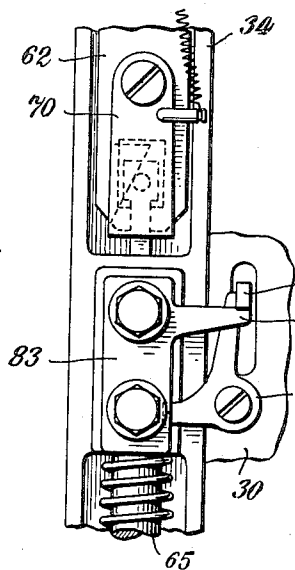


Fig. 5.

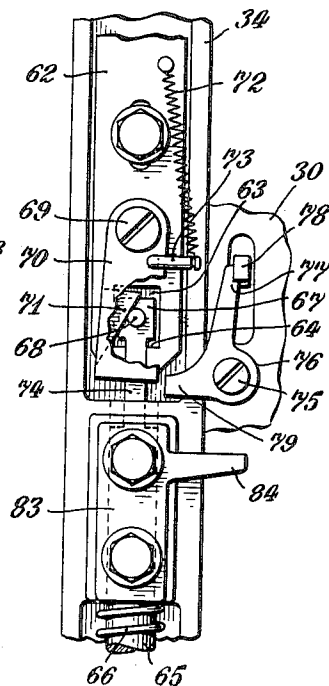


Fig. 6.

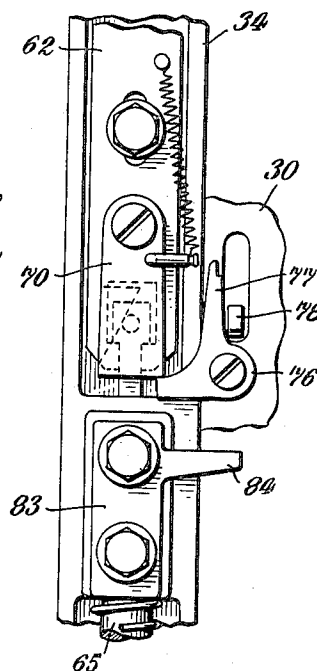


Fig. 12.

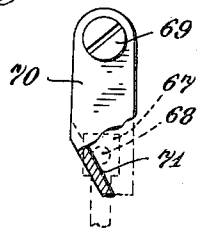


Fig. 11.

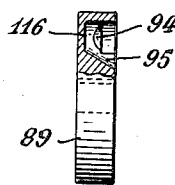


Fig. 10.

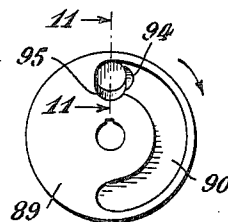
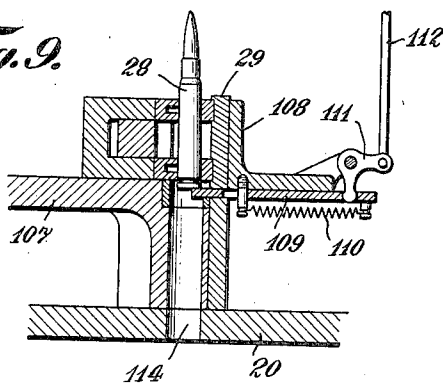


Fig. 9.



INVENTOR
Zenias P. Candee
BY *Charles E. Noy*
ATTORNEY

Oct. 5, 1926.

Z. P. CANDEE

1,602,334

LOADING MACHINE

Filed Feb. 9, 1926

4 Sheets-Sheet 4

Fig. 8.

