Aug. 25, 1953 W. S. REYNOLDS ET AL 2,649,961

GAUGING AND ASSORTING DEVICE

Filed July 19, 1951 4 Sheets-Sheet 1

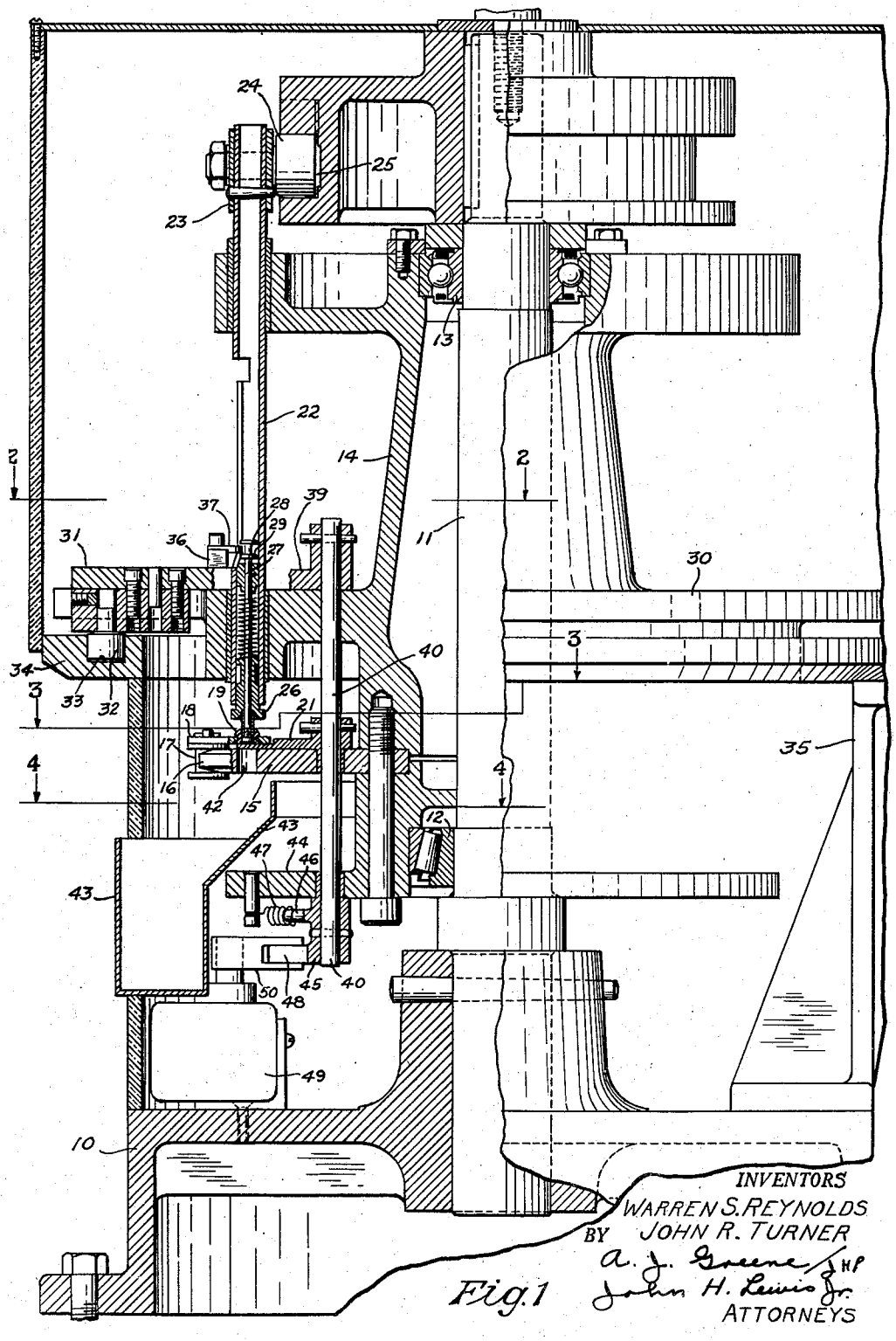

Fig. 1

