MACHINERY

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Making a World-Famous Automatic Pistol

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Approved for Publication by the War Department

Tried and Tested in the First World War, the Colt 0.45 Automatic Pistol is Now Being Manufactured in Larger Quantities than Ever Before. The Reputation of This Famous Firearm has been Established by the Care and Precision of Its Manufacture

THE first successful American automatic pistol was developed and introduced by the Colt's Patent Fire Arms Mfg. Co. in 1900. It was of 0.38 caliber, and its construction was based on Browning's patent, which featured a magazine feed, recoil ejection of the empty cartridge cases, and automatic cocking of the hammer after each shot was fired. It was in many ways a marked improvement over the re-

volver with bulky cylinder and hammer that had to be manually cocked before each shot.

In 1905, the first Colt Military Model 0.45 caliber automatic was introduced. After extensive and rigorous tests by the United States Government, it was adopted with slight modifications as the standard hand gun for the Army, Navy, and Marine Corps in 1911. Since that time, with the addition of one or two refinements in construction, it has continued to be unsurpassed as an automatic side arm for accuracy and reliability of operation.

During the first World War the Colt Government Model was used extensively by our Expeditionary Forces, and to supply the quantities needed, two firms were authorized to manufacture it, besides the Colt's Patent Fire Arms Mfg. Co. Today it is recognized that the automatic pistol still fills a unique and important place in the armory of modern warfare. It is being manufactured in greater quantities than ever before, and three companies, in addition to the Colt's organization, have been authorized to engage in its production.

The present Government Model 0.45 Colt automatic is a compact, well balanced pistol weighing 39 ounces. It is about 8 1/2 inches long and has a magazine capacity of seven shots. The action of the pistol is automatic, except that the trigger must be pulled to fire each shot. It can be discharged at the rate of five shots per second, the cartridges being automatically supplied from a detachable magazine inserted in the handle of the pistol.

The fifty - three parts of which the pistol is composed are shown in Fig. 1, and most of them are also shown in the assembly drawing, Fig. 2. The materials of which the various parts are

Fig. 1. Fifty-three Different Parts Make up the Colt Automatic Pistol. All except the Plastic Stocks are Made of Steel. The Names of the Parts are Listed in the Table on the Opposite Page

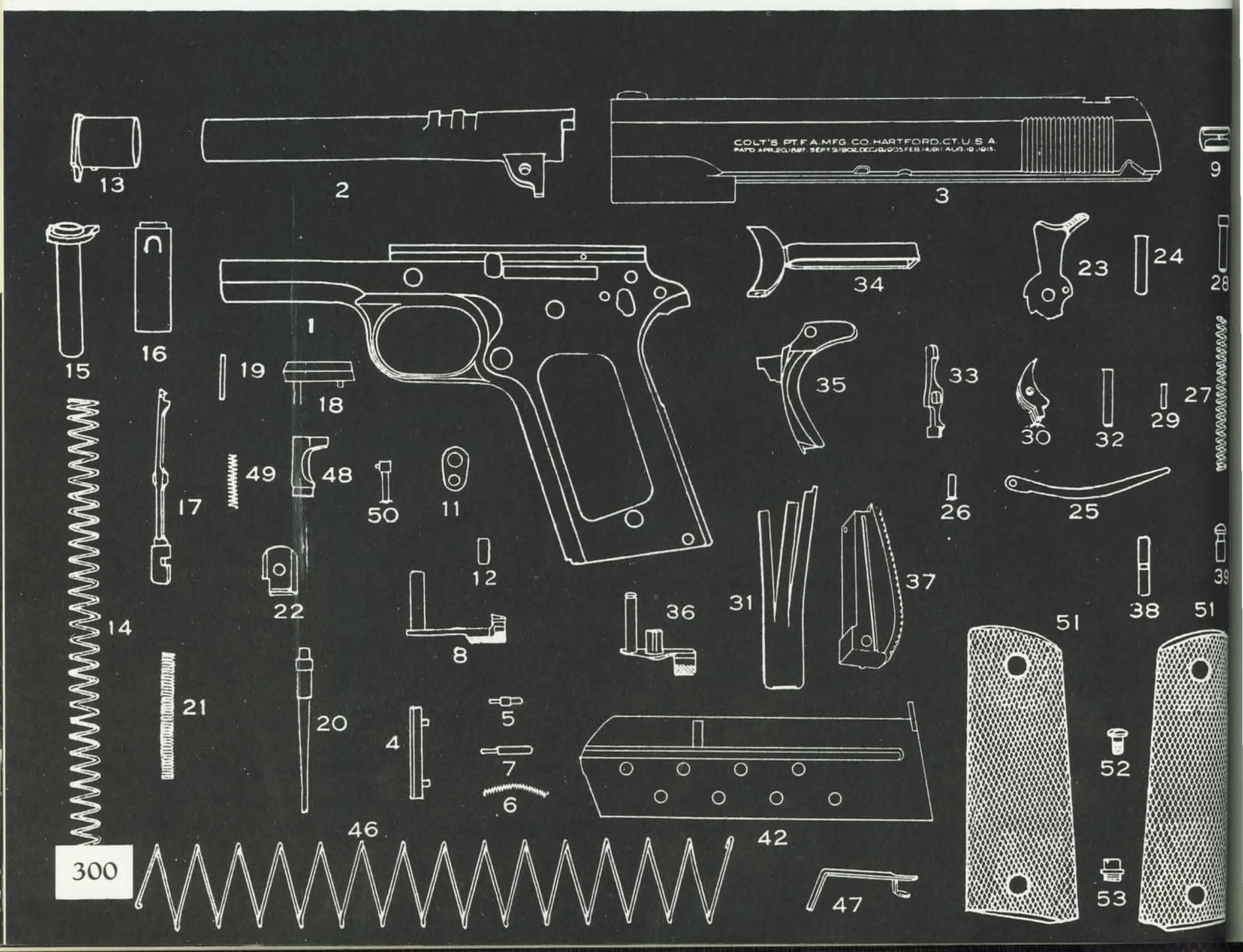

Fig. 2. Cut-away Side View of Assembled Pistol, Showing Receiver, Slide, Barrel, Recoil Spring, Firing Pin, Trigger, Hammer, and Firing Mechanism. Some Parts are Not Visible in This View. Loaded Magazine is Shown at Left

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Material Specifications for Colt Government Model 0.45 Automatic

Part No.	Name	Size and Grade of Steel
1	Receiver	2 1/4" by 1", S A E 1035
2	Barrel	Special Shape, S A E 4150
3	Slide	1 1/8" sq., Special Grade, H.R., S A E 1050 Unannealed
3½	Recoil Plate	0.290" diam. Dukane Drill Rod, Carbon Tool, S A E 1095
4	Plunger Tube	5/16" by 3/16", S A E 1025
5	Slide-Stop Plunger	0.106" diam., S A E 1115
6	Plunger Spring	0.018" diam. Music Wire AA
7	Safety-Lock Plunger	0.106" diam., S A E 1115
8	Slide Stop	7/16" sq., S A E 1075
9	Rear Sight	Special Shape, S A E 1020 C.D.
10	Front Sight	1" by 0.057", S A E 1020 C.R.
11	Barrel Link	7/8" by 0.135", S A E 1095
12	Barrel-Link Pin	0.155" diam. Dukane Drill Rod, Carbon Tool, S A E 1075
13	Barrel Bushing	1 1/4" diam., S A E 1075
14	Recoil Spring	0.043" Music Wire AA
15	Recoil-Spring Guide	13/16" diam., S A E 1045, H.R., Annealed
16	Recoil-Spring Plug	17/32", S A E 1025
17	Extractor	9/32" diam., S A E 1075
18	Ejector	5/8" by 7/32", S A E 1075
19	Ejector Pin	0.063" diam. Dukane Drill Rod, S A E 1095
20	Firing Pin	1/4" diam. Dukane Drill Rod, S A E 1095
21	Firing-Pin Spring	0.026" Music Wire AA
22	Firing-Pin Stop	3/4" by 5/32" plus or minus 0.002", S A E 1075
23D	Hammer	13/16" by 3/8", S A E 1075
24	Hammer Pin	0.180" diam. Dukane Drill Rod, S A E 1095
25	Hammer Strut	2 3/8" by 0.105", S A E 1095
26	Hammer-Strut Pin	0.095" Dukane Drill Rod, Carbon Tool, S A E 1095
27	Mainspring	0.045" Music Wire AA
28	Mainspring Cap	0.278" diam., S A E 1120 C.D.
29	Mainspring-Cap Pin	0.109" diam., S A E 1120 C.D.
30	Sear	3/8" sq., S A E 1075
31	Sear Spring	19/32" by 0.030", S A E 1095
32	Sear Pin	0.134" Dukane Drill Rod, Carbon Tool, S A E 1095
33	Disconnector	5/16" sq., S A E 1075
34	Trigger	3/4" by 3/8", S A E 1020
35	Grip Safety	3/4" diam., S A E 1020
36	Safety Lock	3/4" by 5/8", S A E 1075
37	Mainspring Housing	13/16" by 21/32", S A E 1020
38	Mainspring-Housing Pin	0.155" diam. Dukane Drill Rod, Carbon Tool, S A E 1095
39	Mainspring-Housing Pin Retainer	0.275" diam., S A E 1120 C.D.
40	Lanyard Loop	0.106" diam., S A E 1120 C.D.
41	Lanyard-Loop Pin	0.092" diam. Dukane Drill Rod, Carbon Tool, S A E 1095
42	Magazine Tube	Special Shape, S A E 1050
43	Magazine Base	Special Shape, S A E 1020
44) 45)	Magazine-Base Pin	0.0625", S A E 1120 and S A E 1115 C.D.
46	Magazine Spring	0.047" Music Wire Regular
47	Magazine Follower	17/32" by 0.042", S A E 1020, C.R., Soft Annealed
48	Magazine Catch	17/32" diam., S A E 1020
49	Magazine-Catch Spring	0.023" Music Wire AA
50	Magazine-Catch Lock	0.281" diam., S A E 1120 C.D.
51R	Stock, R.H.	Colt Rock Plastic
51L	Stock, L.H.	Colt Rock Plastic
53	Stock Screw Bushing	S A E 1120

