

Jan. 14, 1958

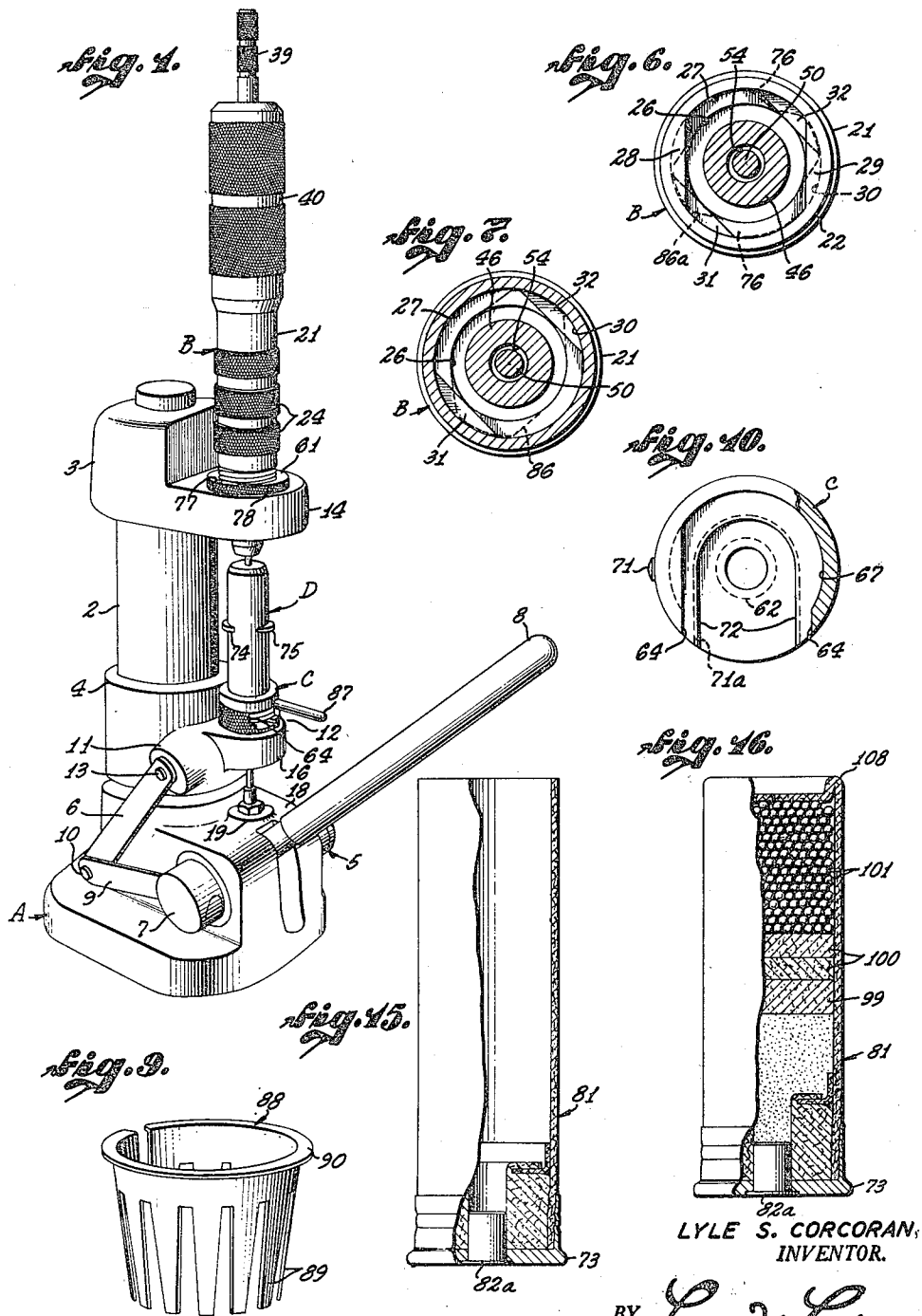
L. S. CORCORAN

2,819,644

SHELL RE-LOADING APPARATUS

Filed March 29, 1954

3 Sheets-Sheet 1



LYLE S. CORCORAN,
INVENTOR.

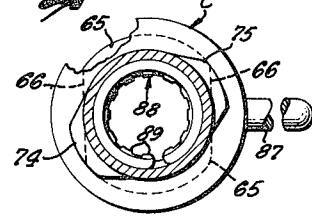
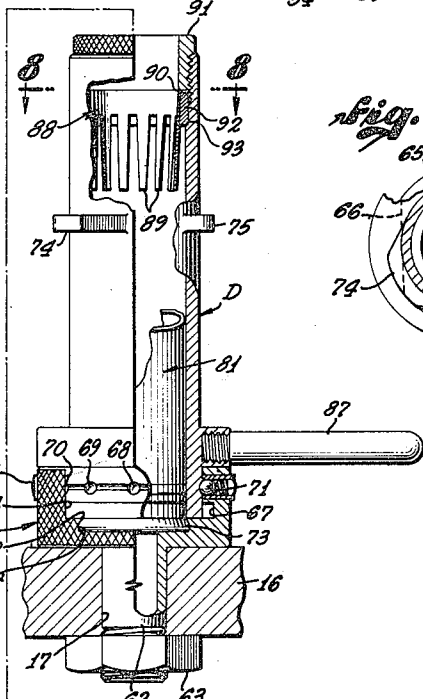
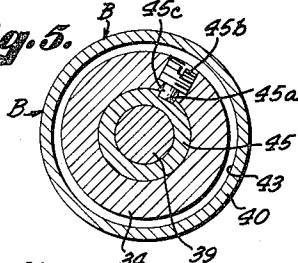
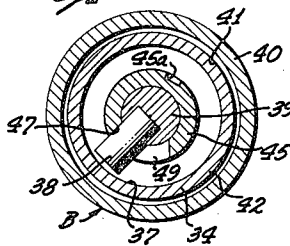
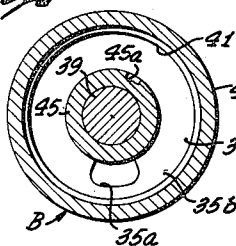
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SHELL RE-LOADING APPARATUS

3 Sheets-Sheet 2



**LYLE S. CORCORAN,
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SHELL RE-LOADING APPARATUS

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3 Sheets-Sheet 3

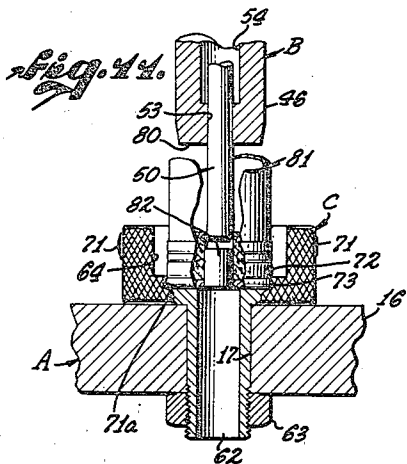


fig. 12.

