

May 10, 1938.

R. H. CRAMER

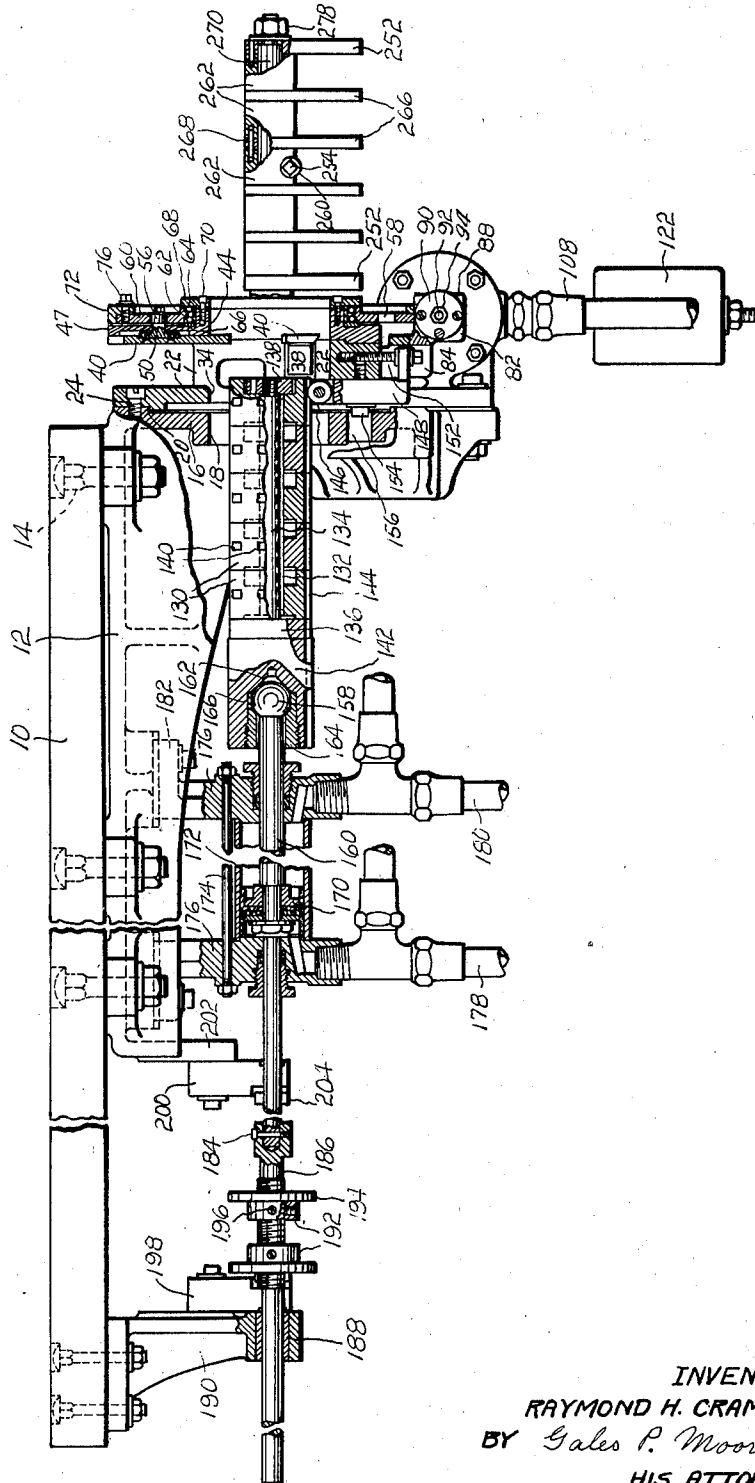
2,116,926

GAUGING MACHINE

Filed Nov. 14, 1934

4 Sheets-Sheet 1

FIG. 1