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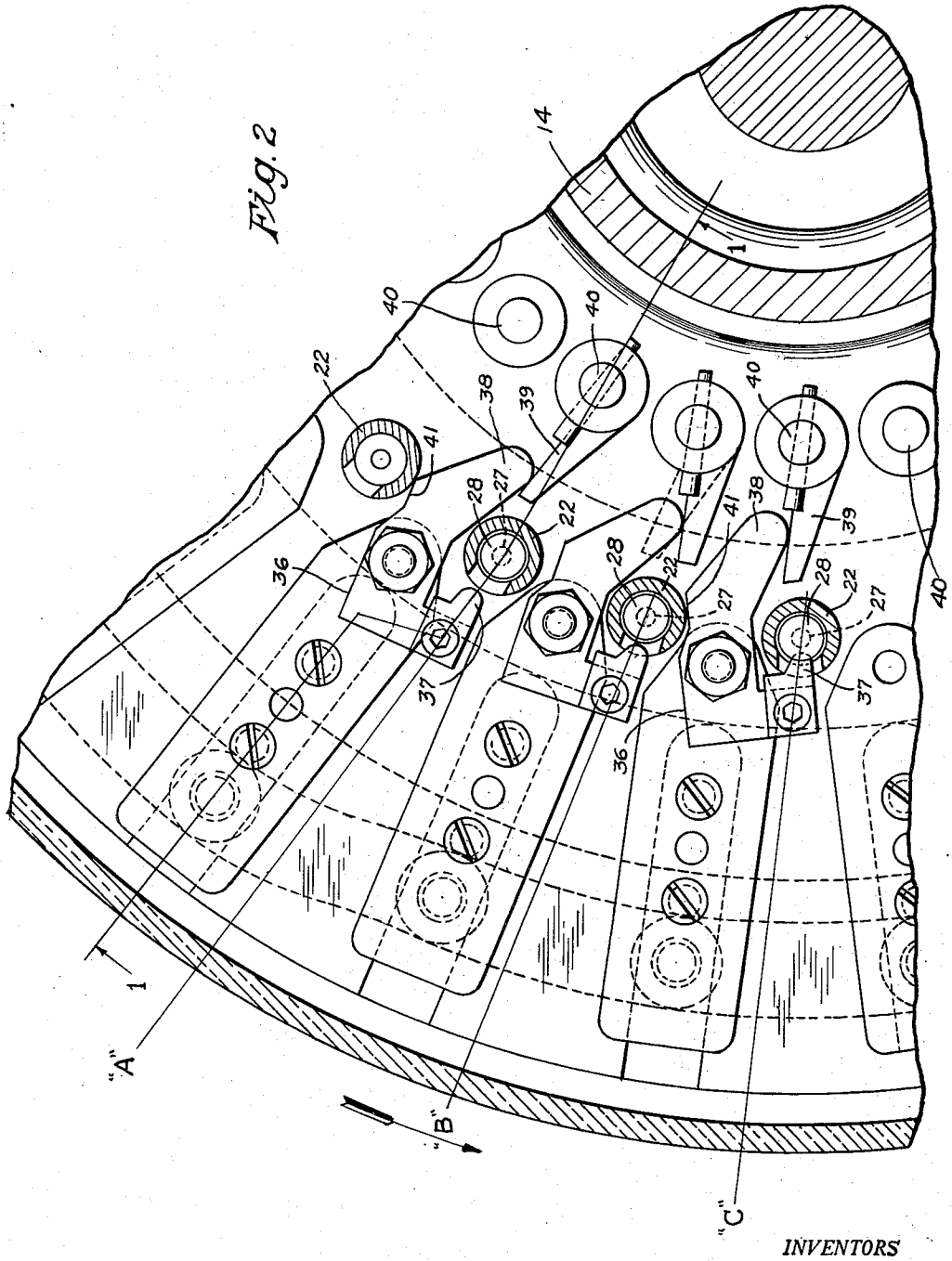
Fig. 2



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Filed July 19, 1951 4 Sheets-Sheet 3