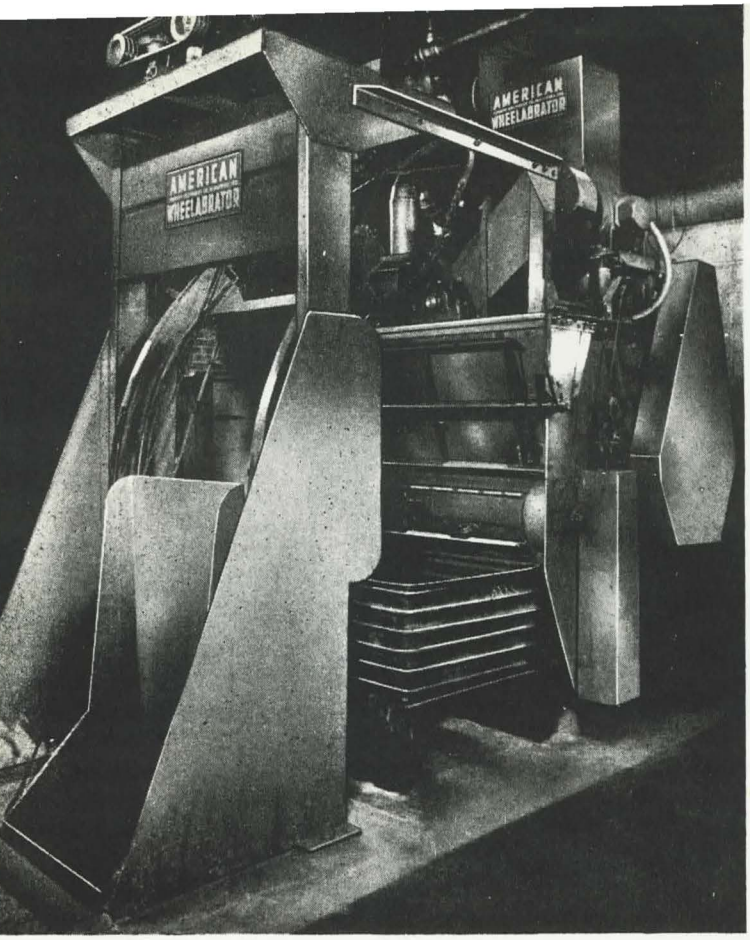

Fig. 3. Forgings are Tumbled in This Machine, and are also Cleaned by Sand, which is Whirled against Them by a Rapidly Rotating Wheel. Four Tumbling Machines were Replaced by This One Machine

made are listed in the accompanying table. This article will deal chiefly with the machining operations on the three main parts—the receiver, the slide, and the barrel.

Machining Operations on the Receiver

The receiver is the main body of the pistol into or on which are fitted most of the other fifty-two parts. One hundred and sixteen operations are required in its fabrication. The raw stock from which the receiver is made is 2 1/4- by 1-inch S A E 1035 steel. This is cut into 7 1/8-inch lengths, which are hot-forged into rough shape. The rough forging is than finish-forged, trimmed, and subjected to a grain refinement. A second trimming operation is followed by the punching out of the guard for the trigger.

The forgings are then taken to a Wheelabrator Tumblast (made by the American Foundry Equipment Co.), which is shown in Fig. 3. Here they are charged into a drum in which they are tumbled about by rotating action, and are also subjected to the continuous impact of very fine shot. This shot is not propelled by compressed air, but is discharged from above on a rapidly rotating wheel from which it is thrown with considerable centrifugal force against the forgings. The combined action of tumbling and shot impact rapidly removes all rust and scale.

Only eight to ten minutes is needed to accomplish in this one machine what formerly required three-quarters of an hour to an hour in four tumbling machines. After cleaning, those forgings that require a slight straightening are given a cold strike, and then are ready for the first machining operation.

Five receiver blanks, mounted together, have their top outlines milled on a heavy-duty Pratt & Whitney horizontal milling machine, as shown

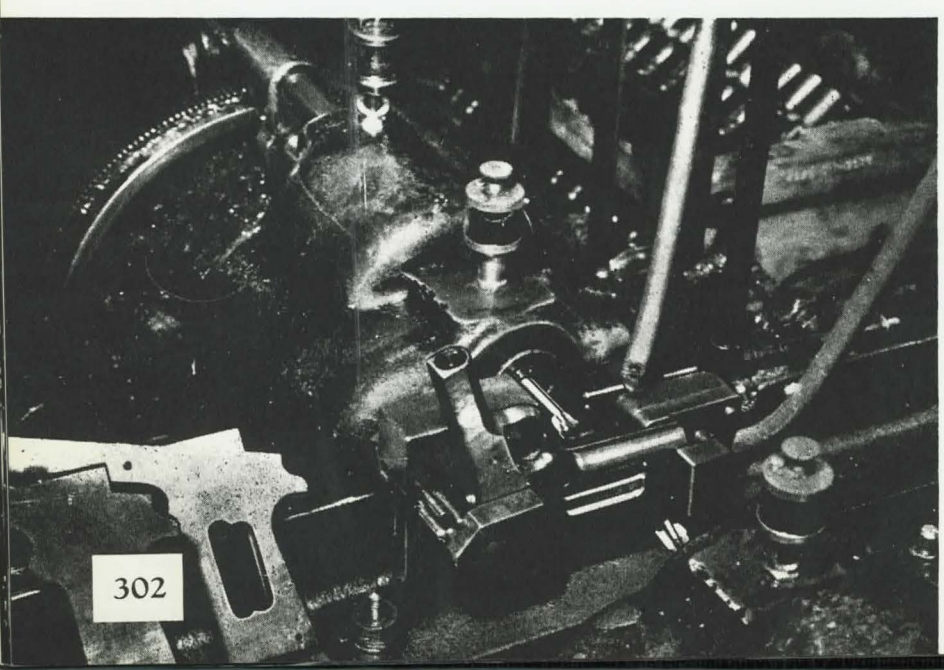

Fig. 4. To Lighten the Receiver, a Rectangular Opening is Cut through the Handle. Two Slots are Spline-milled to Form the Rough Opening. The Two Small Holes in the Blank have been Previously Drilled for Locating the Piece in Subsequent Operations

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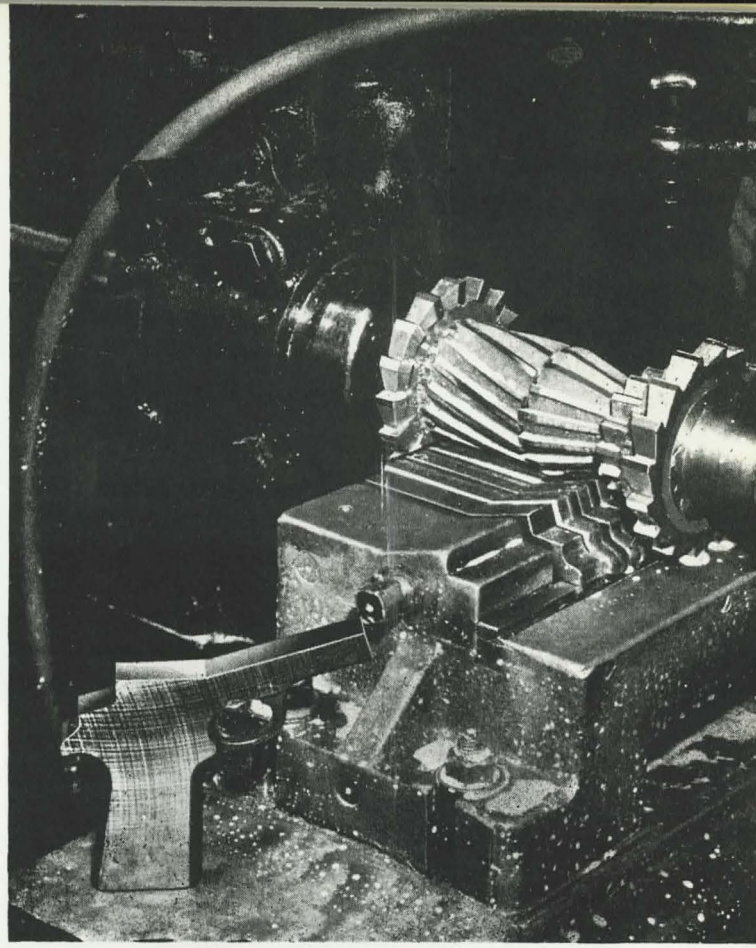


Fig. 5. First Milling Operation on Receiver is Profiling of Top Outline. Here Seven Distinct Surfaces are being Milled on Five Blanks in One Operation. Blank with Finished Profile Seen at Left

in Fig. 5. Seven distinct edges or surfaces are milled on each receiver in this operation with one pass of the interlocking cutters. (The blank with finished profile, shown at the front of the machine, has also had several subsequent operations performed on it.) The next operation is to drill and ream two holes which serve as position locators for subsequent machining operations. This is followed by profile milling of the front of the grip or handle, the bottom and front of the trigger guard, and the bottom of the forward part of the receiver up to the muzzle end.