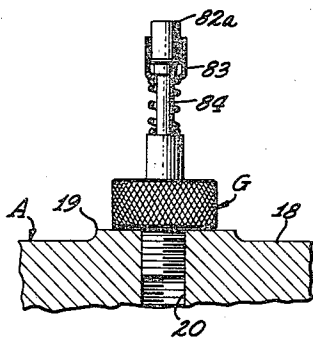
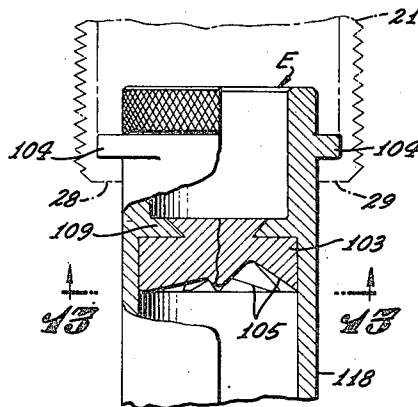


fig. 13.

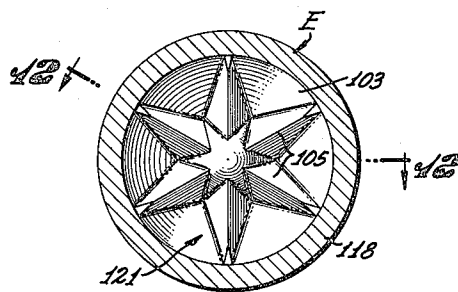
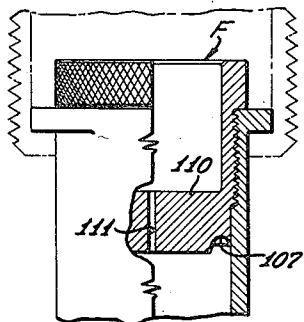


fig. 14.



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2,819,644

SHELL RE-LOADING APPARATUS

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Application March 29, 1954, Serial No. 419,374

16 Claims. (Cl. 86—23)

The invention relates to apparatus for reloading a previously fired shot shell. The apparatus will accommodate shells of different length as well as of different gauge or diameter. A fired shot shell may be reloaded and fired as many as three or four times by utilizing the apparatus of the invention.

The principal object of the invention is to provide a shell reloading apparatus which will permit a great number of shot shells to be reloaded within a brief period of time.

Another object of the invention is to provide a shell reloading apparatus which will accommodate the various operations which are involved in the process of reloading a shot shell and at the same time require a minimum number of adjustments and die changes in the overall process of reloading such a shell.

Another object of the invention is to provide a shell reloading apparatus in which a decapping and re-priming mechanism is incorporated in the shell reloading apparatus.

Another object of the invention is to provide a holding die for a shell reloading apparatus with means for guiding the packing wads which are pressed into the shells.

Another object of the invention is to provide in a shell reloading apparatus a removable die for making the initial crimp in the process of closing off the discharge end of the shot shell.

Another object is to provide a novel process for fabrication of the initial crimping die.

Another object of the invention is to provide in a shot shell reloading apparatus a spring loaded mechanism in combination with a micrometer type adjustment device for accurately controlling the pressure imparted to the "over-powder" wad which is pressed into the shell into contact with the charge of powder in the shell.

Another object of the invention is to utilize the pressure regulating spring in combination with the loading plunger for temporarily anchoring the crimping dies relative to the re-loading apparatus.

Another object of the invention is to provide a re-loading apparatus and a combination shell and die holding tool, each with appropriate holding lugs positioned in predetermined circumferential locations so that the dies which are utilized therewith are alternately anchored and released from the respective re-loading apparatus and die holding tool by rotation of the dies a pre-determined number of degrees about their own axes.

Another object of the invention is to provide a novel combination shell holding and die holding tool for use with a shell re-loading apparatus.

Another object of the invention is to provide a combination die and die holding tool with a mechanism for temporarily anchoring the die relative to the die holding tool in a pre-selected circumferential position of adjustment.

Other objects and advantages of the invention will become apparent from the ensuing specification and appended drawings in which:

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Fig. 1 is a perspective view of the shell reloading apparatus mounted in a single column type hand press;

Fig. 2 is a partial sectional view of the reloading apparatus with the shell loading die mounted in one position in the shell holding tool;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 2;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 2; with the various positions of the loading die superimposed in dotted lines thereon;

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 2;

Fig. 9 is a detail view of the wad guiding device shown in Figs. 2 and 8;

Fig. 10 is a plan view partly in section of the shell holding tool;

Fig. 11 is a fragmentary view partially in section showing the details of decapping and re-priming the shot shell;

Fig. 12 is an enlarged fragmentary detail view, partly in section, of the initial crimping die;

Fig. 13 is an enlarged underneath view of the initial crimping die shown in Fig. 12 taken on the line 13—13 of Fig. 12;

Fig. 14 is an enlarged fragmentary detail view, partially in section, of the finish crimping die;

Fig. 15 is a sectional view of the shot shell prior to reloading;

Fig. 16 is a perspective view partly in section of a shot shell after it has been completely loaded and sealed.

Referring to Fig. 1, I have shown generally the shell reloading apparatus which includes a hand press, referred to generally by the letter A, the decapping and re-loading unit, referred to generally by the letter B, and the shell holding tool which is referred to generally by the letter C. A series of dies are utilized in combination with the reloading and the shell holding units in effecting the complete series of steps which are involved in the reloading of a previously fired shot shell.

Units C and B function alternatively as die holders for supporting a sizing and loading die D first at the lower end thereof and later at the upper end, for successive operations of sizing, loading and crimping, as will be more fully described hereinafter.