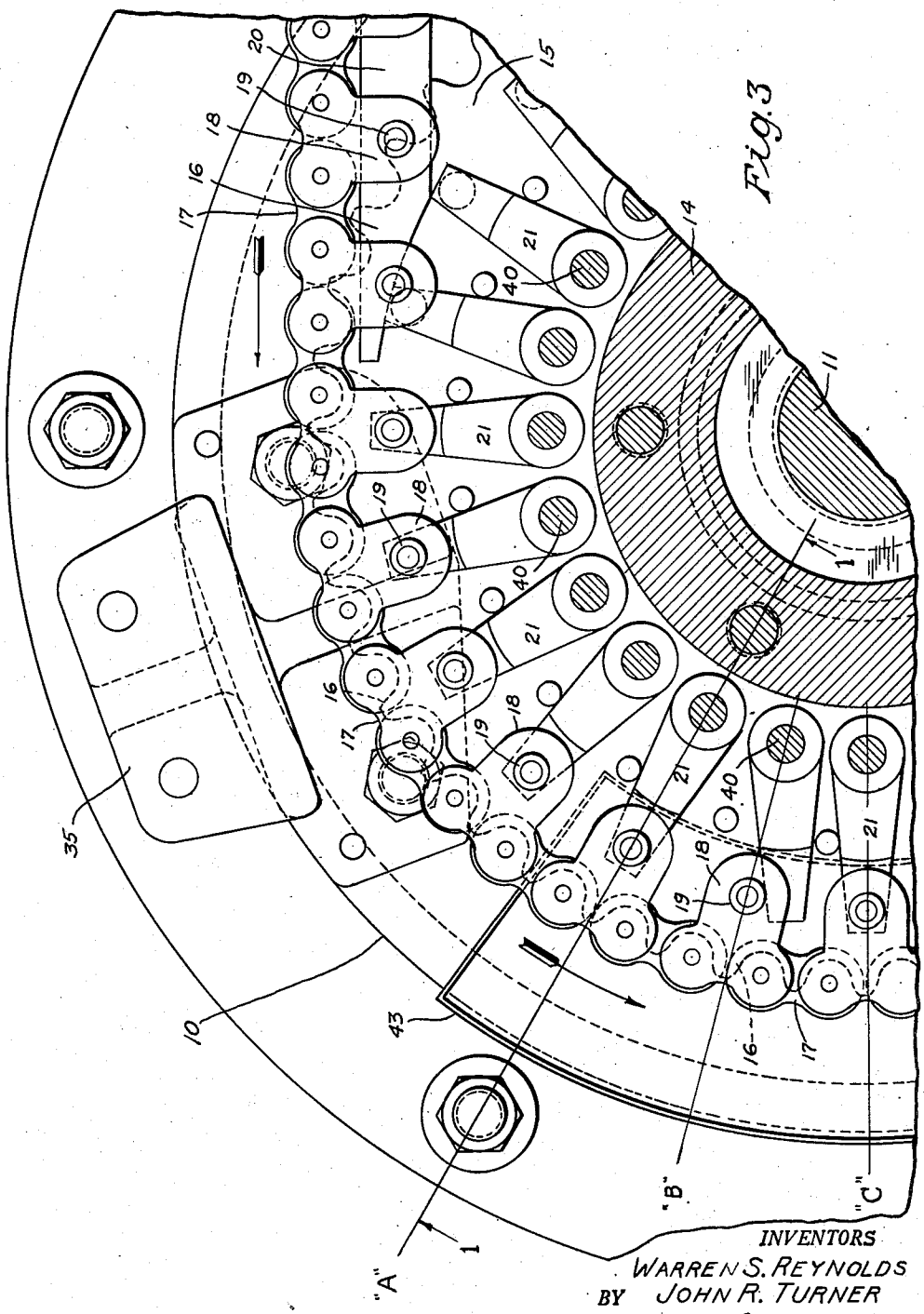

Fig. 3

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GAUGING AND ASSORTING DEVICE