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FIG. 2

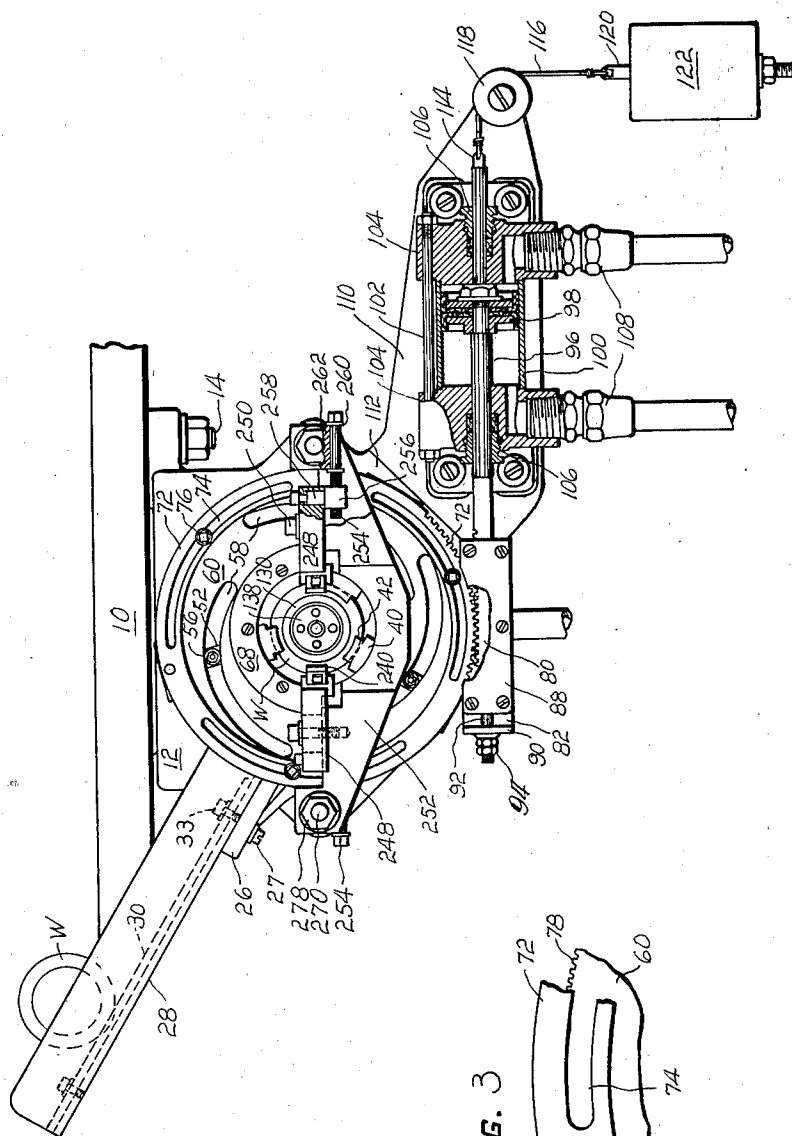
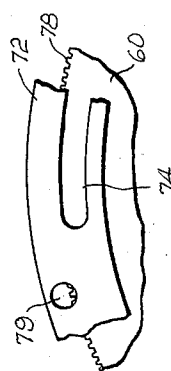