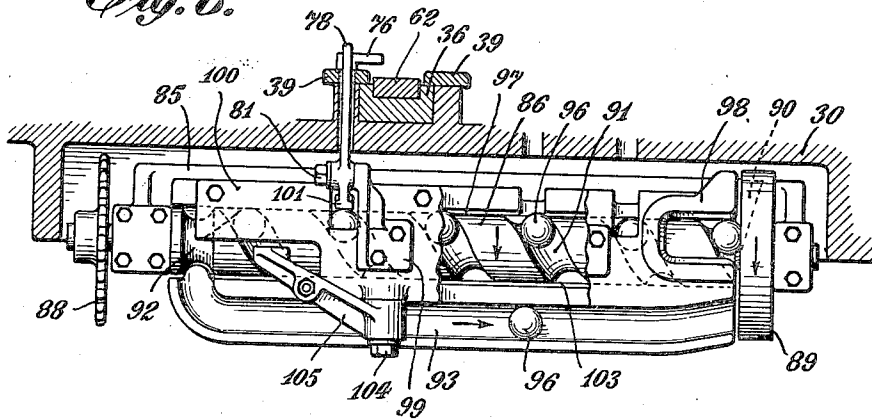
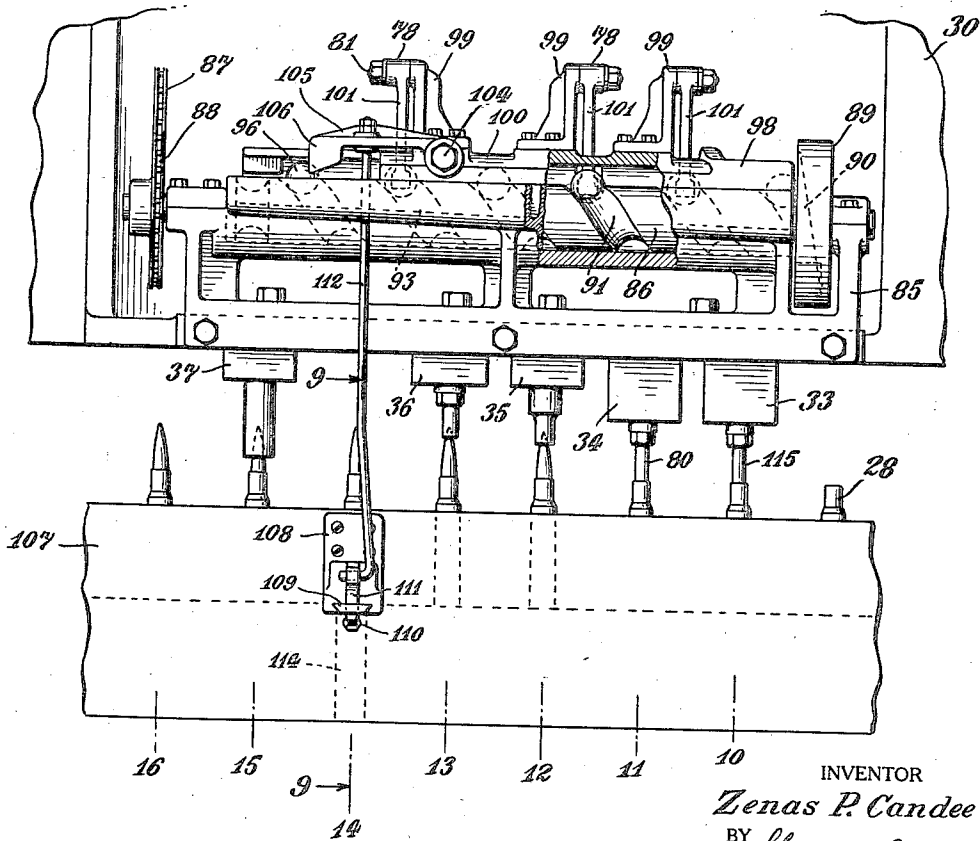


Fig. 1.



INVENTOR
Zenas P. Candee
 BY *George P. Voe*
 ATTORNEY

UNITED STATES PATENT OFFICE.

ZENAS P. CANDEE, OF WATERBURY, CONNECTICUT, ASSIGNOR TO THE WATERBURY FARREL FOUNDRY AND MACHINE COMPANY, OF WATERBURY, CONNECTICUT, A CORPORATION OF CONNECTICUT.

LOADING MACHINE.

Application filed February 9, 1926. Serial No. 87,187.

This present invention relates generally to a loading machine and as illustrated herein is applied to a loading machine of the type wherein the several elements of a cartridge are automatically assembled to form a completed cartridge, including the charge of powder.

In its broadest aspect, however, the invention relates to certain mechanical movements which are derived from or imparted to produce useful results, and such mechanism may be used advantageously with machinery of various types to which it may be applicable, but for the purpose of illustration, one of such uses is illustrated and described herein as being applied to a loading machine. In such application of the invention certain other improvements, forming part of the invention, are hereinafter set forth, being effective in the construction and arrangement of the associated parts of the loading machine, and to some degree render this invention applicable and whereby the maximum advantages may be obtained therefrom.

It is the object of this invention, among other things, to provide in a machine, wherein several elements are assembled to form a unitary structure or article, means for inspecting the article during the progress of assembly to determine if the parts are normal and being assembled in a predetermined manner, and in connection therewith to provide simple and effective means that will eject all of the articles which fail to meet the inspection requirements and without stopping the entire machine or disarranging any of its parts; in brief, to produce a machine wherein the imperfectly assembled article may be automatically ejected at one station and those which are found correct by such inspection are ejected at another station, these inspecting and ejecting operations being continuous and uninterrupted irrespective of the result of the inspecting operations.

This invention has for its purpose the accomplishment of these and other objects, and consists in mechanism having certain details of construction and combinations of parts as will be hereinafter described and

more particularly pointed out in the claims.

In the drawings, wherein like numerals of reference designate like parts in the several figures;

Figure 1 is a front view of my machine having my improved mechanism connected therewith and designed to be used for automatically producing completed cartridges;

Figure 2 is an enlarged detail front elevation of a portion of the inspecting mechanism and adjacent parts;

Figure 3 is a sectional elevation thereof, the parts in section being shown generally upon line 3—3 of Figure 2;

Figures 4, 5 and 6 illustrate the trip mechanism and associated parts in three different positions;

Figure 7 is an elevation of that portion of the inspecting mechanism that is connected with the rear of the machine, as shown in Figure 1;

Figure 8 is a plan view thereof with some of the adjacent mechanism partly in section;

Figure 9 is a transverse sectional detail of the parts taken substantially on line 9—9 of Figure 7;

Figure 10 is a face view of the lifter wheel; Figure 11 is a fragmentary side elevation thereof; and

Figure 12 is an elevation of one of the trip plates.