The first operation in forming the magazine cavity is the cutting of a hole through the end of the handle with a deep-hole drill. This is followed by the drilling of a large hole in the barrel end of the receiver, which will eventually form part of the recoil-spring housing. A rectangular-shaped opening is cut through the handle on the side to lighten the weight of the receiver. This opening is formed by two spline milling operations. Fig. 4 shows the second operation.

In this operation, a milling cutter is fed into each side of the handle, and both cutters are then traversed to form a slot type of opening. After cutting to full depth, one cutter is retracted slightly, so that the other may be plunged deeper to cut away the metal separating the two cavities, thus forming an opening through the handle. Each cut is about 2 3/16 inches long and 0.770 inch deep. A similar operation on another machine forms a slot into which this slot opens, completing the rough shape of the opening as shown in the finished blank in Fig. 4. Also shown in both finished and unfinished blanks are two small holes previously drilled, which serve as position locators for subsequent operations.

The top and bottom of the magazine hole through the end of the handle are next spline-milled to enlarge the cavity, after which each

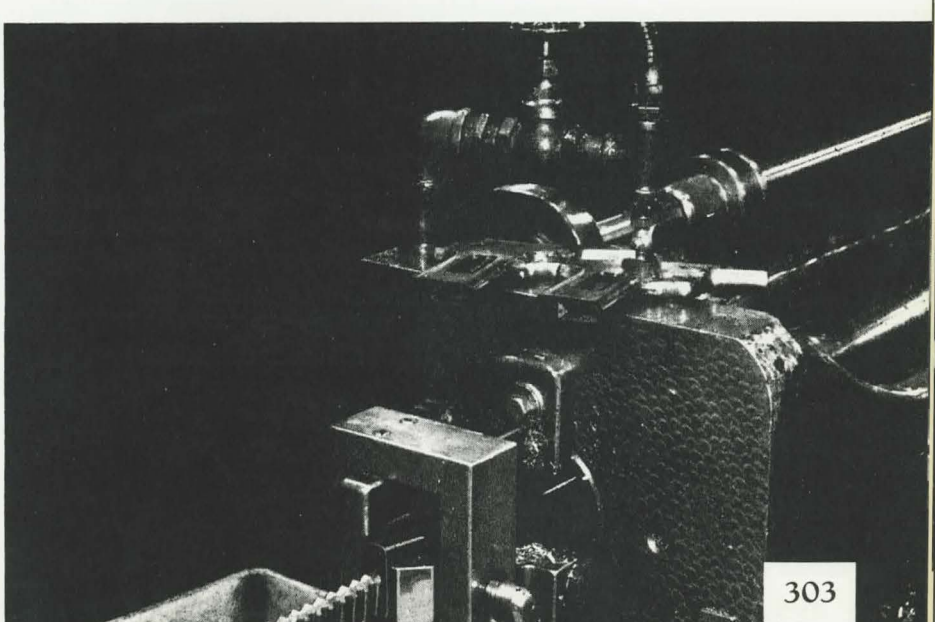


Fig. 6. The Curved Back Surface of the Rough Magazine Cavity in the Receiver Handle is Broached to a Flat Surface. Two Receiver Blanks Showing the Cavity Outline before and after the Broaching Operation are Directly above the Work-holding Fixture

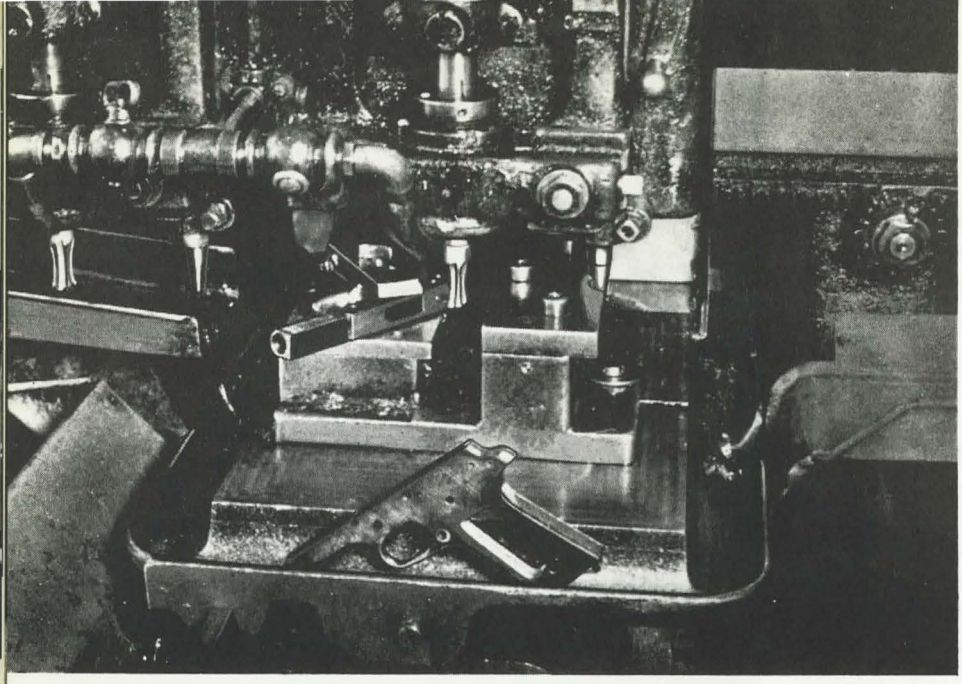


Fig. 7. Profile Milling the Contour around the Hammer Guard of the Receiver. A Receiver with Finished Hammer-guard Profile is Shown at the Front of the Machine

piece is gaged. The inside of the opening through the side of the handle is then rough-profiled. In the finished gun, this opening is covered by a plastic stock on each side. The rough-profiling is followed by a low-temperature anneal to break down the glaze formed by milling.

The rounded back of the magazine cavity is broached to form a square, flat surface in a Lapointe broaching machine, as shown in Fig. 6. The work is located in the machine by two studs bearing on the top of the receiver, which is held tightly against a pad at the left side. A 28-inch broach is used, and the cut taken is 5 inches long and 1 3/8 inches wide.

The inside of the opening through the side of the handle is now finish-profiled and both sides of the receiver are disk-ground. Following the rough and finish cam-milling of the inside of the trigger guard, a profiling cut is taken on the right and left sides of the guard, and the outside of the trigger guard is also rough-profiled.

The succeeding machining operations on the receiver include rough-milling a slot at the rear of the handle to form a recess for the mainspring housing; milling a slot in the hammer guard, finish-milling the top and bottom of the receiver; finish-milling the slot for the mainspring housing; drilling, reaming, and countersinking several small holes on both sides; and disk-grinding both sides of the receiver.

Next, another profiling cut is taken around the hammer support to form a profile that will blend with the outline of the rear of the slide when it is in place. This operation, which is performed on a Pratt & Whitney two-spindle vertical milling machine, is shown in Fig. 7. A

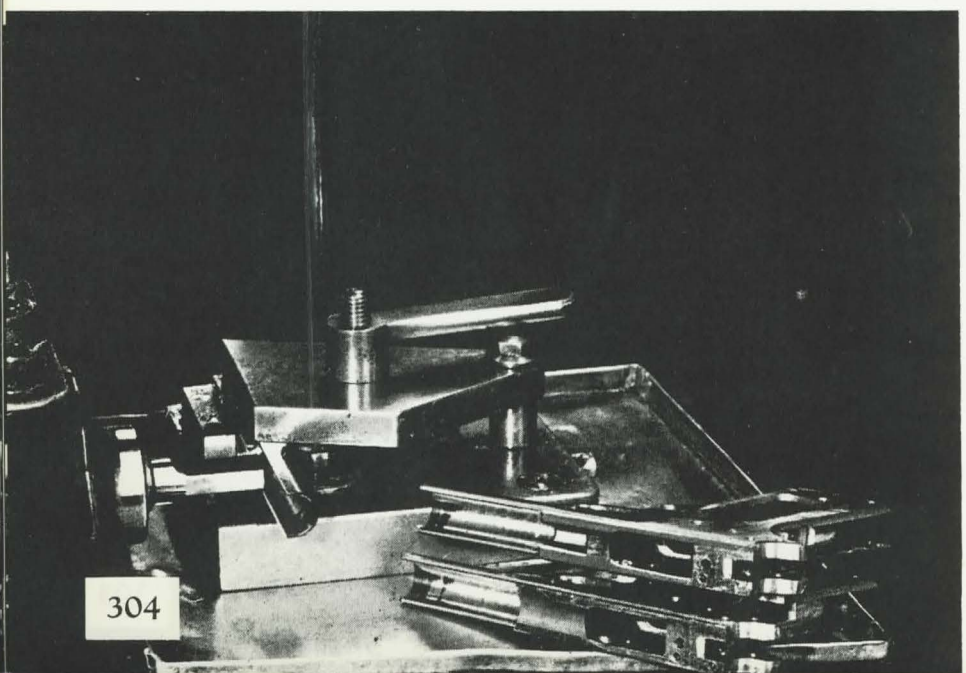


Fig. 8. Shaving a Slot in Top of the Receiver to Form a Square End for Barrel Stop. Of the Two Receivers Seen at the Front, the One with the Finished Cut is on Top

small curvature is then rough- and finish-milled on the rear of the grip.