FIG. 3



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FIG. 9

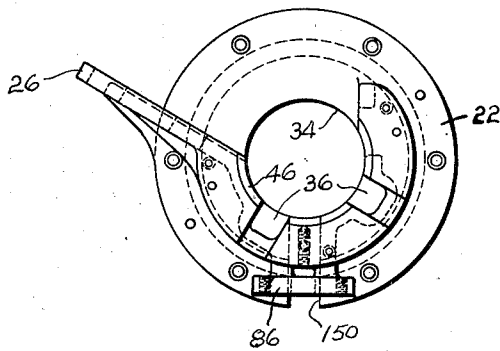


FIG. 10

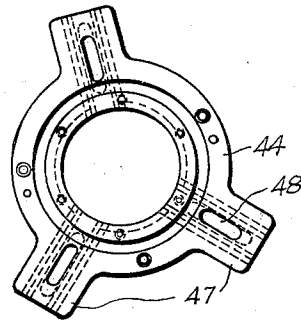


FIG. 11

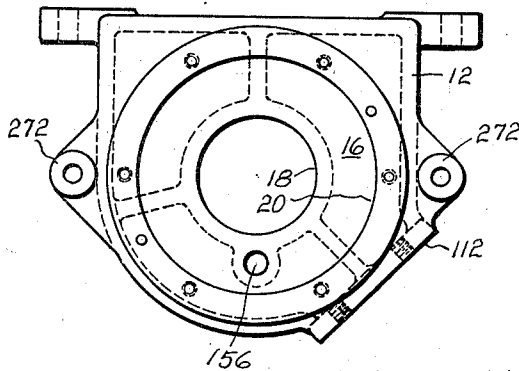
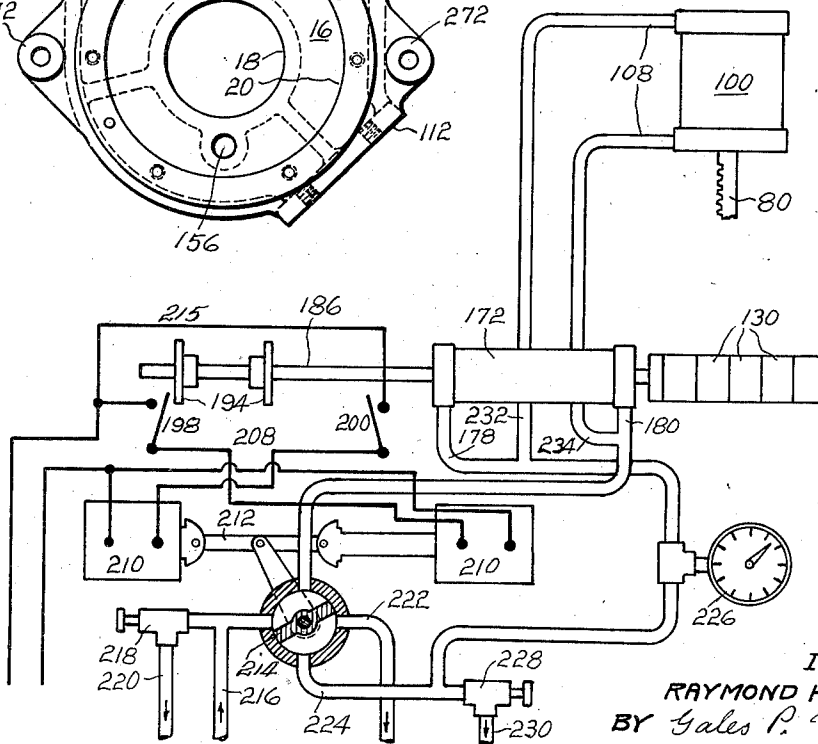


FIG. 12



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UNITED STATES PATENT OFFICE

2,116,926

GAUGING MACHINE

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12 Claims. (Cl. 209—82)

This invention relates to gauging machines and comprises all of the features and aspects of novelty herein disclosed. An object of the invention is to provide an improved machine for gauging articles and segregating them into groups. Another object is to provide a simple and efficient machine especially adapted for gauging the internal diameter of rings or sleeves. Another object of the invention is to provide an internal diameter gauging machine which will neutralize errors in out-of-round and eliminate the human equation.

To these ends and also to improve generally upon devices of this character, the invention consists in the various matters hereinafter described and claimed. In its broader aspects, the invention is not necessarily limited to the specific construction selected for illustrative purposes in the accompanying drawings in which

Fig. 1 is a side elevation with numerous parts broken away and in cross section.

Fig. 2 is an end elevation, a portion of a cam actuating cylinder being broken away and in section.

Fig. 3 is an enlarged end elevation of certain parts pertaining to the adjustment of the cam.

Fig. 4 is an enlarged cross sectional view of one of the work-stripping fingers.

Fig. 5 is an enlarged end view, partly broken away and in section, of a rack housing.

Fig. 6 is an enlarged sectional view of a switch and associated parts.

Fig. 7 is a plan view with some parts broken away and in section.

Fig. 8 is a detail view, partly in section, of one of the slides and associated parts.

Fig. 9 is an end view of the chute body or head.