In loading machines of the type herein referred to, the cartridge is supplied with a charge of powder and the bullet positioned therein.

After the charge of powder is in the cartridge shell it is desirable that the same be inspected to determine whether such charge in bulk is too heavy or too light, and after the shell has passed the bullet inspecting station, make an inspection to determine if a bullet has in fact been so placed therein to complete the cartridge. Obviously, if the bullet feeding mechanism fails and no bullet is inserted in the shell, the cartridge is incomplete, as is also the case if the charge of powder is either too large or too small.

Devices have heretofore been used to inspect these successive operations, but so far

as I am at present advised such inspecting mechanism, if it discloses abnormal conditions, indicates the same by a visual telltale, ringing a bell, or similar devices, to attract
 5 attention. The operator, upon noting the alarm, manually stops the machine and removes the imperfect cartridge. If, perchance, the alarm is not noticed, the machine continues its operations, produces imperfect
 10 shells, and frequently scatters the powder about where it is liable to do more or less damage.

The greater the number of machines under the control of one operator, of course, increases the danger of failure to note the
 15 alarm. The stopping of the machine to remove the imperfect article, readjusting the parts and restarting the same, materially slows down the speed of production.

20 In my device hereinafter shown and described, I have so arranged the parts and mechanism that if any one of the several inspecting devices discloses an abnormal condition, such imperfect article will be
 25 automatically ejected at a predetermined station without stopping the machine or requiring the attention of an operator.

My invention, as shown in the drawings, is applied to a cartridge loading machine, the details of which, except as the same may
 30 apply to this invention, are not essential. However, as shown, the loading machine consists of a bed 20, having frames 21, 22 and 23 fixed thereto, and connected with each other on the top thereof by the plate 24.
 35 Within the frames is a shaft 25, which may be rotated by gears 26 or other means.

Upon one side of the bed is a rotary mechanism 27, by means of which the cartridge
 40 shells 28 are advanced to a point where they may be received by suitable carrier mechanism 29, whereby the cartridges may be successively advanced to several stations, either for operations thereon or other reasons, such
 45 stations in the machine shown being fifteen in number, and vertically are indicated by the broken lines in Figure 1, severally designated 1 to 15, inclusive.

Fixed to the frames 21, 22 and 23 is a
 50 slide bracket 30, within which there is mounted a plurality of slides 31, 32, 33, 34, 35, 36, 37 and 38, which are held therein against outward movement by caps 39. These slides are all of substantially the same
 55 construction, modified only in so far as it may be necessary for the particular operation to be performed thereby.

On the shaft 25 are a plurality of cams
 60 40, one cam for each slide. Motion is imparted from each of the cams 40 to a slide through the rock arm 41 on the shaft 42, having a cam roll 43 mounted therein, which is held against the face of the cam by an
 65 auxiliary rock arm 44 on the shaft 45 carrying a cam roll 46, which also bears against

the periphery of the cam 40. These two rock arms are connected by a link 47, pivoted to one rock arm and having an adjustable connection with another rock arm by the block
 48, through which projects the link 47, upon which are the adjusting nuts 49. A link 50
 70 connects the rock arm 41, upon which are adjusting nuts 49. A link 50 connects the rock arm 41 with the slide, substantially as shown in Figure 2. The shape of each of
 75 the cams 40 depends upon the relative time of movement of the slide actuated thereby.

The powder is conducted to the cartridge from a source of supply through a conduit
 51 into a receptacle 52, from which it is delivered to a cartridge shell at station 7 by
 80 means of a slide 53 actuated through the rock lever 54, which derives its motion from a cam 55 upon the shaft 25.

The bullets are conveyed to station 12 for
 85 assembly with the cartridge shell through a tube 56.

Carrier mechanism 29 is in part actuated through the rock lever 57 connected by a
 90 link 58 to the slide 38 and the rock lever 59 actuated by a cam 60 on the shaft 25.

The cartridge shells 28 are taken from the rotary mechanism 27 and conveyed in a substantially straight path underneath all of the
 95 slides above referred to and if all the operations are normal, the completed cartridge is ejected at the end of this path. At stations 1, 2, 3, 5, 6, 8 and 9, no operations are performed. At station 4, the punch 61 enters the open mouth of the cartridge shell
 100 and irons out any nicks or indentations therein. At stations 7, the charge of powder is placed in the shell. At station 10, there is an inspection for a heavy charge of powder, that is, if there has been too much powder
 105 admitted. At station 11, there is an inspection to determine if there is too light a charge of powder. At station 12, the bullet is inserted in the shell. At station 13, there is inspection to determine the presence of
 110 a bullet. Station 14 is a dwell station for a normal cartridge and an ejecting station for an imperfect cartridge. At station 15, of the cartridge has withstood the several inspections, the bullet is driven home to its
 115 final position. Thereafter, the completed cartridge continues its movement and is discharged into a receptacle conveniently located to receive it at the right of the machine.
 120

The operation of each of the inspecting mechanisms is substantially the same, but for the purpose of illustration, will particularly describe the slide 34 and its associated
 125 parts, that is, the inspecting slide for determining whether the charge of powder in the cartridge shell is too light.