In Fig. 1 the combination sizing and shell loading die, referred to generally by the letter D, is shown anchored within the shell holding tool C. This die is removable from the shell holding tool, such as when the crimping dies are used with the apparatus. The crimping dies E and F which are shown in Figs. 12, 13 and 14, are removably anchored to the upper assembly B for effecting the necessary crimping operations. The re-priming tool, referred to generally by the letter G, is removably anchored to the base of the press A, as shown in Fig. 11, for installing the fresh primer cap after the old one has been removed from the shell.

A. Press

The press included a base 1 having a large bore therein in which the column 2 is anchored. A cap 3 is fixed to the upper end of the column. A collar 4 is slidably mounted on the column and is actuated by means of the bell crank lever 5 and the connecting links 6, there being a link on each side of the collar 4. The bell crank lever is generally made up of the pivot rod 7 which is actuated by the handle 8. A pair of levers 9 are anchored at

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opposite ends of the pivot rod 7 (only one being shown in Fig. 1). The links 6 are connected at their ends to the lever 9 by means of the pivot pins 10 and at their opposite ends to the bosses 11 and 12 on collar 4 by means of the pivot pins 13. The handle 8 is of course actuated up and down relative to the base of the press for moving the collar 4 up and down relative to the column 2.

The cap 3 of the press has an outwardly projecting lug 14 with a vertical threaded bore 15 (see Fig. 2) therein. The collar 4 has an outwardly projecting lug 16 integral therewith, said lug having a bore 17 (see Fig. 2) therein. The base 1 has a shelf portion 18 and a boss 19 projecting upwardly therefrom with a bore 20 therein (see Fig. 11). The bores in the lugs 14 and 16 and in boss 19 are aligned on a common axis, so that all of the component parts of the reloading apparatus are always maintained concentric.

B. Loading and decapping unit

Referring to Fig. 2 the loading and decapping apparatus which is mounted on the upper lug 14 of the press is comprised of a die holding body 21 which has external threads 22 at one end and an externally threaded nose 23 at the opposite end, the intermediate portion having external hand gripping surfaces 24. The die holding body has an axial bore 25 communicating with a counterbore 26 which in turn communicates with a larger counterbore 27. The lower end of the bore 27 has integral holding lugs formed therein which are shown in detail in Figs. 6 and 7, the position of these lugs being important. Referring to Figs. 2 and 6 it will be noted that keeper lugs 28 and 29 are formed at the lower end of the holding body 21. Immediately above these lugs an annular chamber 30 is formed. The diameter of this chamber may be the same as the diameter of the remaining portion of bore 27. Immediately above this annular chamber a second pair of keeper lugs 31 and 32 are formed. Viewing Figs. 6 and 7 it will be noted that the parallel side walls of lugs 31 and 32 are angularly displaced 45° about the work axis with reference to the parallel side walls of lugs 28 and 29, the reason for which will be pointed out hereinafter.

An intermediate barrel 34 is threaded onto the end of body 21 and has a bore 35 communicating with a counterbore 36. An annular chamber 37 is provided near the upper end of the body 34 to accommodate a pin 38 during rotative movement of a decapping rod 39 about the work axis, the pin 38 being anchored to the decapping rod 39. A micrometer thimble 40 has a cylindrical internal wall with an intermediate threaded portion 41 which is threaded onto the externally threaded end 42 of barrel 34. The lower end of the thimble has a counterbore 43. The end wall 44 of the thimble serves to limit the upward travel of a plunger sleeve 45 to which a cylindrical plunger head 46 is connected. The sleeve 45 near its upper end has a longitudinally extending Z slot 47 formed with keeper notches 48 and 49 at its opposite ends. These notches extend in opposite directions about the circumference of the sleeve 45 as shown in Fig. 2. The decapping rod 39 extends concentrically throughout the entire length of the bodies 21 and 34 and the thimble 40 and is slidably and rotatably received within the sleeve 45, the extent of rotation being limited to the extent of the keeper notches 48 and 49. An aperture 35a (see Fig. 3) in the end wall 35b of body 34 permits the pin 38 to be withdrawn out of the annular chamber 37 and raised to the end of slot 47 and into notch 48.

A considerable portion of the decapping rod at its lower or working end 50 is of smaller diameter than the upper end 51 of the rod. The sleeve 45 is internally threaded at 52 at its lower end into which the head 46 is threaded. The head 46 has a cylindrical external surface and its diameter depends upon the inside diameter of the shot shell which is being re-loaded or re-charged, being such that the head 46, cooperating with

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sizing die D, will effect a truing or sizing of the shell wall. Heads of different diameters may be utilized to accommodate different gauge shot shells. The head 46 at its lower end has a bore 53 which is slightly larger than the diameter of the lower end of the decapping rod so as to guide and maintain the concentricity of said decapping rod. The remainder of the head has a counterbore 54. The cylindrical external surface of the sleeve 45 is concentrically guided within the bodies 21 and 34 by the internal cylindrical walls of the bores 25 and 35 respectively, said bores being of the same inside diameter.

The sleeve 45 has a keyway 45a (see Figs. 3, 4 and 5) in its external wall, said keyway extending lengthwise of the sleeve and parallel to its axis. The slot opens unrestrictedly into the upper end of the sleeve and its lower end is adjacent an annular shoulder 55 formed on the sleeve. A set screw 45b has a shank portion 45c of reduced diameter projecting into the keyway to permit axial movement of sleeve 45 relative to bodies 21 and 34 while preventing rotation of said sleeve relative to the bodies.