Fig. 10 is an end view of a spider.

Fig. 11 is an end view of a main bracket.

Fig. 12 is a diagram.

First outlining the general operation, rings or sleeves are placed in a chute from which they roll one at a time into a head. The head holds the article in alignment with a series of plugs of progressively increasing size which are forced into the article as far as they will go under a given pressure. Then the plugs, with the article upon one of them, advance to a given point and return to the starting point but, as the plugs begin the return stroke, the article is stripped off at a position which is dependent upon the distance which the plugs initially advanced into the article.

The apparatus may be conveniently supported

by a table or bench 10 and comprises a main bracket 12 with lugs secured to the bench by bolts 14. The bracket has a depending web or face plate 16 with an opening 18 and an annular rim 20 to center a chute body or head 22 which is fastened by screw bolts 24. The chute body or head has an inclined web 26 (Figs. 2 and 9) which is slotted for bolts 27 which secure the lower end of a chute plate 28. This plate is conveniently of angle cross section and has a companion plate 30 (Fig. 7) whose horizontal web is provided with slots 32 for bolts 33 adjustably securing the plate 30 with its upright side wall at a selected distance from the companion side wall to suit the length of the work. The work-pieces W are herein shown as plain sleeves and the chutes let the work-pieces run down by gravity to a point in alignment with a central opening 34 in the chute body or head, this opening registering with the opening 18. The outer face of the head is provided with two radial pockets 36 (Fig. 9), the latter preferably being 120° apart and receiving work rests or supports 38 projecting into the pockets from dovetail slides 40.

There is also a third or upper slide which is similar to the lower ones except that it omits the projecting work support 38 in order that work-pieces may be let down from the chute. The two lower slides (Figs. 1, 2, and 8) have work abutments or stops 42 which extend radially beyond the supports 38 and these act with the upper slide to resist axial movement of the work. The slides are movable radially in dovetail ways in a three-legged spider 44 (Fig. 10) which is secured by screw bolts to the head 22, the latter having an interrupted arcuate rib 46 entering a little recess in the spider to center it. Each of the spider legs 47 has a radial slot 48 for a stud 50 (Fig. 8) projecting from a plate 52 which is secured in a recess 54 of the slide. Each stud carries a roller 56 engaging a spiral cam slot 58 in a rotatable cam plate 60 which is turned to actuate the slides. The cam plate is provided internally with a V-shaped rib 62 (Fig. 1) separating a pair of raceways for two rows of ball bearings 64, the latter having co-operating raceways on a ring 66 of angular section which is sleeved on an annular projection of the spider and clamped by a retaining ring 68 having securing bolts 70. Fitting the exterior of the cam plate is a ring 72 of angular section having gear teeth on its lower segment. The ring has a flange provided with arcuate slots 74 in order that it may be adjustably secured to the cam plate 60 by bolts 76. A segment of the cam plate has a

series of fine teeth 73 as shown in Fig. 3 while a hole 79 in the ring 72 provides for the insertion of a pinion on the end of a special wrench (not shown) whereby the ring 72 and the cam plate 68, and hence the slides 40, can be given an initial adjustment to suit the size of the work.

The ring gear is turned by a rack 80 in a channelled guide housing 82 having a lug 84 secured to a projecting web or pad 86 on the bottom of the head 22. The housing has a cover plate 88 secured at one side and a stop plate 90 secured to one end. The rack has a cylindrical extension 92 guided in the stop plate and threaded to receive check nuts 94 which limit movement to the right. The other end of the rack is threaded in the end of a piston rod 96 having a piston 98 in a cylinder 100. The cylinder wall is clamped by tie rods 102 between cylinder heads 104 which have suitable packing glands 106 and supply-pipe couplings 108. The heads are bolted to a bracket 110 which is secured by bolts to a web or pad 112 on the main bracket 12. The piston rod has an eye 114 at the end for a cable 116 which runs over a pulley 118 to a rod 120 having a weight 122. This weight is selected, as will appear, to postpone the action of the piston, rack, gear, slides, etc., until another piston of smaller cross section controlling the gauge plugs has made a preliminary movement. Whenever the three slides 40 are moved radially inwards and receive a piece of work W on the two work supports 38, the work abutment surfaces or stops 42 prevent axial movement of the work until the slides retract them.