Adjustably fixed to the face of each of these inspecting slides is a stop plate 62,
 130 which is provided near its lower end with

an opening 63, the lower wall of which forms a stop shoulder 64. Movably mounted within the slide is a plunger 65, which is encircled by a spring 66 to move the plunger in one direction relatively to and independently of the slide. The upper end of this plunger is formed with a head portion 67 that is within the opening 63, being of considerably smaller area in cross section, than the opening and fixed therein is a cam pin 68.

Pivottally mounted upon the stop plate 62 by the screw 69 is the trip plate 70 provided with a cam 71 thereon, which is held in contact with the pin 68 by the spring 72, which is connected at one end to the stop plate 62 and at the other end to the trip plate 70 by the pin 73.

Movement of the head portion 67 on the plunger 65, parallel to the length of the slide causes the lower end of the trip plate 70 to swing to the right or left upon its pivot mounting according to the direction of movement of the head portion 67.

The plunger 65 is flattened at 74 and by its engagement with the walls of the stop plate 62 between which it passes is held against rotation.

In Figure 4 is illustrated a portion of this slide 34 at the extreme upper end of its stroke, at which time the inspecting plug 80 is in its up position and the under-side of the head portion 67 is in contact with the stop shoulders 64 and spring 66 is compressed.

The outer end of the throw over lever 78 is supported in the notch in trip lever arm 77 and the end of the arm 79 is out of the path of movement of the trip plate 70.

In Figure 5 the parts are shown when the plug 80 is resting on a normal charge of powder in the cartridge shell, the slide 34 being in its down position. When thus positioned, the head 67 on the plunger 65 is out of contact with the stop shoulders 64, the trip lever arm 79 is out of the path of movement of the trip plate 70 and the throw over lever is still supported by the trip lever 76.

In Figure 6 some of the parts are shown in the relative positions occupied by them when the charge of powder in the cartridge shell is too light, the head 67 being in contact with the stop shoulders 64, because the stop plug 80 has moved farther into the cartridge shell. Thus the trip plate 70 contacts with the trip lever arm 79, rocking the trip lever and releasing it from the throw over lever 78, which in turn is moved upon its pivot mounting 81 by the spring 82. These throw over levers are each supported upon the bracket 99.

Upon each of the slides 33, 34 and 36, is a lifter plate 83, having a finger 84 thereon that projects laterally into the path of the outer end of the throw over lever 78. At the next upward movement of the slide, after the throw over lever 78 has been released,

the finger 84 contacts with the throw over lever and lifts it to a position substantially as shown in Figure 4, where it is again engaged by the trip lever 76 and held in its up position.

The trip plate 70 connected with the slide 33 differs from those connected with the other slides only in that the cam 71 thereon contacts with the underside of the cam pin 68 instead of the top side. This is requisite because the stop plug 115 which inspects for a heavy charge of powder comes to a stop before the slide 33. Hence the spring moves the trip plate 70 into the path of trip lever arm 79 during the up movement of the head 67 of the plunger.

Attached to a shelf on the slide bracket 30 is a bracket 85, within which is journaled a worm 86 rotated by a sprocket chain 87 connected with the sprocket wheel 88. The helical groove 91 in the worm 86 terminates at one end in an annular groove 92. Fixed on the worm, near one end thereof, is a lifter wheel 89 having a cam groove 90 in its inner face. This cam groove begins at the face of the wheel, extends about one-half the distance around the face, gradually increasing in depth, terminating at a pocket 116, that is substantially the same diameter and depth as the balls 96.

The bottom of the cam groove at its junction with the wall of the pocket 116 is cut away to form an inclined face 94 to facilitate the passage of the balls from the pocket into the cam groove. Likewise the inner wall 95 of the pocket is inclined to facilitate entrance of the balls thereto.

Substantially parallel with the bracket 85 is a runway 93 for the balls 96, one end of which is adjacent to the annular groove 92, and the other adjacent to the inner face of the lifter wheel 89 opposite the path of the cam groove 90 therein.

The pitch of the helical groove 91 is substantially the same as the distance between the centers of the slides 33, 34, 35 and 36, and within said groove are the balls 96. During the rotation of the worm, these balls travel in a straight path on the left of the center thereof, as shown in Figure 3, riding against the face 97. After they have traveled the length of the worm they enter the annular groove 92 and fall therefrom onto and over the runway 93 and drop into the pocket 116 and by the rotation thereof are carried in the cam groove into the helical groove 91, at the next rotation thereof, being guided in this movement by the yoke 98, the open space therein being substantially the same diameter as the balls 96. These balls continue to travel in this path when the inspecting mechanism slides do not disclose an abnormal assembly condition.