The annular shoulder 55 abuts against the end face 55a of the die holder 21 to limit the downward axial movement of sleeve 45 relative to the bodies 21 and 34. A compression spring 56 is positioned around the sleeve 45 within the counterbore 36, said spring abutting at one end against the annular shoulder 55 and at its opposite end against the annular shoulder formed at the top of the counterbore 36. The functions of the spring will be explained hereinafter. The spring may be approximately two inches in length and capable of being compressed within about a one inch travel range. The external cylindrical surface of body 34 may have appropriate micrometer indicia 57 inscribed therein throughout a distance of one inch longitudinally of the body 34 representing a pressure range of zero to 100 lbs. The lower end of the micrometer thimble 40 has a circumferential scale 58 such which may comprise fifty separate marks, inscribed thereon throughout its entire circumference. Each complete revolution of the micrometer thimble 40 relative to body 34 advances the end 59 of the thimble the distance from one mark to the next mark on the scale 57 and represents a change of five pounds pressure being exerted by the spring 56. A partial revolution of the micrometer thimble equal to the distance between two adjacent marks on circumferential scale 58 represents a variance in spring pressure of one tenth of one pound. Consequently, by rotating the micrometer thimble down body 34 until a pre-determined scale reading is obtained, one can accurately control the number of pounds pressure to be exerted by the head 46 against the "over-powder" wad which is pressed into contact with the charge of powder in the shell. This will be explained more fully hereinafter.

C. Shell holder

Before the decapping operation can proceed, it is necessary to thread the assembly B into the internally threaded bore 15 in lug 14 of the press until the lower end face 60 of body 21 is flush with or slightly beyond the under surface of lug 14. The side walls of lugs 28 and 29, which are parallel to each other, are positioned so as to extend directly toward the front of the press (as indicated in Fig. 2). Then the lock ring 61 is tightened against the upper face of lug 14. The indicia 57 on body 34 will face directly forwardly.

The shell holding tool C is installed in position on lug 16 with its shank 62 projecting through the bore in the lug 16 and having a nut 63 tightened against the under surface of lug 16 to firmly hold it in a stationary position relative to lug 16, with its open face directed toward the front of the press. Before commencing the decapping operation it is advisable to adjust the assembly B in the proper position in which it is prepared for the subsequent shell loading operation.

This involves aligning the assembly B relative to the shell holding tool C. Shell holder C is of socket form, defining a die-receiving socket which has a mouth 64 (Fig. 10) opening through the lateral wall of the holder. Viewing Fig. 2 it will be noted that the mouth 64 is positioned to face directly toward the front of the press.

D. Sizing and loading die

The shell sizing and loading die D is fed into the mouth 64, segmental lugs 65 which are formed integral with and at the lower end of the die being disposed extending to the front and to the rear to permit the side flats 66 to clear the side walls of the mouth 64. The side walls of the recess in the shell holding tool are undercut to provide crescent shaped slots 67 (see Figs. 2 and 10) to receive the lugs 65 as the die D is rotated within the shell holding tool. A series of indicator indentations, preferably numbering eight, are arranged circumferentially about the lower end of the die D and are spaced equidistantly from each other. The indentation 68 may be considered as station number 1, indentation 69 as station number 2, indentation 70 as station number 3, and so on around the circumference of the die. Spring pressed balls 71 on diametrically opposite sides of the shell holding tool move into two diametrically opposed indentations to temporarily anchor the die D in a selected position of rotative adjustment relative to the shell holding tool. When the indentation 68 is facing directly to the front, the die D may be removed from the shell holding tool, however, when the die is rotated one or more stations, the lugs 65 move into the undercut slots 67 to anchor the die relative to the shell holding tool. A dovetail type slot 71a in the base of the shell holding tool, its side walls being parallel to the side walls of the mouth 64, is defined beneath overhanging lips 72 for the purpose of engaging the rim 73 on the base of the shot shell, to anchor the shell within the shell holding tool. The shell can be removed from the shell holding tool, of course, by withdrawing it horizontally through the open front end of dovetail slot 71a. The shot shell, however, is not installed into the shell holding tool at this stage.

When the die D has been inserted into the shell holding tool C and then rotated two stations (until station 70 faces directly to the front), then the handle 8 of the press is slowly lowered causing the body of the die D to move upwardly into the dieholder 21 of assembly B, the die D being in what may be termed a neutral position relative to tool C, wherein the lugs 74 and 75 which are formed integral with and near the upper end of the die D, will clear the lugs 28 and 29 and will also clear the lugs 31 and 32 in the dieholder 21. The clearance position of these lugs 74 and 75 is shown in the dotted line diagram in Fig. 6 and indicated by the numeral 76. If the lugs 74 and 75 do not clear the lugs in body 21, then it is necessary to loosen the lock ring 61 and rotate assembly B slightly relative to lug 14 until the necessary clearance is effected. When this has been done, then the lock ring 61 can be re-tightened against the upper surface of lug 14 and the set screws 77 can be tightened against the lug 14. Likewise the set screws 78 (Fig. 1) can be tightened against the threads 22 of the body 21. When this is done, it is possible to loosen the set screws 77 and remove the assembly B from the press and later on the assembly B can be reinstalled in the press for future shell re-loading operations without the necessity of going through the preliminary adjustment steps, since the lock ring 61 is already locked in the correct position on the threaded end 22 of the body 21.

With the assembly B properly aligned relative to the shell holding tool C and properly adjusted for the subsequent shell re-loading operation, the die D can be removed from the shell holding tool C by simply rotating it two stations until it is in the position shown in Fig. 2, then it may be withdrawn manually from the shell holding tool C.

Operation—Decapping and repriming

Viewing Fig. 2, the decapping rod 39 is in the correct position for the decapping operation, with the pin 38 being received in the lowermost circumferential notch 49. When the decapping rod is in this position, the lower wad tamping end 50 of the rod projects outwardly beyond the end face 80 of the head 46. A shot shell 81 is then inserted into the shell holding tool C until the annular lip 73 of the shell engages the closed end of the dovetail slot 72. When this occurs the shell is automatically aligned concentrically with the axis of the decapping rod 39. Manual downward pressure on handle 8 raises the carriage 4 and with it the shell until the lower end of the decapping rod forces the previously fired primer 82 (see Fig. 11) out of the bottom of the shell. Then the new primer 82a is inserted into the cup 83 of the primer loading device G and the subsequent raising of the handle 8 causes the shell to move downwardly until the new primer which is resting on top of the plunger 84 is forced into the opening in the bottom of the shell. Thus the decapping and repriming operation is accomplished in one cycle of downward and upward movement of the press handle 8. It is desirable to decap and reprime a large number of empty shells before proceeding to the next operation of reloading or recharging the shell. When the decapping and repriming operation has been performed on a large number of empty shells, then the apparatus may be prepared for the subsequent shell recharging operation.