Filed July 19, 1951 4 Sheets-Sheet 4

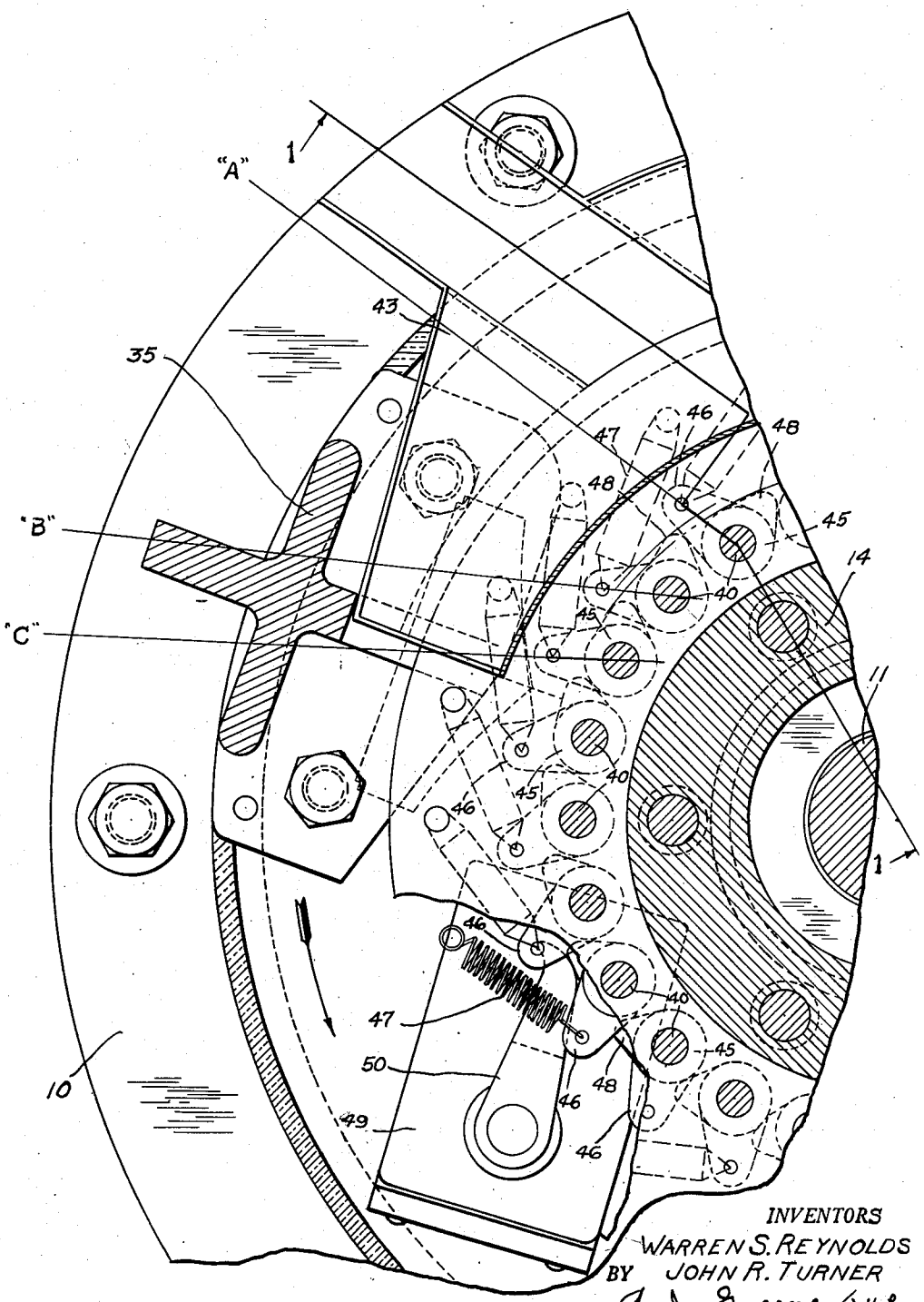

Fig. 4

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Patented Aug. 25, 1953

2,649,961

UNITED STATES PATENT OFFICE

2,649,961

GAUGING AND ASSORTING DEVICE

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Application July 19, 1951, Serial No. 237,562

8 Claims. (Cl. 209—88)

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This invention relates to a device for gauging articles and for assorting those articles in accordance with a dimension of a component thereof.

In the specific embodiment illustrated, the article is a cartridge case for ammunition and the dimension with regard to which the assortment is made is the depth of the powder charge therein. The device may be set to reject automatically those cartridge cases having either too much or too little powder. A practically identical embodiment may be arranged to assort loaded cartridges in accordance with the overall length and differs from that illustrated only, in that the gauging finger contacts the bullet of the loaded round rather than the powder charge.