The timing of the worm 86 is such that a ball 96 is in front of the arm 101 of each of

the throw over levers 78 at each down stroke of the slides 33, 34 and 36. If any one of these levers is rocked in the manner above described, the arm 101 moves the adjacent ball from the position shown by full lines in Figure 3 to that shown by broken lines 102 in the same figure, that is, upon the opposite side of the axis of the worm. Thereafter, the ball in its travel rides against the face 103 on the bracket 85 and out of the path of any subsequent throw over levers.

Journalled upon a stud 104 in the bracket cap 100 is the lever 105, having a cam lug 106 at the outer end thereof, which is in the path of movement of the balls 96 when riding against the face 103.

Fixed to a portion of the carrier mechanism 29, supported upon the holster plate 107, is a bracket 108, with which is connected a slide 109, that is moved in one direction by a spring 110. Journalled in the bracket 108 is a rock lever 111, one arm of which projects into an opening in the slide 109 and the other end is connected by a rod 112 with the lever 105.

At all of the stations, except station 14, the lower edge of the cartridge shell, while traveling through the machine, rides upon a fixed shelf 113, but at station 14 it rides upon the inner end of the slide 109 and travels thereover in substantially a straight path, if the shell has been found normal, at each of the inspecting stations. If, however, at any one of the inspecting stations it has not withstood the inspection test, the adjacent throw over lever 78 is rocked upon its mounting and the ball 96 adjacent to the end of the arm 101 thereon is moved over to the position shown by broken lines 102 in Figure 3, and while thereafter traveling in this position, it is moved under the cam lug 106 on the lever 105. This causes the lever 105 to rock upon its pivot mounting, lift the rod 112, actuate the rock lever 111, and by reason thereof withdraw the slide 109 from underneath the cartridge. There now being no support for the defective cartridge it drops through the opening 114 into a receptacle conveniently arranged to receive it. The last mentioned ball, after actuating the lever 105, continues its movement, falls into the annular groove 92 and is returned to the other end of the worm to be reused in the manner above described.

After the member 109 has moved to its outward position to permit the escape of a defective cartridge, the same is returned to its former position by the spring 110 and this assists gravity in returning the lever 105 to its position, substantially as shown in Figures 7 and 8, to be actuated by another ball, if perchance a defective cartridge is inspected. By this mechanism, the defective cartridge is ejected from the machine when found faulty at a station, and without notice

to the operator of the machine and without stopping the same.

The bullet is lightly inserted in the cartridge shell at station 12, so that if ejected at station 14 it can be readily removed and a charge of powder therein released, but if the cartridge is perfect, the shell is presented to tools at station 15 that drive the bullet home and secures the same in its permanent position. By thus arranging to insert the bullet lightly at this point, no powder escapes from the shell if the same is found defective.

There are minor changes and alterations that may be made within my invention, aside from those herein suggested, and I would therefore have it understood, that I do not limit myself to the exact construction herein shown and described, but claim all that falls fairly within the spirit and scope of the appended claims.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In an apparatus wherein a plurality of separate elements are assembled to produce a single article; of means for automatically inspecting the result of some of the several assembly operations prior to the next succeeding operation; and means for segregating at one station any article that fails to meet any of such inspection tests without stopping the continuous operation of the apparatus.

2. In an apparatus wherein a plurality of separate elements are assembled to produce a single article; of means for automatically inspecting the result of several assembly operations prior to the next succeeding operation; means actuated in part by the inspecting means for discharging at one station any articles that fail to meet any of such inspection tests, without stopping the continuous operation of the apparatus; and means for discharging at another station all of the articles that have met such inspection tests.

3. In an apparatus wherein a plurality of separate elements are assembled to produce a single article; of means for automatically inspecting the result of several assembly operations prior to the next succeeding operation; and means for discharging at one station after such succeeding operation any article that fails to meet such inspection test and without stopping the continuous operation of the apparatus.

4. In an apparatus wherein a plurality of separate elements are assembled to produce a single article; of means for presenting all of the separate elements for assembly one at a time and in a predetermined sequence; means for automatically inspecting the result of some of the several assembly operations, prior to the next succeeding operation; and means for discharging at one station an article, with all of its assembled ele-

ments, that has failed to meet any inspecting test and without stopping the continuous operation of the apparatus.

5. In an apparatus wherein a plurality of separate elements are assembled to produce a single article; of means for presenting all of the separate elements for assembly one at a time and in a predetermined sequence; means for automatically inspecting the result of some of the several assembly operations, prior to the next succeeding operations; means for discharging at one station an article, with all of its assembled elements, that has failed to meet any inspecting test and without stopping the continuous operation of the apparatus; and means for temporarily assembling one of such elements before the article is delivered to said discharge station.