The shell reloading operation

A large number of empty shells now having the new primers inserted therein may have respective charges of powder poured into them. A measuring device is used to assure that each shell receives a pre-determined quantity of powder. Now the decapping rod 39 is rotated slightly to the left (viewing Fig. 2) and is then retracted upwardly relative to the sleeve 45 until the pin 38 engages the upper extremity of slot 47, then continued slight rotation of the rod 39 to the left is effected until the pin 38 is resting within the notch 48. With the decapping rod in this position the lower end of the rod is retracted within the sleeve 45 until it is substantially flush with or slightly inwardly beyond the lower end face 80 of the head 46. The die D is now inserted into the shell holding tool C and is rotated one station, for example, until station 69 faces directly to the front. Then the press handle 8 is lowered until the lugs 74 and 75 come into engagement with the internal lugs 31 and 32 in body 21. In this position of the die D relative to the shell holder C the lugs 74 and 75 clear the lugs 28 and 29 as is shown in Fig. 7 in the dotted line position of the lugs 74 and 75 as designated by the numeral 86. While holding the lugs 74 and 75 in contact with the under faces of lugs 31 and 32, then the die D is rotated back one station, for example until station 68 again faces directly to the front, and now the lugs 74 and 75 are locked between the two sets of lugs 28 and 29 and 31 and 32. This position of the lugs 74 and 75 is shown in Figs. 2 and 8 and is also shown superimposed in dotted lines in Fig. 6 and indicated by the numeral 86a. In this position the die D is free to be withdrawn from the shell holding tool C and this is done by raising the press handle 8, the die D remaining locked to the assembly B.

One of the shells with its charge of powder is then inserted into the shell holding tool C and the press handle 8 is lowered until the shell is fully inserted within the interior of the die D (this position is shown in Fig. 2). It is usually desirable to rub a small amount of lubricant on the outside of the shell to facilitate the insertion and withdrawal of the shell from the several dies D, E and F. The inside diameter of the die D is such as to size to proper outside diameter the lateral wall of the shell, and during the loading operation the outside diameter of the shell is maintained accurately by the die D. The die D is now rotated two stations by grasping handle 87

and rotating it until station 70, for example, is facing directly to the front. In this position the die D is locked to the shell holding tool C but the lugs 74 and 75 are in a "neutral" position so that the die D can be fully retracted from within the dieholder 21. The carriage is then lowered to retract the die. Now the first wad (referred to in the trade as the "over-powder" wad) is inserted and pressed with slight manual pressure into the open upper end of the die D. The press handle 8 is then lowered again elevating the die D into the dieholder 21. The end face 80 of the plunger head 46 engages the wad and forces it downwardly through the die D and on into the open end of the shot shell 81. In order to assure that the wad is accurately guided into the open end of the shot shell, I have provided at the upper end of the die D a guide member 88 which consists of a plurality of spring fingers 89 integrally formed with and projecting downwardly from an annular flange 90. The detail of this member is shown in Fig. 9. The flange 90 is received between the annular end face of the threaded collar 91 and the annular end face of the spacer bushing 92. The guide member 88 can be adjusted to a lower position within the interior of die D to accommodate a shorter length shot shell by simply removing the collar 91, the member 88 and the spacer sleeve 92 and then re-assembling the parts by inserting the member 88 into the die first, then inserting the spacer sleeve 92 directly above it and then reinserting the collar 91. In this position the annular flange 90 of the member 88 will rest upon the annular shoulder 93 formed in the internal wall of die D.

When the shell 81 has been pressed into the die D throughout its full length, the uppermost end of the shell projects upwardly behind the spring fingers and the fingers thus assure that the "over-powder" wad is properly guided into the open end of the shell preparatory to being pressed against the charge of powder.

It is very important that a predetermined amount of pressure be exerted upon the over-powder wad as it is pressed against the charge of powder. This is accomplished by means of the carefully calibrated spring 56 and the micrometer adjustment device afforded by the thimble 40. If, for example, it is desired to exert 78 pounds of pressure against the over-powder wad in seating it against the charge of powder, it is only necessary to rotate the thimble 40 from right to left (viewing Fig. 2) until the lower end face 59 thereof reaches the mark next beneath the "8" on scale 57 (indicated by numeral 96—see Fig. 2). Then the thimble can be rotated reversely (from left to right viewing Fig. 2) until thirty marks on scale 58 beyond zero are passed (each 10 marks represent 1 pound of pressure). In this position the number "30" on scale 58 will be aligned with the longitudinal line 97 on body 44 and in this position the end face 98 of the sleeve 45 is spaced a predetermined distance from the under surface 44 of the thimble 40. As the press handle 8 is lowered, the end of the head 46 engages the over-powder wad 99 and presses it down into the shot shell until it engages the powder. When this occurs, the spring 56 commences to offer resistance to the further travel of the head and sleeve toward the end of the thimble 40, and at the moment the end face 98 of the sleeve engages the under-surface 44 of the thimble, the spring 56 will have been compressed to a point where it is exerting a 78 pound pressure through the head 46 to the "over-powder" wad. Thus the amount of pressure which is imparted to the "over-powder" wad can be accurately controlled within fractional pound pressure ranges by first setting the micrometer adjustment by rotating thimble 40 relative to body 34.

Now that the "over-powder" wad has been seated, the next step is to lower the press handle until the die D is clear of the dieholder 21 and then additional filler wads may be pressed into the open end of the shot shell. There are usually two or more of these. These filler wads 100

are pressed into the shot shell by first inserting them at the open end of the die D and then lowering the press handle 8 until the "bottoming" of the filler wad against the "over-powder" wad can be felt. Only light pressure is exerted against the press handle in seating the filler wads 100 against the "over-powder" wad so as not to disturb the initial pressurized seating of the "over-powder" wad. After the filler wads have been inserted into the shot shell, then a measured quantity of shot 101 is poured into the open end of the shell. If desired, the shot shell can be removed from the die D before the shot is poured thereinto. In order to remove the shell from the die D, it is necessary to perform the steps as previously pointed out for locking the lugs 74 and 75 between the lugs 28 and 29 and 31 and 32 of the dieholder 21. When this is done the die D is in the proper position for being removed from the shell holding tool C and this is accomplished by simply raising the press handle 8, the shell 81 being anchored to the shell holding tool C is forcibly withdrawn from the die D. Now the die D can be removed from the dieholder 21 by simply rotating same manually until the lugs 74 and 75 clear both sets of lugs 28 and 29 and 31 and 32 of the body 21. Now the next operation involves that of crimping or closing the end of the shot shell.