Following this, the slide ribs or ways are milled on the right- and left-hand sides just below the top edge of the receiver, and the rear profile of the trigger guard is cut. The upper wall of the recoil-spring hole is removed by cutting in from the left side on a hand milling machine and then breaking off the thin top piece, leaving an open channel. The sides of this open channel, which forms a seat for the rear portion of the recoil spring, are then milled to flat surfaces. The next operation is the milling of the hammer slot.

As may be seen by referring to the assembly drawing, Fig. 2, the rear loop of the trigger extends back to the firing mechanism. The groove in which this trigger loop slides is milled in the next operation. Following this, two profiling cuts are taken to provide a seat for the grip safety, which is at the rear of the handle just below the trigger guard. The second of these two cuts is shown being performed in Fig. 9.

Next the barrel seat is milled and the disconnector hole counterbored. Various other holes are drilled and reamed, and then begins a series of shaving operations, one of which is shown in Fig. 8. In this operation, the top hollowed portion of the receiver just back of the recoil-spring

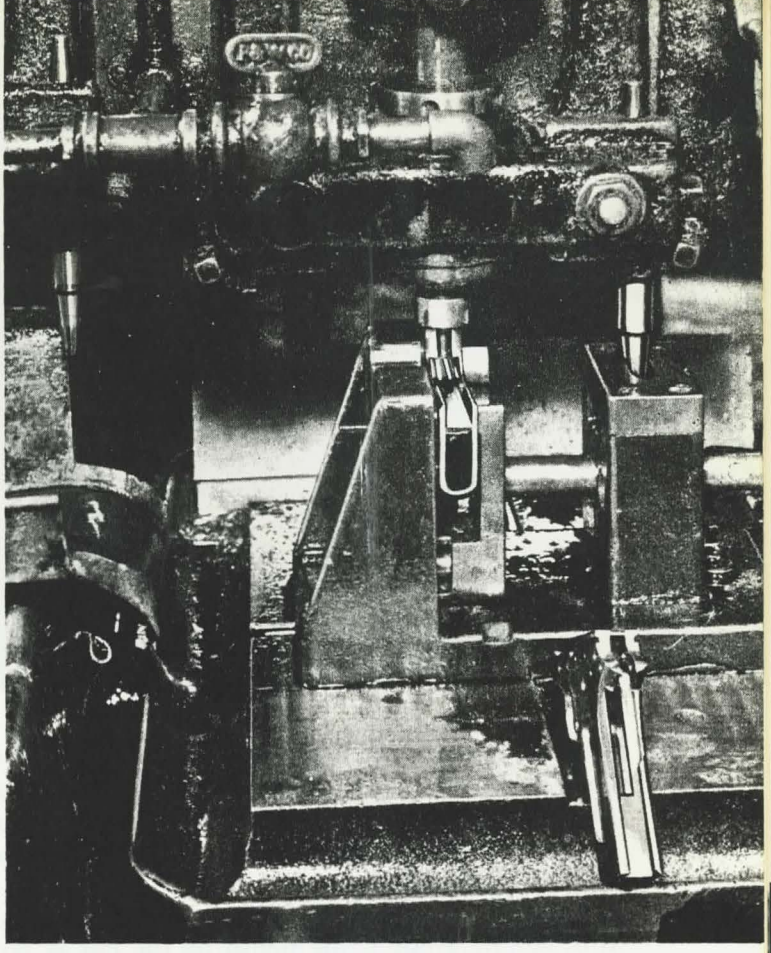
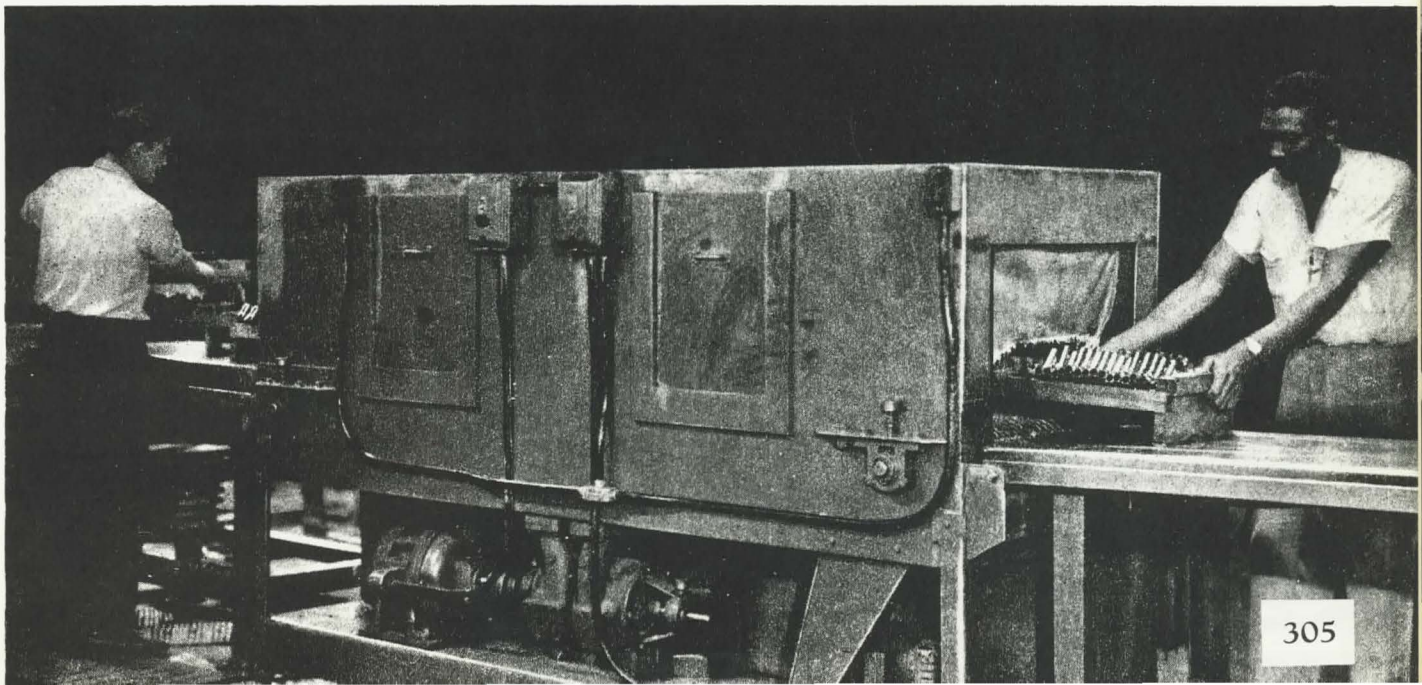


Fig. 9. Milling out a Recess in the Rear of the Receiver for the Grip Safety. This Cut is Taken well up Inside the Hammer Guard. A Receiver with Finished Recess is Shown at the Front of the Machine

Fig. 10. To Facilitate Machining, Each Trayful of Parts is Cleaned after Every Operation in an Automatic Washing Machine. Here a Tray of Receivers is Seen being Removed from the Spray Chamber of the Washing Machine