6. In an apparatus wherein a plurality of separate elements are assembled to produce a single article; of means for presenting all of the separate elements for assembly one at a time and in a predetermined sequence; means for automatically inspecting the result of some of the several assembly operations, prior to the next succeeding operation; means for discharging at one station an article, with all of its assembled elements, that has failed to meet any inspecting test without stopping the continuous operation of the apparatus; and means for temporarily assembling the last of such elements to be assembled, before the article is delivered to said discharge station.

7. In an apparatus wherein an element is presented to several stations and a plurality of other elements assembled therewith to produce a single article; of means for automatically inspecting the result of some of the assembly operations prior to the next succeeding operation; a member at another station; and means for moving the member out of the path of an article that has failed to meet any of such inspection tests.

8. In an apparatus wherein an element is presented to several stations and a plurality of other elements assembled therewith to produce a single article; of means for automatically inspecting the result of some of the assembly operations prior to the next succeeding operation; a member at another station; and means, actuated by the said inspecting means, for moving this member out of the path of an article that has failed to meet any of such inspection tests.

9. In an apparatus wherein an element is presented to several stations and a plurality of other elements assembled therewith to produce a single article; of means for automatically inspecting the result of some of the assembly operations prior to the next succeeding operation; a member at another station; means for moving this member out of the path of an article that has failed to

meet any of such inspection tests; and means for normally maintaining said member in a fixed position so that an article that has withstood the inspection tests may pass thereover.

10. In an automatic apparatus for loading cartridges or the like, the combination with means for admitting powder to the shell; of means for automatically determining if the charge of powder so admitted is too heavy; and means for automatically rejecting a shell with such overcharge of powder from such apparatus at a predetermined station and without stopping the operation of the machine.

11. In an automatic apparatus for loading cartridges or the like, the combination with means for admitting powder to the shell; of means for automatically determining if the charge of powder so admitted is too light; and means for ejecting a shell with such undercharge of powder at a predetermined station and without stopping the operation of the machine.

12. In an automatic apparatus for loading cartridges or the like, the combination with means for placing a bullet in the cartridge shell; of means for automatically determining if the bullet has been so placed; and means for ejecting a shell if no bullet has been placed therein at a predetermined station and without stopping the operation of the machine.

13. In an apparatus wherein the several elements of a cartridge are automatically assembled to produce a completed cartridge, the combination with means for admitting a charge of powder to the cartridge shell; of means for placing a bullet in the cartridge shell after the charge of powder has been admitted thereto; of means for thereafter positioning the bullet within the cartridge shell in its final relative position; means for inspecting one or more of the assembly operations; and means for ejecting from the apparatus between the station where the bullet is first placed in the cartridge shell and the station where it is placed in its final relative position, such cartridges as have failed to pass the inspection test.

14. In an apparatus wherein the several elements of a cartridge are automatically assembled to produce a completed cartridge and during such assembly travel in substantially a straight line to the several stations, the combination with a support for the cartridges while moving through said line; means for admitting a charge of powder to the cartridge shell; of means for placing a bullet in the cartridge shell after the charge of powder has been admitted thereto; of means for thereafter positioning the bullet within the cartridge shell in its final relative position; means for inspecting one or more of the assembly operations; a member mov-

able into and out of the path of travel of the cartridges; and means for actuating this member whereby the same is out of the path of an article that has failed to meet an inspection test but remains in the path of an article that has passed such tests.

15. In an apparatus wherein the several elements of a cartridge are automatically assembled to produce a completed cartridge and during such assembly travel in substantially a straight line to the several stations, the combination with a support for the cartridges while moving through said line; means for admitting a charge of powder to the cartridge shell; of means for placing a bullet in the cartridge shell after the charge of powder has been admitted thereto; of means for thereafter positioning the bullet within the cartridge shell in its final relative position; means for inspecting one or more of the assembly operations; a member movable into and out of the path of travel of the cartridges; and means for actuating this member whereby the same is out of the path of an article that has failed to meet an inspection test but remains in the path of an article that has passed such tests, comprising a transitory element actuated by the inspection mechanism and moved in the path of parts associated with the movable support.

16. In an apparatus wherein an element is presented to several stations and a plurality of other elements assembled therewith to produce a single article; of means for automatically inspecting the result of some of the assembly operations prior to the next succeeding operation; a member at another station; and means for moving the member at substantially a right angle out of the path of an article that has failed to meet any of such inspection tests.

17. In an apparatus wherein an element is presented to several stations and a plurality of other elements assembled therewith to produce a single article; of means for automatically inspecting the result of some of the assembly operations prior to the next succeeding operation; a member at another station; and positively actuated means for moving the member out of the path of an article that has failed to meet any of such inspection tests.

18. In an apparatus wherein an element is presented to several stations and a plurality of other elements assembled therewith to produce a single article; of means for automatically inspecting the result of some of the assembly operations prior to the next succeeding operation; a member at another station; positively actuated means for moving the member out of the path of an article that has failed to meet any of such inspection tests; and yielding means for returning the member into the path of the next article.