The crimping operations

A large number of the shells which have been loaded with the powder and the "over-powder" and filler wads may now be charged with a predetermined amount of shot 101 preparatory to the shell sealing or crimping operation. The sealing of the end of the shot shell involves two separate crimping operations. The "star" crimp starting die 103 (shown in Figs. 12 and 13) is manually installed into the dieholder 21 by guiding the lugs 104 until they clear the lugs 28 and 29 and then rotating the die slightly until the lugs 104 are locked between the pairs of lugs 23 and 29 and 31 and 32 in the same manner in which the loading die D was locked therein. The web 109 which is formed internally of the die 103 engages the end of head 46 and spring 56 is compressed to some extent as the lugs 104 are locked between lugs 28, 29 and 31, 32 thereby holding the die E within the body 21 under tension. The shot shell 81 with the charge of shot therein is then inserted into the shell holding die C and the press handle 8 is lowered causing the shell to move up into the interior of die 103 whereupon the protruding radially directed die teeth 105 (which in section are generally triangular) engage the upper end of the shot shell forcing same to fold over so as to close off the previously open end of the shell. This crimping die leaves a somewhat star shaped impression in the folded over flange, and the six die teeth which are impressed into the flange serve to effect a neat folding under of the otherwise excess material which would be present in closing off the end of the shell. By raising handle 8 the shell which is anchored to the shell holder C is retracted from the die 103 which is anchored to dieholder 21.

While the shell remains in the shell holding tool C, the initial crimping die 103 is then manually rotated so that lugs 104 clear the lugs 28 and 29 and the die is then withdrawn from the body 21. Then the final crimping die F is manually inserted into and locked within the body 21 in the same manner in which the die 103 was inserted. The web 110 in die F serves the same function as web 109 in die E. Then the press handle is lowered until the shot shell moves into the die F and the upper perimeter of the shot shell is forced into the annular groove or die cavity 107 thereby forming an annular bead 108 at the upper end of the shot shell. The shell is then retracted from die F in the same manner as explained relative to die E. The die F is provided with a fluid pressure relief passage 111 in the web portion 110.

This completes the overall operation of the reload-

ing of a shot shell and the shell is now removed from the shell holder C and is ready to be used in the manner of a new shell. The finished product, the reloaded shell, is shown in Fig. 16, the shell being broken partly in section.

I claim:

1. In a shell sizing and reloading apparatus, in combination: a press including a base, a column rising from the base, a support carried by the upper end of the column and overhanging the base, a carriage slidable on the column between the base and the support, and means for actuating the carriage toward and from the support; a combined shell holder and lower die holder mounted on the carriage and having a die holding socket formed with a locking recess and an undercut shell holding slot therebeneath; a wad guiding die comprising a tubular body having its lower end receivable in said socket while enclosing a shell mounted in said slot, and having a lower lug engageable in said locking recess upon rotation of the die in the socket, whereby to lock the die to said shell holder, said die having, above said lower lug, an upper lug projecting radially outwardly from its said tubular body; an upper die holder of tubular form mounted in said support in coaxial relation to said shell holder and adapted to receive said die and its upper lug when said carriage is elevated, said upper die holder having internal keeper means adapted to engage said upper die lug and, upon rotation of said die to a position for release of its lower lug from said shell holder, to interlock with said lug so as to transfer the die from said shell holder to the upper die holder, whereby a shell subsequently sealed in said shell holder may be sized by upward movement thereof into the die as carried by said upper die holder; said die being adapted to enter the lower die holder socket of the shell holder in a subsequent downward movement of the carriage and to be transferred back to the shell holder upon being reversely rotated; and a wad seating plunger carried by said support in a position for reception into the shell in subsequent operation in which said die surrounds the shell and guides the wad.

2. A reloading apparatus as defined in claim 1, operable for a decapping operation: wherein said wad seating plunger is tubular, and including a decapping plunger telescoped within said wad seating plunger and retractable therein to an inoperative position from an operative position projecting below the lower end thereof.

3. A reloading apparatus as defined in claim 2, operable for a repriming operation: including a repriming tool carried by said base below said carriage, coaxial with said shell holder, and operable upon lowering the carriage, to insert a primer cap into the bottom of a shell supported in the carriage.

4. A reloading apparatus as defined in claim 1, wherein said shell holder has a mouth opening from said socket and slot through its lateral wall, to accommodate horizontal insertion and removal of shell and die.

5. In a shell sizing and reloading apparatus, in combination: a press including a base, a column rising from the base, a support carried by the upper end of the column and overhanging the base, a carriage slidable on the column between the base and the support, and means for actuating the carriage toward and from the support; a combined shell holder and lower die holder mounted on the carriage and having a die holding socket formed with a locking recess and an undercut shell holding slot therebeneath; a wad guiding die comprising a tubular body having its lower end receivable in said socket while enclosing a shell mounted in said slot, and having a locking lug engageable in said locking recess upon rotation of the die in the socket, whereby to lock the die to said shell holder, said die having, above said locking lug, a locking device on its external wall; an upper die holder of tubular form mounted in said sup-

port in coaxial relation to said shell holder and adapted, upon elevation of said carriage, to receive said die, to be engaged by said locking device to limit the elevating movement, and upon rotation of said die to a position for release of its lug from said shell holder to interlock with said locking device so as to transfer the die from said shell holder to the upper die holder, whereby a shell subsequently seated in said shell holder may be sized by upward movement thereof into the die as carried by said upper die holder; said die being adapted to enter the lower die holder socket of the shell holder in a subsequent downward movement of the carriage and to be transferred back to the shell holder upon being reversely rotated; and a wad seating plunger carried by said support in a position for reception into the shell in a subsequent operation in which said die surrounds the shell and guides the wad.