The invention is illustrated as applied to a unit of a continuously operating cartridge loading machine, of which other units are shown in Patents Nos. 2,506,175 and 2,538,707, both to Warren S. Reynolds and John R. Turner. The general overall arrangement of a machine of this type is shown in the patent to C. R. Johnson, No. 2,403,286.

In machines of this character, a cartridge shell is inserted into a bushing on a continuous chain by means which may be that described in Patent No. 2,506,175 and, in the traverse of that chain around the successive turrets of the machine, the shell is charged with powder, has a bullet seated, is crimped and discharged into a suitable receptacle or conveyor. In the loading of quality ammunition it is desirable to have 100% gauging of each of the loading operations and, unless the purpose of the continuous loading machines is to be defeated, such gauging and assortment must take place without interrupting the continuity of movement of the chain.

It is the object of this invention to produce a gauging and assorting unit capable of such continuous operation and suitable for use after the appropriate loading operations, such as powder charging and bullet seating.

The exact nature of the invention as well as other objects and advantages thereof will become apparent from consideration of the following specification referring to the attached drawing, in which:

Fig. 1 is a partial vertical sectional view of a unit embodying a preferred form of our invention. A "Micro-Switch" in the lower part of this figure is shown out of position and reference should be made to Fig. 4 to locate the proper circumferential position of this switch.

Fig. 2 is a partial plan view partially in section on the line 2—2 of Fig. 1.

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Fig. 3 is a partial plan view partially in section on the line 3—3 of Fig. 1.

Fig. 4 is a partial plan view partially in section on the line 4—4 of Fig. 1.

Referring to the drawings by characters of reference, it will be seen that the machine comprises a fixed base 10 to which there is affixed a vertical column 11 carrying suitable bearings 12 and 13. Mounted for rotation on these bearings is a turret, identified generally by the numeral 14, and provided about its periphery with a sprocket 15. The teeth 16 of the sprocket are engaged by the links of a driven roller chain 17 which may be the same chain as that shown in Patent No. 2,506,175. As illustrated, the chain differs from that of the prior patent in that the work-holding plates 18 on the chain are provided with suitably shaped synthetic rubber or rubber-like bushings 19. As may be seen in Fig. 3, the chain makes a tangential approach to the turret and during the approach the shells in the bushing ride on a support rail 20, which terminates adjacent the position traversed by the ends of trap plates 21 mounted on the turret. The trap plates are so positioned relative to the sprocket and the chain thereon that each trap plate in turn slides under a bushing in the chain and takes over from the support rail the function of preventing the shells from falling out of the bushings. Thus, the chain has the dual function of driving the turret and supporting the shells thereon in predetermined spaced positions for gauging.

The actual gauging operation is performed by a series of inspection punches 22 reciprocably mounted in pairs on the periphery of the turret in spacing identical with that in which the shells are delivered to the turret. As noted, these punches are mounted in pairs, each punch of a pair being joined to a crosshead 23 provided with a cam roller 24 which rides in a cam track 25 fixedly secured to the vertical column 11. The cam track is so shaped that the inspection punches are carried in a raised position clear of the mouth of the shell until shortly after the chain has wrapped onto the turret and again raised before the chain departs tangentially from the turret. During most of the time the shells are being carried around on the periphery of the turret, the punches are down, and the spring loaded punch nose 26 is bearing on the mouth of the shell and urging it down against the trap plate 21.

Each inspection punch, it will be noted, is hollow and freely floating therein is a gauge finger 27 which drops into the shell and comes to rest on the powder charge therein. The position of

the flanges 28 and 29 on the upper end of the gauge finger relative to the main body of the turret is therefore an indication of the height of the powder charge above the base of the shell which is pressed down on the trap plate 21 into a fixed position relative to the turret. Since the finger rests directly on the powder and substantially fills the shell, this gauging of the bulk of the powder charge can be performed with considerable accuracy.

The indication of the gauge finger 27 is utilized in controlling the assorting operation by providing in a shelf 30 on the turret body a plurality of radially movable detector slides 31. These detector slides are each provided with a cam roller 32 received in a track 33 in a fixed annular cam plate 34 supported from the base of the machine by standards 35. The cam is so disposed on the machine that after the chain has wrapped onto the turret and the punch has been lowered onto the shell mouth, the detector slide will be moved radially inward toward the inspection punch and there retained for a dwell slightly less in extent than the dwell of the punches in their lower position.