19. In an apparatus wherein an element is presented to several stations and a plurality of other elements assembled therewith to produce a single article; of means for automatically inspecting the result of some of the assembly operations prior to the next succeeding operation; trip mechanism released by such means if the article does not meet the inspection test; a member at another station that is in the path of the articles passing through said apparatus; and means, controlled by the action of the trip mechanism for moving this member out of the path of an article that has failed to meet any of such inspection tests.

20. In an apparatus wherein an element is presented to several stations and a plurality of other elements assembled therewith to produce a single article; of means for automatically inspecting the result of some of the assembly operations prior to the next succeeding operation; trip mechanism released by such means if the article does not meet the inspection test; a member at another station that is in the path of the articles passing through said apparatus; and means, comprising a transitory element, controlled by the action of the trip mechanism for moving this member out of the path of an article that has failed to meet any of such inspection tests.

21. In an apparatus wherein an element is presented to several stations and a plurality of other elements assembled therewith to produce a single article; a member movable in a defined path; means for automatically inspecting the result of some of the assembly operations prior to the next succeeding operation; a platform at another station in the path of movement of the articles while moving between two of the stations; means for moving the platform out of the path of an article that has failed to meet any of such inspection tests, comprising in part a trip mechanism; and means actuated by the inspecting mechanism if in the operation thereof any of the assembly operations do not meet the inspection test, for projecting the movable member so that it will engage and actuate the trip mechanism.

22. In combination with a rotary member; of a member fixed in relation thereto and having faces thereon upon opposite sides of the axis of the rotary member; a movable member actuated by the rotary member so that it will travel in a defined path against either of the said faces; and means for projecting said member from its engagement with one of said faces into engagement with the other of said faces.

23. In combination with a rotary member; of a member fixed in relation thereto and having faces thereon upon opposite sides of the axis of the rotary member; a movable member actuated by the rotary member so

that it will travel in a defined path against either of the said faces; and means for projecting said member at substantially a right angle to the axis of the movable member from its engagement with one of said faces into engagement with the other of said faces.

24. In combination with a rotary member having a helical groove in the periphery thereof; of a member fixed in relation thereto and having faces thereon upon opposite sides of the axis of the rotary member; a movable member within said helical groove, actuated by the rotary member so that it will travel in a defined path against either of the said faces; and means for projecting said member from engagement with one of said faces into engagement with the other of said faces.

25. In combination with a rotary member having a helical groove in the periphery thereof; of a member fixed in relation thereto and having faces thereon upon opposite sides of the axis of the rotary member; a movable member within said helical groove, actuated by the rotary member so that it will travel in a defined path against either of the said faces; lever means for actuating the member within the helical groove; and means for projecting said member from engagement with one of said faces into engagement with the other of said faces.

26. In an apparatus wherein an element is presented to several stations and a plurality of other elements assembled therewith to produce a single article; means for automatically inspecting the result of some of the assembly operations prior to the next succeeding operation; a platform at another station in the path of movement of the article while moving between two of the stations; a rotary member; a member fixed in relation thereto and having faces thereon upon opposite sides of the axis of the rotary member; a movable member actuated by the rotary member so that it will travel in a defined path against either of the said faces; a throw-over lever in the path of movement of the movable member when traveling against one of said faces; an operative connection between the throw-over lever and the inspecting mechanism; a lever having a part thereon projecting over that face of the fixed member opposite to the one adjacent to the throw-over lever; and an operative connection between the platform and the last mentioned lever.

27. In an apparatus wherein an element is presented to several stations and a plurality of other elements assembled therewith to produce a single article; a plurality of inspecting mechanisms for automatically inspecting the result of some of the assembly operations; a platform at another station in the path of an article while traveling between two of the stations; a rotary member;

a member fixed in relation thereto and having faces thereon upon opposite sides of the axis of the rotary member; a plurality of movable members actuated by the rotary member so as to travel in a defined path against either of said faces; a plurality of throw-over levers, corresponding in number with the inspecting mechanism, in the path of movement of the movable members and traveling against one of said faces; an operative connection between each of the throwover levers and an inspecting mechanism; a lever having a part thereon projecting over that face of the fixed member opposite to the one adjacent to the throwover levers; and an operative connection between the platform and last mentioned lever.

28. In combination with a rotary member having a helical groove in the periphery thereof; of a member fixed in relation thereto and having faces thereon upon opposite sides of the axis of the rotary member; a plurality of balls within the helical groove and by the rotation of the rotary member travel therewith against one of said faces; and means for moving one of said balls in said helical groove at substantially a right angle to the axis of the rotary member so that it may travel against the opposite face on the fixed member.

29. In combination with a rotary member having a helical groove in the periphery thereof; of a member fixed in relation thereto and having faces thereon on opposite sides of the axis of the rotary member; a plurality of balls within the helical groove and by the rotation of the rotary member travel therewith against one of said faces; and means for moving one or more of said balls either synchronously or at different times in said helical groove at substantially a right angle to the axis of the rotary member so that it may travel against the opposite face on the fixed member.