The gauging device, in its preferred form, comprises a series of gauge plugs 130, of slightly different diameter but graded according to the sizes of work-pieces being gauged and segregated. In effect, the gauging device is stepped although it could be tapered and it is forced endwise into the work as far as it will go, being detachably secured by a long key 132 on an arbor 134. The individual sections or plugs abut against one another and against a spacer 136, and are clamped by a nut 138 threaded on the arbor and housed in a recess of the endmost plug. All of the plugs preferably have a series of hardened inserts 140 set into their periphery but projecting very slightly, and all of them are also recessed so that any one placed at the end can house the nut 138. The spacer 136 abuts against an enlargement 142 of the arbor and this enlargement, and also the spacer and plugs, are provided with aligned grooves 144 to run on a convex supporting roller 146. The roller is carried in a fork of a bracket 148 adjustable in a radial slot 150 of the chute body, the bracket having a projecting lug carrying an adjusting screw 152 which is threaded in the chute body. After adjustment, the bracket is secured in position by a screw bolt 154 which is accessible through a hole 156 in the face plate 16. The supporting roller and its adjustment are to locate or center the gauge plugs with respect to the work-pieces and the plugs have a slight lost motion or play if forced endwise into a work-piece which is a trifle out of round. The enlargement 142 has a loose universal connection with its operating means to let the plugs align themselves with the work. The connection comprises a ball 158 on a piston rod 160, the ball entering a recess 162 of the enlargement and being retained by a coupling nut 164. The nut has a cylindrical extension 166 fitting around the ball with a little clearance, and both the nut and the

enlargement have conical faces holding the ball endwise.

The piston rod 160 has a piston 170 in a cylinder 172 whose wall is clamped by tie-rods 174 between cylinder heads 176. The heads are provided with ports leading to elbows on supply pipes 178 and 180, and supporting lugs 182 projecting from the heads are bolted to the bracket 12. The piston rod is connected by a pin 184 to the forked end of a switch control rod 186 which has a slide bearing 188 in a bracket 190 bolted to the bench. A portion of the rod is threaded to adjustably receive collars 192 which have switch operating flanges 194. The collars are secured in adjusted positions by set screws 196. A switch base 198 of insulating material is secured to the bracket 190 and a similar switch base 200 is secured to a lug 202 on the main bracket 12, both switch bases being just to one side of the rod. Projecting from each base (Fig. 6) in the path of one of the flanges 194 is an insulating button 204 carried by a spring 206 which is electrically connected to a wire 208. Each spring has a contact button 209 arranged to be pressed into contact with a contact stud 211 which is electrically connected by a contact arm 213 with a line wire 215. The wires 208 run to solenoids 210 (Fig. 12) whose plungers are connected by links 212 to a four-way reversing valve 214.

The valve receives pressure fluid from a supply pipe 216 connected to a pump, there being a relief valve 218 in a by-pass pipe 220 leading to a tank. An exhaust pipe 222 leads from the valve to the tank. A pipe 224 leads from the valve to the cylinder supply pipe 178, a pressure gauge 226 being attached. A relief valve 228 in a pipe 230 connects the pipe 224 to the tank. A branch pipe 232 leads from the pipe 178 to one end of the cylinder 100 and another branch pipe 234 leads from the pipe 180 to the other end of the cylinder 100. The diagram shows the parts in the position wherein the gauge plugs are reaching their retracted position. When the valve is reversed by switch 198 to advance the gauge plugs, the latter enter the work as far as they are forced by pressure of the fluid, the work being held from movement by the thrust surfaces or stops 42. The cylinder 172 is of smaller cross section than the cylinder 100 and a light pressure will advance the plugs. Then the pressure fluid builds up in the pipe 232 leading to the cylinder 100 and, after overcoming the resistance of the weight 122, operates the rack and segment gear to expand or withdraw the slides 40 and their stops 42. The gauge plugs with the work-piece on one of them then advance freely to the end of their stroke, one of the switch operating flanges 194 closing the switch 200 and again reversing the valve 214 to the position shown. Pressure fluid in cylinder 172 then retracts the gauge plugs, and pressure fluid in cylinder 100, with the help of the weight, moves the slides 40 inwardly again. In this retreat of the gauge plugs, the work piece is stripped off at or near its advanced position, such position depending on its internal diameter, and the various pieces being graded or segregated accordingly.