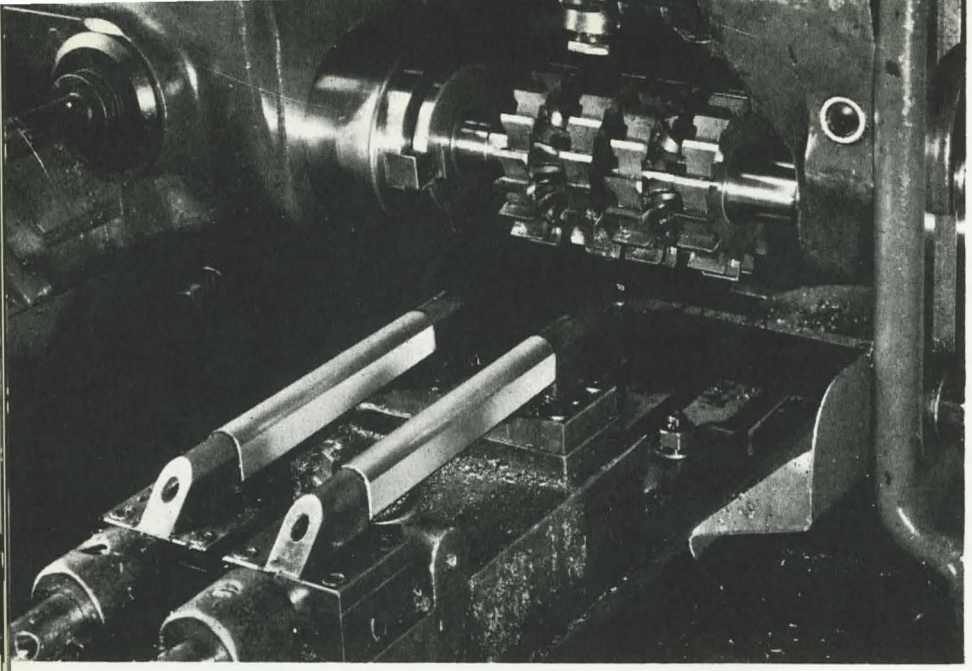


Fig. 11. Two Slides being Straddle-milled to Form a Curved Top Surface and Straight Sides. Each Slide is Held by Pins which Fit into the Barrel-bushing Hole, the Recoil-spring Hole, and the Centered Hole at the Rear End

channel is cut further back to form a square end for the barrel stop. This operation is accomplished on a shaving machine with automatic feed, which was built by the Taylor & Fenn Co. to Colt's own design.

Because there is a slight hollow in the top of this middle section, the depth of the cut is not uniform, and ranges from about 1/4 inch at each edge to about 1/16 inch in the center. The feed is about 1/64 inch. The receiver is located in the machine by a block bearing against the top and by two pins which fit into two locating holes previously drilled in the receiver blank.

The remaining machining operations on the receiver consist in providing slots, holes, or recesses for the parts that fit into the receiver.

One of the practices followed at the Colt plant to make certain that all parts will be in suitable condition for machining is to clean them afte every operation in a Colt automatic washing ma chine. Fig. 10 shows one of these machines wit a tray of receivers just emerging from the wash ing chamber, where they have been sprayed wit a hot soda solution. This particular model ma chine has a washing chamber 8 feet long through which a loaded tray will pass in abou fifty seconds. The machine is operated continu ously for approximately twenty-three hours, an then is shut down for an hour to permit the re moval of accumulated waste and chips. When a tray of parts has passed through this washing chamber, the parts are thoroughly cleaned and ready for the next machining operation.

Wooden trays similar to those shown in Fig. 10 hold about thirty parts. From the time the tray is loaded with blanks for the first machining op-

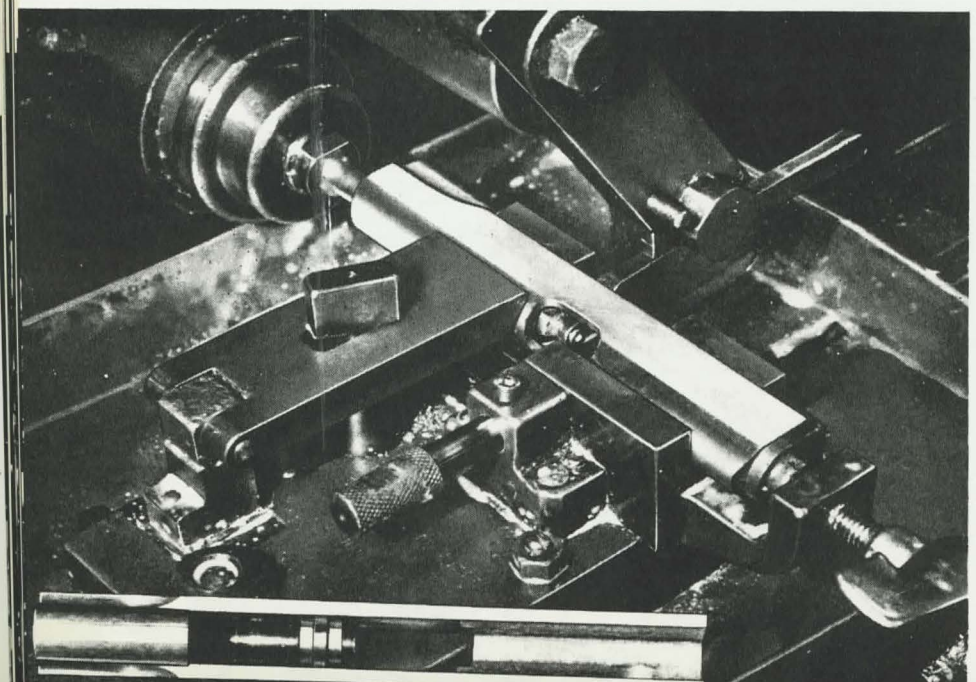


Fig. 12. Two Locking Grooves are being Milled at the Top of the Inside of the Slide just in Front of the Carriage Outlet. A Small Cutter is Used at the End of a Long Spindle Supported by an Arm

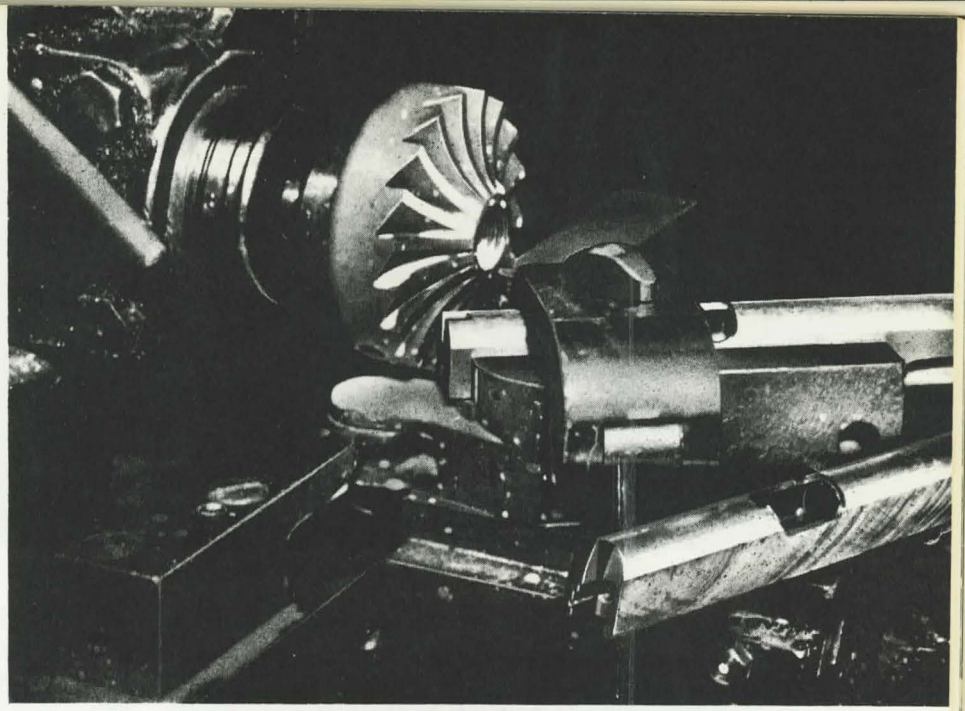


Fig. 13. A Double Curvature is Milled on the End of the Slide by Using a Concave Cutter to Form the Vertical Curvature and a Rotating Action of the Work-holding Fixture to Generate the Horizontal Curvature

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eration up to the point where each receiver is assembled with a slide, the pieces in each tray travel from one machining operation to another together. A serial number is assigned to every tray and a record is kept of the machinist who performs the operations on each part.

During the various operations on the parts, most of the gaging is done only by the operators themselves. Each operation is checked, however, about once an hour by floor inspectors, and the piece last finished at the time of the inspection is gaged to make sure that the operation is being conducted correctly.

To prevent later difficulties in assembly, each part is carefully checked for "skipped operations" before leaving the machine shop. Parts that have been rejected because some dimension falls outside of the established limits are also inspected and sorted into scrap and salvage. The latter go to a special group of workmen who reclaim such parts by skillful hand work, thereby saving valuable machining time and material.

The most thorough gaging and operational inspection of each part is made as it proceeds through final filing and finishing operations. In addition to company inspection, the finished parts are, of course, subjected to a complete and thorough gaging and visual examination by U. S. Army inspectors.