30. In combination with a rotary member having a helical groove in the periphery thereof; of a member fixed in relation thereto and having faces thereon on opposite sides of the axis of the rotary member; a plurality of balls within the helical groove and by the rotation of the rotary member travel therewith against one of said faces; means for moving one of said balls in said helical groove at substantially a right angle to the axis of the rotary member so that it may travel against the opposite face on the fixed member; and means for conveying the balls from the discharge end of the helical groove to the opposite end of the rotary member.

31. In combination with a rotary member having a helical groove in the periphery thereof, of a member fixed in relation thereto and having faces thereon on opposite sides of the axis of the rotary member; a

plurality of balls within the helical groove and by the rotation of the rotary member travel therewith against one of said faces; means for moving one of said balls in said helical groove at substantially a right angle to the axis of the rotary member so that it may travel against the opposite face on the fixed member; and gravity means for conveying the balls from the discharge end of the helical groove to the opposite end of the rotary member. 70

32. In combination with a rotary member having a helical groove in the periphery thereof; of a member fixed in relation thereto and having faces thereon on opposite sides of the axis of the rotary member; a plurality of balls within the helical groove and by the rotation of the rotary member travel therewith against one of said faces; means for moving one of said balls in said helical groove at substantially a right angle to the axis of the rotary member so that it may travel against the opposite face on the fixed member; means for conveying the balls from the discharge end of the helical groove, to the starting end thereof, which includes a rotary member for lifting the balls into register with the helical groove. 80

33. In combination with a rotary member having a helical groove in the periphery thereof; of a member fixed in relation thereto and having faces thereon on opposite sides of the axis of the rotary member; a plurality of balls within the helical groove and by the rotation of the rotary member travel therewith against one of said faces; means for moving one of said balls in said helical groove at substantially a right angle to the axis of the rotary member so that it may travel against the opposite face on the fixed member; means for conveying the balls from the discharge end of the helical groove, to the starting end thereof, which includes a rotary cam for lifting the balls into register with the helical groove. 90

34. In combination with a rotary member having a helical groove in the periphery thereof; of a member fixed in relation thereto and having faces thereon on opposite sides of the axis of the rotary member; a plurality of balls within the helical groove and by the rotation of the rotary member travel therewith against one of said faces; means for moving one of said balls in said helical groove at substantially a right angle to the axis of the rotary member so that it may travel against the opposite face on the fixed member; means for conveying the balls from the discharge end of the helical groove, to the starting end thereof, which includes a rotary cam for lifting the balls into register with the helical groove, having a cam groove in one face thereof of varying depth. 100

35. In combination with a rotary member having a helical groove in the periphery thereof; of a member fixed in relation thereto and having faces thereon on opposite sides of the axis of the rotary member; a plurality of balls within the helical groove and by the rotation of the rotary member travel therewith against one of said faces; means for moving one of said balls in said helical groove at substantially a right angle to the axis of the rotary member so that it may travel against the opposite faces on the fixed member; means for conveying the balls from the discharge end of the helical groove, to the starting end thereof, which includes a rotary cam for lifting the balls into register with the helical groove, having a cam groove in one face thereof of varying depth and at its deepest part having a pocket therein of substantially the same diameter and depth as the said balls. 110

36. In an apparatus wherein a plurality of separate elements are assembled to produce a single article; of means for automatically inspecting the result of one of the several assembly operations prior to the next succeeding operation; and means for segregating at a station more distant from the inspecting station than the one where the next succeeding operation is performed, any article that fails to meet such inspection test and without stopping the continuous operation of the apparatus. 120

37. In an apparatus of the character described, the combination with a slide; of a stop plate movably mounted on the stop plate and having a cam face thereon; a punch having movement relatively to the slide, stop plate and trip plate; a throw-over lever; a trip lever having an arm thereon in the path of movement of the trip plate, whereby the trip lever may be actuated when the trip plate is in one of its relative positions upon the stop plate, the trip plate being mounted on a part adjacent to the slide and in one of its positions having engagement with the throwover lever. 130

38. In an apparatus of the character described, the combination with a slide; of a stop plate movably mounted thereon; a trip plate movably mounted on the stop plate; a punch movable relatively to the slide and during such movement contacting with and actuating the trip plate; a throwover lever; a trip lever having an arm thereon in the path of movement of the trip plate whereby the trip lever may be actuated when the trip plate is in one of its relative positions upon the stop plate, the trip lever being mounted on a part adjacent to the slide and in one of its positions having engagement with the throw over lever. 140

39. In an apparatus of the character described, the combination with a slide; of a stop plate movably mounted thereon; a trip plate movably mounted on the stop plate; a punch movable relatively to the slide and 150

during such movement contacting with and actuating the trip plate; a throwover lever; a trip lever having an arm thereon in the path of movement of the trip plate whereby the trip lever may be actuated when the trip plate is in one of its relative positions upon the stop plate, the trip lever being mounted on a part adjacent to the slide and in one of its positions having engagement with the throwover lever; and means connected with the slide for moving the throwover lever to such position that it will be engaged by the trip lever. 10

In testimony whereof, I have hereunto affixed my signature.

ZENAS P. CANDEE.