The stripping mechanism comprises pairs of fingers 240, each pair corresponding in position to the advanced position of one of the gauge plugs. Each finger is pivoted on a pin 242 and is urged to stripping position by a coil spring 244. The fingers are forced by the work into a channel 246 of a holding plate 248 when the gauge plugs advance and the fingers snap behind the

work as the latter passes. There are two holding plates each being slotted transversely for clamping bolts 250 which clamp them in adjusted position on U-shaped end supports or yokes 252. The holding plates are adjustable towards or from another to adapt the fingers to strip work of different diameter, an adjusting screw 254 being threaded in a nut 256 on a stud 258 which is secured to each holding plate. Each adjusting screw has a smooth cylindrical portion between collars 260 which embrace a spacer 262 whose lower surface is grooved or recessed to receive the smooth cylindrical portion. There are other similar spacers which separate the end supports 252 and a series of partitions or separating plates 266 which are similar in shape to the end supports but somewhat thinner. The spacers are keyed to the adjacent partitions by pins 268. All the keyed together parts, at each side of the machine, are supported by being sleeved on a long supporting bolt 270 which is secured to a lug 272 projecting laterally from the web or face plate 16 of the main bracket. A long inner spacing sleeve 276 abuts against each lug 272 and the keyed together parts are clamped against it by a nut 278 on the outer end of the bolt 270. As the work-pieces are stripped from the plug which selects them, they drop between the corresponding pair of partitions 266, or between one of the end supports 252 and the next partition, then going to a corresponding bin. In the present machine, the work is segregated into five classes or groups according to internal diameter.

Summarizing the operation, the operator keeps the chute supplied with work-pieces, the lowest piece dropping freely past the upper slide 40 onto the work supports 38 of the lower slides. The valve 214 is turned to effect the advance of the gauge plugs 130 which are forced into the work as far as they will go, the stops 42 on the ends of the slides temporarily holding the work from advancing. The plugs, having some lost motion universally, will find their opening and will force a work-piece which is slightly out of round to fit the plug. As soon as fluid pressure builds up enough in the large cylinder 100 to overcome the weight 122, the rack 80 advances, turning the cam plate 60 clockwise in Fig. 2 and so expanding or retracting the slides 40 so that the stops 42 no longer obstruct the work-piece. Pressure fluid is still active in the small cylinder 172 and hence the gauge plugs advance to the end of their stroke which is always ultimately the same, although the work-piece goes only as far as the plug which selects it. At the end of the stroke, the switch 200 causes the reversal of the valve and hence the gauge plugs retreat, the work-piece being stripped off by the first pair of fingers 240 which it encounters and dropping between the corresponding partitions. The slides 40 also move in and a new work-piece drops onto the work supports 38 as soon as the gauge plugs (which hold the work-pieces in the chute) have retreated through the chute body. As this occurs, the other switch 198 is operated and the cycle is repeated automatically. The work is always stripped off at a location which is a function of the distance the gauge device enters it. The more the work and the gauge telescope one with the other, the shorter distance is the work carried over the partitions so that work travel is inversely proportional to the advance of the gauge with respect to the work.

I claim:

1. In a machine of the character described, a

gauging device, a work holder, a piston and cylinder unit for advancing one of said last named members towards the other, abutment means for limiting said movement, and a piston and cylinder unit for removing said abutment means; substantially as described.

2. In a machine of the character described, a gauging device, a work abutment, fluid pressure means for advancing one of said last named members towards the other, fluid pressure means for releasing the work abutment, and means for causing the last means to operate only after the first means has built up a definite pressure; substantially as described.