Each detector slide has a pivotally mounted detector 36 having an adjustable nose 37 adapted to enter, when the gauge finger 27 indicates a proper powder charge, between the flanges 28 and 29 on the head thereof. Obviously, the relationship between the thickness of the nose 37 and the spacing of the flanges 28 and 29 determines the tolerance allowed by the gauging operation. If the charge is within specification limits, the detector nose enters between the flanges. If the charge is too low, the detector nose is blocked by the uppermost flange 28; if the charge is too high, the detector nose will be blocked by the lowermost flange 29.

The detectors, it will be noted, are each of crank-like form and, as previously stated, are pivotally mounted on the detector slides. Obviously, if the nose of the detector enters freely between the flanges 28 and 29, the radial movement of the slide has no material effect upon the detector. This situation is illustrated at position "C" in Figs. 2, 3, and 4. However, if the detector nose is blocked by one or the other of the flanges 28 and 29, further movement of the detector slide is possible only if the detector swings upon its pivot as shown at position "B" in Figs. 2, 3, and 4.

Each detector is provided with a lever arm 38 which engages a lever 39 fixedly mounted on a vertical shaft 40 which controls the trap plate 21 in a manner to be described. The lever 39 is spring biased to turn in a clockwise direction as viewed in Fig. 2 and therefore opposes the clockwise movement of the detector. In the position "B" referred to above, the swinging of the detector results in an anti-clockwise swinging of the lever 39. In the outer or non-inspect position "A" of the detector, the opposing force applied to the detector by the lever 39 would possibly result in turning the detector nose into engagement with the gauging finger and interfering with the proper positioning thereof unless stop means were provided. The most convenient way to provide such stop means is to arrange a lug 41 on the detector which, in the retracted position, bears on the outside of the punch 22 at the succeeding position on the turret.

Referring particularly to Figs. 1 and 3, it will be noted that each trap plate 21 is pinned on the shank of the vertical shaft 40 associated with that turret station. Thus, when the detector is turned on its pivot by engagement with one of the gauging finger flanges and necessarily swings the lever 39, the trap plate swings also. This operation is shown at position "B" in Figs. 2, 3, and 4, and shows that the trap plate 21 is swung to one side sufficiently to remove support from beneath the head of the cartridge carried in the bushing 19 on the chain. As the support of the trap plate is removed, the spring-loaded nose 26 on the inspection punch impels the shell downwardly through the hole 42 provided in the sprocket beneath each turret station. Such ejected shells fall into the collecting receptacle 43, which is of arcuate form and underlies enough of the sprocket to be sure of receiving all defective ejected shells. Since, in the embodiment illustrated, the ejected component will be a primed shell charged with an improper amount of propellant powder, it is desirable to take suitable precaution against fire and explosion. One useful measure is the connection of a vacuum exhaust system, preferably water trapped and necessarily static-proof, to collect spilled powder as the ejected shells are deposited in the receptacle 43.

Occasionally, it will be found that a shell which should have been ejected will tend to hang up in the chain bushing 17 only partially through the hole 42 in the sprocket. If this situation were allowed to persist, it would, at the least, result in damage to the chain where the chain unwraps from the turret sprocket. This danger is obviated by carrying the vertical shaft 40 down through another shelf 44 on the turret. Beneath this shelf another lever 45 is pinned on each shaft and provided with one arm 46 which engages a spring 47 to bias the shaft and its associated trap plate 21 and lever 39 back to their normal position. Each lever 45 is also provided with a short cam arm 48 which, in the "B" or eject position (Fig. 4), extends out beyond the circular path ordinarily traversed by these arms. If anything, such as a jammed shell, obstructs the return of the trap plate to normal position after the fixed cam 33 returns the detector slide 31 to its normal position, the cam arm 48 will remain in the abnormal outward position.

A "Micro-Switch" or other precision switch 49 is disposed near the point at which the chain unwraps from the turret with an operating lever 50 disposed in position to be engaged by a cam arm 48 displaced to its abnormal outward position. By means of suitable relays, not shown, this switch may be arranged to cut the power to the driving motor and apply suitable electric or mechanical brakes to bring the machine to a stop without damage from a jammed component. Since this unit is only one of several on the complete machine which may include machine stop arrangements, it is desirable to also arrange for the switch 49 to operate an indicator light or other indication of the source of the trouble.