Function of the Slide

The slide is that part of the automatic pistol which rides on top of the receiver, enclosing the barrel and the firing pin. When the pistol is fired, the pressure of the powder gases drives

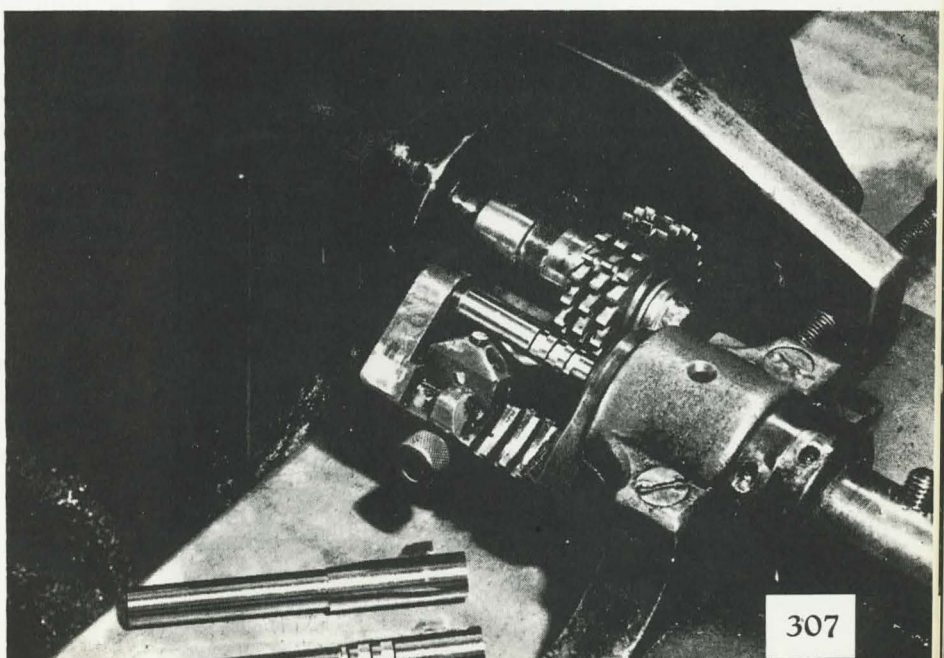

Fig. 14. Locking Slots are Milled on the Top of the Breech Section of the Barrel by the Use of a Rotating Work-fixture. The Front Slot is Cut Shallow to Allow for Blending with the Barrel Section Contour

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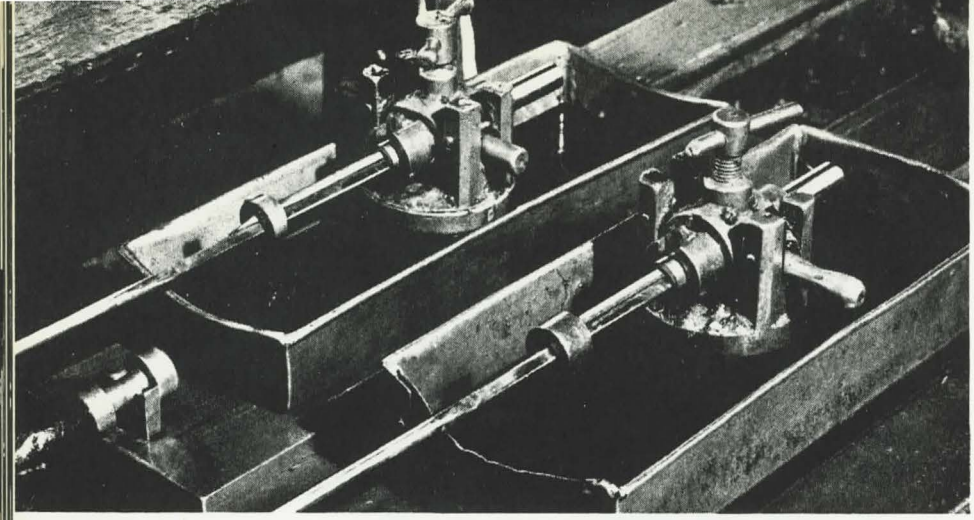
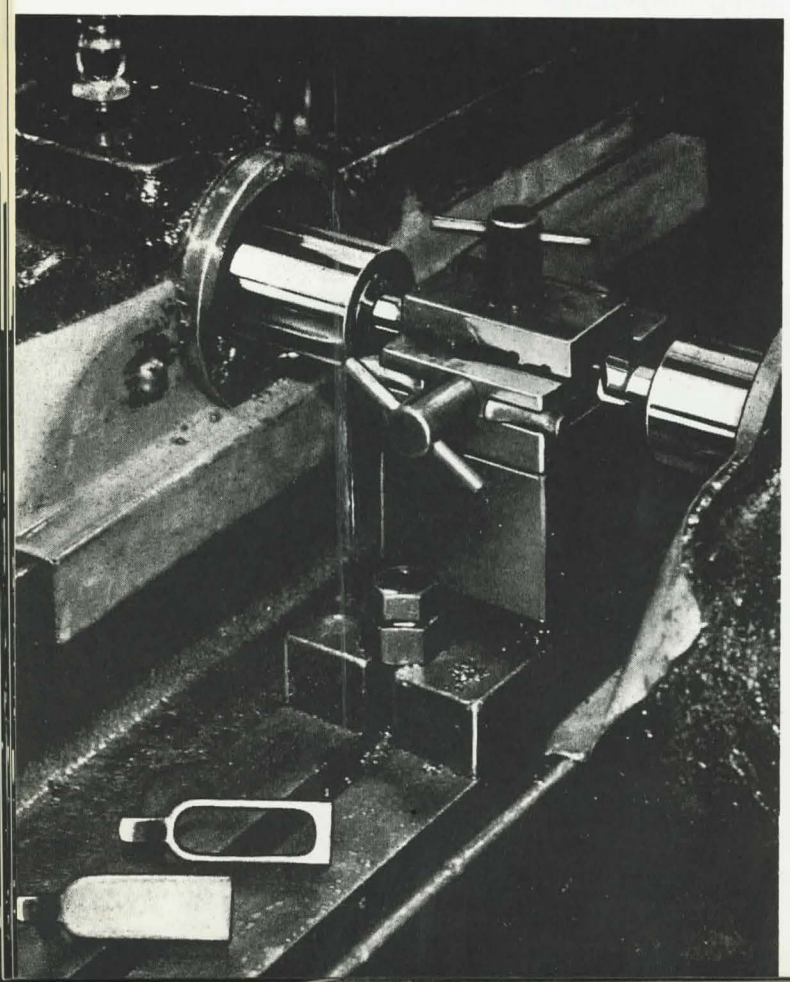


Fig. 15. Final Finishing of the Bore before Rifling is Accomplished with a Square Reamer. A Wooden Guide is Placed against One Side of the Reamer to Hold the Cutting Edge Steadily and Firmly against the Work



the bullet forward, and at the same time, forces the slide and barrel together toward the rear. After a short distance of travel, the barrel, which swings on a link pivoted on the receiver, moves downward and disengages the slide, so that the latter is free to continue its rearward movement. In so doing, the slide cocks the hammer, extracts and ejects the empty shell, and compresses the recoil spring. After completing its rearward movement, it is driven forward again by the compressed recoil spring, and in its forward movement, carries the barrel back to the firing position and also forces a fresh cartridge from the magazine into the chamber.

The initial operations on the slide are similar to those performed on the receiver. They consist of hot forging, annealing, shot-blasting, trimming, and "cold striking" where straightening is needed. The first machining operation is to straddle-mill the bottom and the ends of the slide. This is followed by the drilling of the hole for the barrel with a deep-hole drill and disk-grinding of one end.

A heat-treating operation is employed to remove the hard glazed surface formed by the previous operation. At this point the slide is subjected to a preliminary gaging before subsequent machining.

Following this, the rear end is center-drilled and reamed, and a hole is drilled and reamed in the lower abutment at the front of the slide to receive the recoil-spring plug.

Milling the Contour of the Slide

In Fig. 11, the sides and top of two slides have just been cut to the proper size and contour in a straddle-milling operation. Each piece is located by pins which fit into the barrel-bushing hole, the recoil-spring hole, and the centered hole at the rear end. The operation gives the slide a rounded top and straight sides.