6. In a shell sizing and reloading apparatus, in combination: a press including a base, a column rising from the base, a support carried up the upper end of the column and overhanging the base, a carriage slidable on the column between the base and the support, and means for actuating the carriage toward and from the support; a combined shell holder and lower die holder mounted on the carriage and having a die holding socket, an undercut shell holding slot therebeneath, and a locking part; a wad guiding die comprising a tubular body having its lower end receivable in said socket while enclosing a shell mounted in said slot, and having a locking element interengageable with said locking part upon rotation of the die in the socket, whereby to lock the die to said shell holder, said die having a latching device on its outer wall above said locking element; an upper die holder of tubular form mounted in said support in coaxial relation to said shell holder and adapted to receive said die and said latching device when said carriage is elevated, said upper die holder having latching means adapted to engage said latching device during said carriage elevating movement and, upon rotation of said die to a position for release of its locking element from said shell holder, to interlock with said latching means so as to transfer the die from said shell holder to the upper die holder, whereby a shell subsequently seated in said shell holder may be sized by upward movement thereof into the die and carried by said upper die holder; said die being adapted to enter the lower die holder socket of the shell holder in a subsequent downward movement of the carriage and to be transferred back to the shell holder upon being reversely rotated; and a wad seating plunger carried by said support in a position for reception into the shell in a subsequent operation in which said die surrounds the shell and guides the wad.

7. In a shell sizing and reloading apparatus, in combination: a press including a base, a column rising from the base, a support carried by the upper end of the column and overhanging the base, a carriage slidable on the column between the base and the support, and means for actuating the carriage toward and from the support; a combined shell holder and lower die holder mounted on the carriage and having a die holding socket, an undercut shell holding slot therebeneath, and a locking part; a wad guiding die comprising a tubular body having its lower end receivable in said socket while enclosing a shell mounted in said slot, and having a locking element interengageable with said locking part upon rotation of the die in the socket, whereby to lock the die to said shell holder, said die having a latching device on its outer wall above said locking element; an upper die holder mounted on said support in coaxial relation to said shell holder and having at its lower end means for telescopic interengagement with said die when said carriage is elevated, and having means adjacent said lower end for interengagement with said latching device of the die upon rotation of the die to a position for release of its locking element

from said shell holder, whereby to transfer the die from said shell holder to the upper die holder and to secure it to the latter in coaxial relation to said shell holder so that a shell subsequently seated in said shell holder may be sized by upward movement thereof into the die as carried by said upper die holder; said die being adapted to enter the lower die holder socket of the shell holder in a subsequent downward movement of the carriage and to be transferred back to the shell holder upon being reversely rotated; and a wad seating plunger carried by said support in a position for reception into the shell in a subsequent operation in which said die surrounds the shell and guides the wad.

8. A reloading apparatus as defined in claim 7, operable for a decapping operation: wherein said wad seating plunger is tubular, and including a decapping plunger telescoped within said wad seating plunger and retractable therein to an inoperative position from an operative position projecting below the lower end thereof.

9. A reloading apparatus as defined in claim 8, operable for a repriming operation: including a repriming tool carried by said base below said carriage, coaxial with said shell holder, and operable upon lowering the carriage, to insert a primer cap into the bottom of a shell supported in the carriage.

10. A reloading apparatus as defined in claim 7, wherein said shell holder has a mouth opening from said socket and slot through its lateral wall, to accommodate horizontal insertion and removal of shell and die.

11. In a shell reloading apparatus, in combination: a supporting structure comprising a vertical guide member and a support at the upper end thereof; a carriage mounted on said vertical guide member for vertically sliding movement; means for moving said carriage on said guide member toward and from said support; a combined shell holder and lower die holder mounted on the carriage and having a die holding socket and an undercut shell holding slot therebeneath; a combined sizing and wad guiding die comprising a tubular body having its lower end receivable in said socket while enclosing a shell mounted in said slot; co-acting locking means on said lower die holder and said die respectively for securing the die to the holder; an upper die holder mounted on said support in coaxial relation to said lower die holder and having at its lower end, means for interengagement with said die in coaxial relation thereto when the carriage is elevated; co-acting latching means on said die and upper die holder respectively for securing said die to said upper die holder; common actuator means for simultaneously releasing said locking means and engaging said latching means when said interengagement of the die with the upper die holder has been effected, whereby to transfer the die from said lower die holder to the upper die holder and to secure it to the latter in coaxial relation to said slot, so that a shell subsequently seated therein may be sized by upward movement thereof into the die as carried by said upper die holder, said die being adapted to enter the lower die holder socket in a subsequent downward movement of the carriage and to be transferred back to said lower die holder upon reverse operation of said actuator means; and a wad seating plunger carried by said support in a position for reception into the shell, in a subsequent operation in which said die surrounds the shell and guides the wad as the carriage is moved upwardly to present the shell to said plunger.

12. In a shell reloading apparatus, in combination: a supporting structure including a vertical guide member and a support at the upper end thereof; a carriage mounted on said vertical guide member for vertically sliding movement; means for moving said carriage vertically toward and from said support; a combined shell holder and lower die holder mounted on the carriage and having a die holding socket and an undercut shell holding slot therebeneath; a combined sizing and wad guiding die comprising a tubular body having its lower end receivable in said socket

while enclosing a shell mounted in said slot; co-acting locking means on said die and lower die holder respectively for securing them together; an upper die holder mounted on said upper support in coaxial relation to said lower die holder, having at its lower end, means for telescopic interengagement with said die in coaxial relation thereto when the carriage is elevated; coacting latching means on said die and upper die holder respectively for securing said die to said upper die holder; actuator means for releasing said locking means and for engaging said latching means when said telescopic interengagement of the die with the upper die holder has been effected, whereby to transfer the die from said lower to said upper die holder, so that a shell subsequently seated in said shell holder slot may be sized by upward movement thereof into the die as carried by said upper die holder; said die being adapted to enter the socket of the lower die holder in a subsequent downward movement of the carriage and to be transferred back to said lower die holder upon reverse operation of said actuator means; and a wad seating plunger carried by said support in a position for reception into the shell in a subsequent operation in which said lower die holder supports the shell and said die while moving them upwardly to effect reception of the plunger in the shell, with the die surrounding the shell and guiding the wad.