3. In a machine of the character described, a gauging device, a work abutment, fluid pressure means for advancing one of said last named members towards the other, and means for causing the release of the work abutment after the fluid pressure means has applied a definite pressure; substantially as described.

4. In a machine of the character described, a gauging device, a work abutment, means for advancing one of said last named members towards the other, a cylinder and piston unit for actuating the work abutment, and a weight connected to the unit for preventing actuation until the gauging device and work engage with a predetermined pressure; substantially as described.

5. In a machine of the character described, a gauging device, a work holder having means to support a work-piece in alignment with the gauging device, means for causing relative movement of approach between the gauging device and the work holder to bring the work and the gauging device into tight telescoping engagement, the work holder having means to temporarily limit the relative movement and bring about said tight engagement and mechanism for operating said limiting means to release the piece from the holder and thereby render the first-mentioned means again operative to produce simultaneous movement of the gauging device and the work to a stripping position which is dependent upon the amount of the preliminary relative movement; substantially as described.

6. In a machine of the character described, a gauge plug, a work holder, means for forcing the gauge plug into a hollow work-piece, the holder having means to positively limit axial movement of the work-piece whereby the plug and the work-piece engage tightly to make the work-piece conform to and stop the plug, and mechanism for thereafter removing the limiting means and causing the work-piece to be carried a distance which is a function of the preliminary advance of the plug; substantially as described.

7. In a machine of the character described, a gauging device, a work holder comprising a plurality of slides for locating a hollow work-piece in axial alignment with the gauging device, means for urging the gauging device and work-piece into tight telescoping engagement, means for preventing axial movement of the work-piece with respect to the slides as a result of said tight engagement of the work-piece with the gauging device, and means for releasing the work-piece and shifting it axially with respect to the slides; substantially as described.

8. In a machine of the character described, a gauging device, a work holder to support a work-piece in alignment with the gauging device, a piston and cylinder unit for advancing one of said last named members into telescoping relation to the other, abutment means for posi-

tively limiting said movement when the work and the gauging device are in contact, and means for removing said abutment means to make said cylinder and piston unit again effective to produce a subsequent relative axial movement between the work holder and the work-piece; substantially as described.

9. In a machine of the character described, a gauging device, a work holder, means for causing relative telescoping movement between the gauging device and a work-piece held by the holder, a positive stop to prevent relative axial movement between the work-piece and the holder, means for limiting the pressure of the work-piece against the positive stop to a predetermined amount, and means for causing said gauging device and work-piece to have an axial movement with respect to the holder when said pressure is reached; substantially as described.

10. In a machine of the character described, a gauging device, a work holder, means for causing relative telescoping movement between the gauging device and a work-piece held by the holder, means for limiting the endwise pressure between the gauging device and the work to a predetermined amount, and said limiting means having operating connections co-operating with the first mentioned means for controlling a subsequent relative axial movement between the work-piece and the holder; substantially as described.

11. In a device of the character described, a gauging device, a work holder, a cylinder and piston unit for reciprocating one of the first mentioned members to cause relative telescoping

movement between the gauging device and a work-piece held by the holder, a second cylinder and piston unit having fluid pressure connections with the first cylinder, said second unit being constructed and arranged for operation of its piston at a higher pressure than the first piston, a work engaging stop on the work holder for interrupting the stroke of the first piston in one direction until pressure builds up to the higher pressure, operative connections between the second piston and the stop for retracting the stop at said higher pressure to provide for resumption of the stroke of the first piston and advance of the work-piece with respect to the holder, and means for releasing the piece at its point of greatest advance; substantially as described.

12. In a device of the character described, a gauging device, a work holder, a cylinder and piston unit for reciprocating one of the first mentioned members to cause relative telescoping movement between the gauging device and a work-piece held by the holder, the work holder having a positive stop arranged to engage the work-piece to interrupt the stroke in one direction until pressure between the work-piece and the gauging device reaches a predetermined amount, stop retracting means constructed and arranged to retract the stop at said predetermined pressure to provide for completion of the stroke of the reciprocated member, and means for releasing the piece at its point of greatest advance; substantially as described.

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