Then follows the rough-milling of a slot along the bottom of the slide, which extends down into the barrel hole and lengthwise to the rear of the slide. This provides a recess in which ribs will

Fig. 16. To Form the Opening in the Trigger Slide through which the Magazine Passes, a Spline-milling Operation is Used. The Finished and Unfinished Pieces are Shown in the Left Foreground

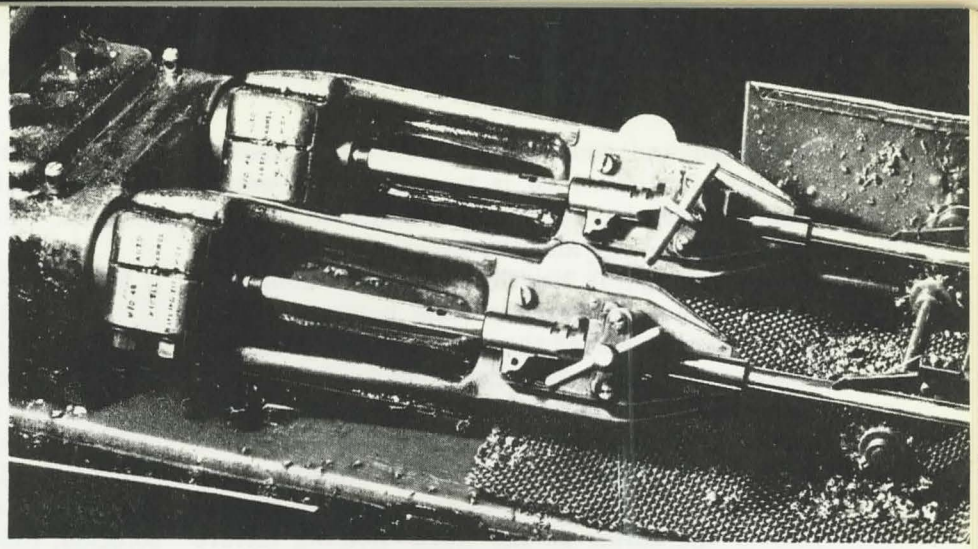


Fig. 17. Rifling Two Colt 0.45 Automatic Barrels. The Cutters are Shown Retracted below the Surface of the Rifling Head. Ready for Return to Starting Position. At Each Forward Stroke 0.0001 Inch of Stock is Removed

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be later cut to match similar ribs along the top of the receiver. The abutment underneath the front end of the slide is next milled along both sides of the bottom, and ornamental cuts are milled on each side to form a pleasing contour where the top of the abutment joins that part of the slide surrounding the barrel. Another slot is milled on the bottom for the receiver and the ejector, and a clearance is milled on the bottom to allow room for the top of the magazine.

Ribs are now cut inside the slot previously formed to accommodate the top of the receiver; these ribs provide ways which fit into grooves along the outside edge of the receiver, permitting the slide to move easily backward and forward.

A recess is drilled for the extractor with a deep-hole drill, the recoil hole is countersunk, and the first cut is taken on a spline milling machine to form the cartridge outlet opening. Clearance for the linking arrangement which connects the barrel with the receiver is provided by a shaving operation. A seat for the cartridge head is also produced by a shaving cut, and a second cut is taken on a hand milling machine to enlarge and shape the cartridge-outlet opening, through which the empty shells are ejected.

Milling Locking Grooves Inside the Slide

Rather a difficult operation is that of milling the transverse locking grooves into which fit matching ribs on the barrel. This is accomplished on a hand milling machine. Since these grooves must be cut well up inside the slide, a small milling cutter mounted on a long spindle is used, which can be inserted through the barrel hole, as shown in Fig. 12. The outer end of the cutter-spindle is supported by an arm, as shown. In this operation, the slide is located from the front of the cartridge-outlet opening, which is held firmly in contact with a locking pin by pressure exerted through a thumb-screw at one end of the holding fixture.

This operation is followed by the milling of the cartridge-head seat and the barrel clearance, and chamfering of the cartridge outlet. A seat

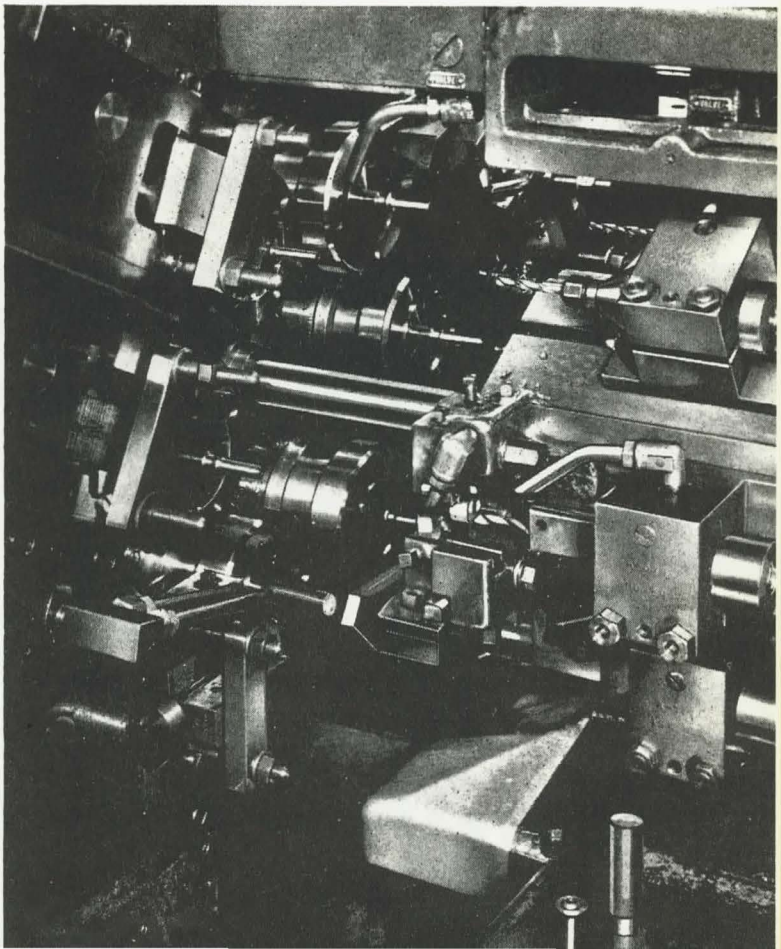

Fig. 18. Automatic Screw Machines are Used in Making Some of the Smaller Parts. Here a Recoil-spring Guide is Turned, Drilled, Formed, and Cut off. The Rough Stock and Finished Piece are Shown in the Foreground

is reamed and counterbored for the extractor, the function of which is to remove the empty shell from the barrel before it is ejected through the slide opening, and the breech block and the slot extending the length of the slide along the bottom are finish-milled. The hammer slot is milled in the rear of the slide and the firing-pin hole drilled with a deep-hole drill.

In Fig. 13 is shown the milling of the double curvature on the rear end of the slide. A concave milling cutter forms the vertical curvature, while the horizontal curvature is generated by the action of the cutter as the work-holding fixture rotates the end of the slide across it. A roller attached to the front of the work-holding fixture is shown in contact with the front push member, which is mounted on a reciprocating cross-slide. This front member rotates the work for the cut, while a similar member at the rear end of the slide moves the work-holding fixture back into position for reloading after the cut has been completed.

Following this, profiling cuts are taken for the firing-pin stop, safety-lock and slide stop, and the angle on the rear of the slide-stop notch is formed by shaving. The front end is then faced and milled to receive the barrel-bushing locking nut.

Various filing, reaming, and burring operations are followed by a preliminary inspection. Both sides of the slide are then ground, and the vertical serrations that provide a grip to pull the slide backward in the initial loading operation are milled. The top curvature of the slide is ground, and the front end is finish-milled.

Succeeding operations provide for the location of the recoil plate, sights, and disconnector, and the rolling of the name and model designation on the side. The slide is then hardened for a length of 2 inches from the bore end, and after this, it is tempered at 850 to 900 degrees F. Before it is "butted up" with the receiver in a test assembly, it is thoroughly cleaned electrolytically. This process consists of a three- to four-minute dip in a hot soda solution through which an electric current is passed, a three-minute dip in a dilute muriatic acid solution, a cold water rinse, another three-minute dip in the electrolytic soda solution, followed by a hot water rinse and drying under air blowers. After cleaning, the barrel receptacle and spring holes are given a final reaming.

The slide is then fitted to a receiver in the "green state." A working barrel and recoil spring are used. After filing to the desired fit, the slide is tried or "butted up" with thirty different receivers in succession to test its interchangeability.

Following a rigid inspection of all critical dimensions of the slide, it is polished, stamped as having passed inspection, and the front sight is mounted at the muzzle end.

Although all of the parts of this automatic pistol were at one time finished by bluing, most of them are now Parkerized. In this finishing operation, the slide is first cleaned in an alkali bath, then sand-blasted with flour grade sand, rinsed in warm water, and placed in the Parkerizing solution for about fifteen minutes. The bluing operation took five hours. After Parkerizing, the slide is rinsed in hot water, dried, and a coating of oil applied to prevent rust.