13. In a shell reloading apparatus, in combination: a supporting structure including a vertical guide member and a support at the upper end thereof; a carriage mounted on said vertical guide member for vertically sliding movement; means for moving said carriage vertically toward and away from said support; a combined shell holder and lower die holder mounted on the carriage and having a die holding socket and an undercut shell holding slot therebeneath; a combined sizing and wad guiding die comprising a tubular body having its lower end receivable in said socket while enclosing a shell mounted in said slot; an upper die holder mounted on said support in coaxial relation to said lower die holder; means for selectively attaching said die to either said upper die holder or said lower die holder; said upper die holder embodying a slide bearing at its upper end; a tubular wad seating plunger slidably mounted in said bearing in a position for reception into the shell in an operation in which said die surrounds the shell and guides the wad while both the shell and die are carried upwardly by said carriage; a decapping rod extending axially through said plunger for shifting movement between a position projecting from the lower end of the plunger for a decapping operation performed by an upward movement of the carriage in which an empty shell is forced upwardly against a projecting end of said rod and a position retracted into the plunger to provide a wad-seating face on the lower end of the plunger, used in a subsequent upward movement of the carriage carrying the die and shell upwardly to receive the plunger in the shell, with the die surrounding the shell to guide the wad into the shell; means for locking said rod selectively in either said retracted or said projected position and for shifting it between said positions; yielding means acting downwardly against said plunger; and means carried by said die holder and loading said yielding means to cause the latter to apply a yielding wad-seating force against the wad.

14. In a shell reloading apparatus, in combination: a supporting structure comprising a vertical guide member and a support at the upper end thereof; a carriage mounted on said vertical guide member for vertically sliding movement; a combined shell holder and die holder mounted on the carriage and having a die holding socket and an undercut shell holding slot therebeneath; means for moving said carriage vertically toward and from said support; a wad guiding die comprising a tubular body having its lower end receivable in said socket while enclosing a shell mounted in said slot; coacting locking means on said die holder and said die respectively for securing the

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die to the holder; a slide bearing carried by said support; a tubular wad seating plunger slidably mounted in said bearing in a position for reception into the shell in an operation in which said die surrounds the shell and guides the wad while both the shell and die are carried upwardly by said carriage; a decapping rod extending axially through said plunger for shifting movement between a position projecting from the lower end of the plunger for a decapping operation performed by an upward movement of the carriage in which an empty shell is forced upwardly against a projecting end of said rod, and a position retracted into the plunger to provide a wad-seating face on the lower end of the plunger, used in a subsequent upward movement of the carriage carrying the die and shell upwardly to receive the plunger in the shell, with the die surrounding the shell to guide the wad into the shell; means for locking said rod selectively in either said retracted or said projected position and for shifting it between said positions; yielding means acting downwardly against said plunger; said yielding means comprising a coil spring surrounding said plunger, said plunger having an annular flange against which the lower end of said coil spring bears, said flange seating against the upper end of said upper slide bearing to determine the limit of downward movement of said plunger; and loading means comprising a barrel attached at its lower end to said slide bearing and extending upwardly around said coil spring and having at its upper end a head against which the upper end of said coil spring is loaded; a thimble receiving the upper end of said barrel and having at its upper end a head providing a stop to limit receding movement of said plunger under the upward movement of a loaded shell thereagainst, to determine a limit of compression of said spring whereat a selected seating pressure has been applied to the wad by the plunger; and indicator means on said thimble and barrel respectively for indicating the said pressure.

15. In a shell reloading apparatus, in combination: a supporting structure comprising a vertical guide member and a support at the upper end thereof; a carriage mounted on said vertical guide member for vertically sliding movement; a combined shell holder and die holder mounted on the carriage and having a die holding socket and an undercut shell holding slot therebeneath; means for moving said carriage vertically toward and from said support; a wad guiding die comprising a tubular body having its lower end receivable in said socket while enclosing a shell mounted in said slot; coaxing locking means on said die holder and said die respectively for securing the die to the holder; a slide bearing carried by said support; a tubular wad seating plunger slidably mounted in said bearing in a position for reception into the shell in an operation in which said die surrounds the shell and guides the wad while both the shell and die are carried upwardly by said carriage; a decapping rod extending axially through said plunger for shifting movement between a position projecting from the lower end of the plunger for a decapping operation performed by an upward movement of the carriage in which an empty shell is forced upwardly against a projecting end of said rod and a position retracted into the plunger to provide a wad-seating face on the lower end of the plunger, used in a subsequent upward movement of the carriage carrying the die and shell upwardly to receive the plunger in the shell, with the die surrounding the shell to guide the wad into the shell; means for locking said rod selectively in either said retracted or said projected position and for

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shifting it between said positions; yielding means acting downwardly against said plunger; and means carried by said bearing and loading said yielding means to cause the latter to apply a yielding wad-seating force against the wad; said decapping rod locking means comprising a pin projecting radially from said decapping rod, a Z-slot in the upper end of said plunger, receiving said pin and having an axially extending portion in which the pin may move to accommodate the vertical shifting of the rod, having an upper circumferential recess to receive the pin to support the rod in said retracted position, and having a lower circumferential recess to receive the pin and to lock the rod in said projecting position.

16. In a shell reloading apparatus in combination: a supporting structure comprising upper and lower supports, disposed one above the other and a vertical member extending between said supports; a carriage mounted on said vertical member for vertically sliding movement; means for moving said carriage vertically between said supports; a combined shell holder and lower die holder mounted on the carriage and having a die holding socket and an undercut shell holding slot therebeneath; a combined sizing and wad guiding die comprising a tubular body having its lower end receivable in said socket while enclosing a shell mounted in said slot; an upper die holder mounted on said support in coaxial relation to said lower die holder; means for selectively attaching said die to either said upper die holder or said lower die holder, so that a shell subsequently seated in said shell holder slot may be sized by upward movement thereof into the die as carried by said upper die holder; said die being adapted to enter the socket of the lower die holder in a subsequent downward movement of the carriage and to be transferred back to said lower die holder upon reverse operation of said actuator means; a wad seating plunger carried by said support in a position for reception into the shell in a subsequent operation in which said lower die holder supports the shell and said die while moving them upwardly to effect reception of the plunger in the shell, with the die surrounding the shell and guiding the wad; and a repriming device mounted in said lower support, coaxial with said die holders, said lower die holder having a passage communicating with the bottom of the shell as mounted in said shell holder slot, whereby to receive the repriming device as the carriage approaches said lower support with the shell holder carrying the shell, thereby to reprime the shell.

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