As noted in the introduction, this machine may, without essential change, be used to perform other inspections. One example is the use of a unit which is in most respects identical to that shown here for inspecting the overall length of loaded cartridges and, incidentally, the depth to which the bullets are seated in the cartridge case. For that function, it is only necessary to modify the spring loaded punch nose 26 to bear on the bourrelet or driving band

portion of the seated bullet while the gauging finger 27 bears on the point thereof. All other parts may remain as previously described herein.

Although we have illustrated and described in considerable detail a preferred embodiment of our invention, it should be understood that we consider our invention to include all equivalent designs, devices, or constructions coming within the scope of the claims appended hereto.

We claim:

1. Apparatus for gauging and assorting workpieces in accordance with a dimension of a component thereof, said apparatus including in combination, a chain conveyor disposed in a horizontal plane, spaced individual workpiece carrying receptacles, carried by said conveyor, a continuously rotating turret traversed by said conveyor, a plurality of inspection stations on said turret arranged for alignment with receptacles on a reach of said conveyor traversing said turret, movable trap plates on said turret at each of said inspection stations beneath the bases of workpieces carried in said receptacles, the upper surface of each of said trap plates lying in a common horizontal plane, which plane establishes a common reference point for gauging said workpieces, a reciprocable gauge finger on said turret at each of said inspection stations, an operator arranged to advance each of said fingers in turn to contact the component to be gauged, a detector on said turret at each of said inspection stations, common means for moving each of said detectors in turn to engage its associated gauge finger when said finger is in an abnormal position with respect to said reference level, and means controlled by the engagement of a detector with its gauge finger for withdrawing the associated trap plate from supporting relation to said workpiece.

2. Apparatus according to claim 1, said detectors each comprising a base mounted for movement toward said finger, and a lever pivotally mounted on said base, one end of said lever being arranged to engage said gauge finger if said component does not bear a predetermined relationship to said reference level, further movement of said base after engagement of said one end with the finger causing the other end thereof to operate said trap plate withdrawing means.

3. Apparatus according to claim 2, said gauge fingers each comprising a pair of abutments separated by a fixed amount plus the allowable tolerance in said particular dimension, said one end of said detector lever having a thickness equal to said fixed amount and being so positioned relative to said reference level as to pass between said abutments without engaging said finger if said particular dimension as indicated by the position of said finger when thrust into contact with said component is within the allowable tolerance.

4. Apparatus according to claim 3, including

carriers for said gauge fingers mounted on said turret at each of said stations for reciprocation along lines substantially parallel to the axis of rotation of said turret, said gauge fingers being yieldably mounted in said carriers; and common fixed cam means operatively engaged with each of said carriers to yieldingly thrust each of said fingers in turn into contact with said particular component.

5. Apparatus according to claim 4, said detector bases being mounted on said turret for substantially radial sliding movement in the general direction of said fingers; and common fixed cam means operatively engaged with each of said bases arranged to project and retract each of said bases in turn while said finger is in contact with said particular component.

6. Apparatus according to claim 5, said trap plate withdrawing means comprising a shaft at each station coupled to the trap plate at the same station and an arm on said shaft disposed in the path of movement of said other end of the detector lever at the same station and engageable thereby to rotate said shaft when the detector base is projected toward the gauge finger at the same station and said one end of the detector lever engages one of said abutments on the finger.

7. Apparatus according to claim 6, each of said shafts being provided with spring means urging the associated trap plate into workpiece supporting position; radially projecting cam means on each of said shafts arranged, when said trap plate is out of workpiece supporting position, to project substantially radially outward relative to the axis of the turret; and a common machine stop member fixedly positioned relative to said turret and provided with an actuator arranged to be engaged by the outwardly projecting cam means on any of said shafts which has not returned the associated trap plate to workpiece supporting position.

8. Apparatus according to claim 7, each of said carriers for said gauge fingers being provided with a nose piece engageable with the workpiece when said carrier is reciprocated toward the trap plate; and spring means applying a yielding projecting force to said nose piece whereby the nose piece will forcibly eject said workpiece when the support of the trap plate is removed from beneath the base of the workpiece.

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JOHN R. TURNER.

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