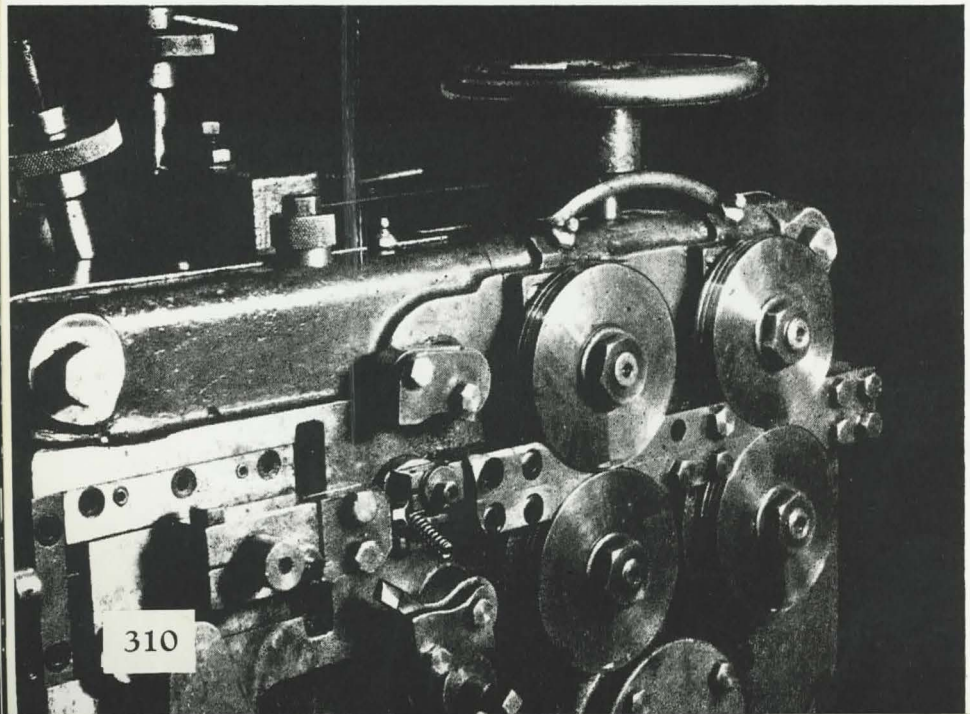

Fig. 19. The Mainspring, which Actuates the Hammer when Trigger is Pulled, is Produced on the Automatic Spring-making Machine Illustrated. The Finished Spring Must be Held within Close Limits for Weight, Length, Diameter, and Deflection for Given Load

Forty-Two Operations Required on the Barrel

The making of the barrel for the Colt 0.45 automatic requires forty-two operations. A modified S A E 1350 steel in the form of a special shape is used, and this is cut to length, normalized, hardened and drawn, and then pickled to remove scale.

The first machining operation is the straddle-milling of the ends and bottom of the barrel, as well as the front and back of the barrel-link lug. The butt end is turned down for chucking, and the bore is drilled with a deep-hole drill to a diameter of 0.430 inch, after which it is reamed to a diameter of 0.439 inch.

The breech and muzzle sections are turned to different diameters, and then the muzzle section is ground to 0.580 inch diameter, and the breech section to 0.696 inch diameter. The working slot in the link lug is next milled, and this is followed by the straddle-milling of the sides and top of the link lug. The curved surface of the barrel that lies directly adjacent to the link lug is then rough-finished in a rotary milling operation. In the finish-grinding operations, an eccentric arrangement on the rotating head oscillates the work-piece. The rear end of the link lug is milled and faced, as well as the breech end of the barrel itself.

The transverse ribs which interlock with the grooves on the interior of the slide are next milled around the top of the breech section, as shown in Fig. 14. Three slots are milled with a tolerance of 0.002 inch on the width and depth of each cut. The front slot, which is to be blended with the contour of the muzzle section, is made 0.004 inch shallow for finishing. The fixture shown holding the barrel in the illustration is rotated as the cutters are engaging the work, thus generating the grooves. The milling machine on which this operation is performed is one of Colt's own design.

The hole in the lug which holds the link pin is next drilled, reamed, and burred. After two further operations on the link slot, the barrel bore is given a first and second finish-reaming. The first finish-reaming brings the diameter up to 0.4420 inch plus or minus 0.00025 inch. The second finishing operation, performed by a square reamer, takes off about 0.0015 inch of stock and increases the diameter to within 0.4435 to 0.4440 inch. For the Government Model the diameter should preferably be within 0.4435 to 0.44375 inch. Approximately 0.0005 to 0.00075 inch of taper from the breech end to the muzzle end is allowed.

As can be seen in Fig. 15, the square reamer is backed up on one side with a wooden guide, which holds the reamer's single cutting edge firmly against the surface of the bore, and at the same time, prevents two of the other edges of the reamer from rubbing against the bore wall. The reamer consists of a 0.220-inch square head about 8 inches long, welded to a 0.250-inch shank about 20 inches long, with a chucking arrangement at the end.

Rifling the Barrel

Following inspection of the bore for diameter and surface condition, the barrel is subjected to a lead polishing operation, and then goes to a Pratt & Whitney small arms rifling machine. This machine has two rifling heads, as shown in Fig. 17. Each is 0.4415 inch in diameter, and has a hooked cutter about 0.158 inch wide, which is pushed up through a small opening in the head into cutting position on the forward movement, and drops back below the surface of the head on the retracting movement.

As the cutter moves forward, the barrel is rotated, so that a helical groove is produced. About 0.0001 inch of stock is removed at each cut, and thirty-five cuts are taken on each groove, bringing the bore diameter from bottom of groove to bottom of groove up to 0.450 to 0.451 inch at the muzzle end and 0.451 to 0.452 inch at the breech end, with a 0.001-inch taper from breech to muzzle end. Six grooves are cut, the barrel being indexed after each pass of the cutter.

The next operation is chambering. The rear end of the barrel is countersunk, and about 0.02 inch of stock removed by rough-reaming. A second reaming operation removes 0.003 to 0.004 inch of stock. Following this a burnishing reamer removes up to 0.001 inch, and finally a ball-seat reamer forms a small curved seat at the junction of the bore and the chamber in which the lead bullet is seated. The machine on which these operations are conducted is a Pratt & Whitney chambering machine, made to a special Colt's design.

Returning to the outside of the barrel, the breech section is milled, and this is followed by a straddle-milling operation which blends the contour of the remainder of the barrel with the breech end. Following this, the rear bottom edge of the chamber is chamfered to facilitate introduction of the cartridge from the magazine. The

muzzle end is form-milled to a rounded contour and polished, and the breech end is filed to a square shoulder. The bore is reamed to remove any burrs formed by the rifling cut, and the barrel is inspected, washed, and swabbed with oil.

The barrel is then "proof shot" with a cartridge developing 25 per cent greater breech pressure than an ordinary cartridge. Thus, while the ordinary cartridge develops a breech pressure of from 12,000 to 16,000 pounds, the "proof cartridge" tests the barrel at a pressure of about 20,000 pounds.

After "proof shooting," the barrel is again cleaned and oiled, the cartridge entrance is polished, and a final cleaning and polishing brings the barrel to the point where it can be assembled with the link and pin which will connect it with the receiver. The cartridge incline cut is now chamfered and polished, and the barrel is ready for final finishing.

The barrel cannot be Parkerized, as are most of the other parts, since the action of the solution used would impair the accuracy of the highly finished bore. Instead, a bluing process is used, which produces a smooth, rust-resistant finish without resorting to preparatory sand-blasting. The final operation on the barrel is to roll the designation Colt 0.45 Auto on the side.

Operation on the Trigger Blank

As shown in Fig. 2, the finger grip of the trigger is part of an oblong slide which extends back to the firing mechanism. When inserted in the handle, the magazine extends through the trigger slide. To provide for this, a large opening is milled out of the trigger blank, forming a loop with relatively thin connecting sides which fit into and slide along the trigger grooves in the receiver. The cutting of this opening is accomplished by a spline-milling operation, as shown in Fig. 16. The cut is 0.230 inch deep and a little over 1 1/2 inches long. By utilizing a spline-milling machine, two triggers are cut at one time, as shown.

Several of the small parts which enter into the pistol mechanism are turned out on automatic screw machines. One of these—the recoil-spring guide — is almost completely machined on a Greenlee multi-spindle automatic screw machine, as shown in Fig. 18. Five stations are utilized to turn, drill, form, and cut off the finished piece. The rough stock is in the form of 144-inch lengths of 13/16-inch diameter S A E hot-rolled and annealed steel rod, which is turned down on one end for chucking.

At the first station, the small diameter of the piece is rough-turned. At the second station, the large diameter, forming the disk, is turned and the front end of the piece spot-faced. At the third station, the piece is drilled to a 17/64-inch diameter for a depth of about 3/8 inch and a 45-degree chamfer is cut on the disk end. At the fourth station, the depth of the hole is extended to 3/4 inch and the rear side of the disk is faced. At the fifth station, the drilling is completed through the piece and it is cut off. The finished piece is 1.760 inch long, within plus 0.000, minus 0.020 inch, and has an outside diameter of 0.336 inch, plus 0.000, minus 0.003 inch, and an inside diameter of 0.265 inch, plus 0.006, minus 0.000.

Springs play an important part in the operation of this automatic pistol. They vary in size from the slide-stop plunger spring, which is about 3/32 inch outside diameter and 9/16 inch long when fully extended, to the magazine spring, which is 1 1/4 inches outside diameter and 7 1/2 inches long when fully extended. In each case, diameter, length, weight, and deflection for a given load must be held within close limits. All of the springs in this pistol are made by Colt's.

In Fig. 19 is shown a mainspring, which actuates the hammer when the trigger is pulled, being produced on a Torrington spring-making machine. This spring has 21 1/2 coils of 0.045-inch diameter AA music wire. It must have an external diameter of 0.273 inch, within plus 0.000, minus 0.006 inch. Assembled in the gun, it will have a load of 18.05 pounds placed upon it when the hammer is not cocked. A load of 26.02 pounds would be required to compress it to a solid position.

The last operations on the pistol, which cover preliminary and final assembly, require a good deal of careful bench work and exhaustive gaging and testing. All parts must work together smoothly and exactly. The test of this is the "proof shooting" given every assembled pistol. One final inspection follows, and the automatic then receives its "V.P.," or verified proof of its accuracy and reliability.