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Deitemeyer

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[54] **SHELL RELOADER WITH IMPROVED SIZING DIE**

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[52] **U.S. Cl.** **86/30,** 86/25, 86/31, 86/36

[51] **Int. Cl.** **F42b 33/04**

[58] **Field of Search** 86/25, 27, 29, 30, 31, 86/36

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Attorney, Agent, or Firm—Vincent L. Carney

[57] **ABSTRACT**

To simplify and reduce the cost of a shotshell reloader (1) an aluminum retaining tube having internal threads and an inwardly extending flange is threaded onto one end of an aluminum sleeve of a sizing tool, with an annular steel sizing die being held within the inner side of the aluminum retaining tube above the flange to shape the outer side of the brass ferrule of the shotshell, the flange of the aluminum retaining tube spacing the bottom surface of the steel die to compensate for the rim of the shotshell; (2) an aluminum pilot holds a steel punch along the longitudinal axis of the sleeve with its point extending therebeyond to remove the primer from a shotshell; (3) the charge bar holder has an open back and a longitudinally extending groove on its inner surface adapted to fit a complementarily formed longitudinally extending locating ridge on the charge bar, with the charge bar having a different stop on each end so that the charge bar may be inserted through the open back of the charge bar holder before assembling the powder and shot containers thereto, the column of the shotshell reloader closing the open back of the charge bar holder to hold the charge bar in place; (4) the wad guide body is a one piece aluminum cylinder having an annular recess in it to receive the rim of a nylon wad guide to hold the nylon wad guide in place; and (5) the pressure scale for indicating the pressure applied to the over-powder wad and powder is the pressure pad that forms the bottom of the powder, shot and wad loading station, which is exposed by a cut-away portion of the base with markers being located along the side of the cut-away portion of the base.

9 Claims, 8 Drawing Figures

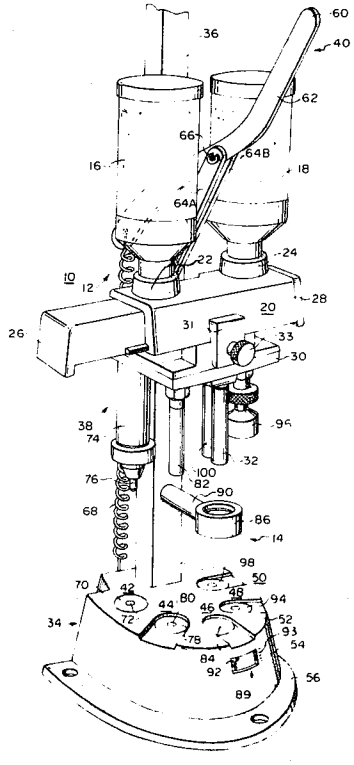
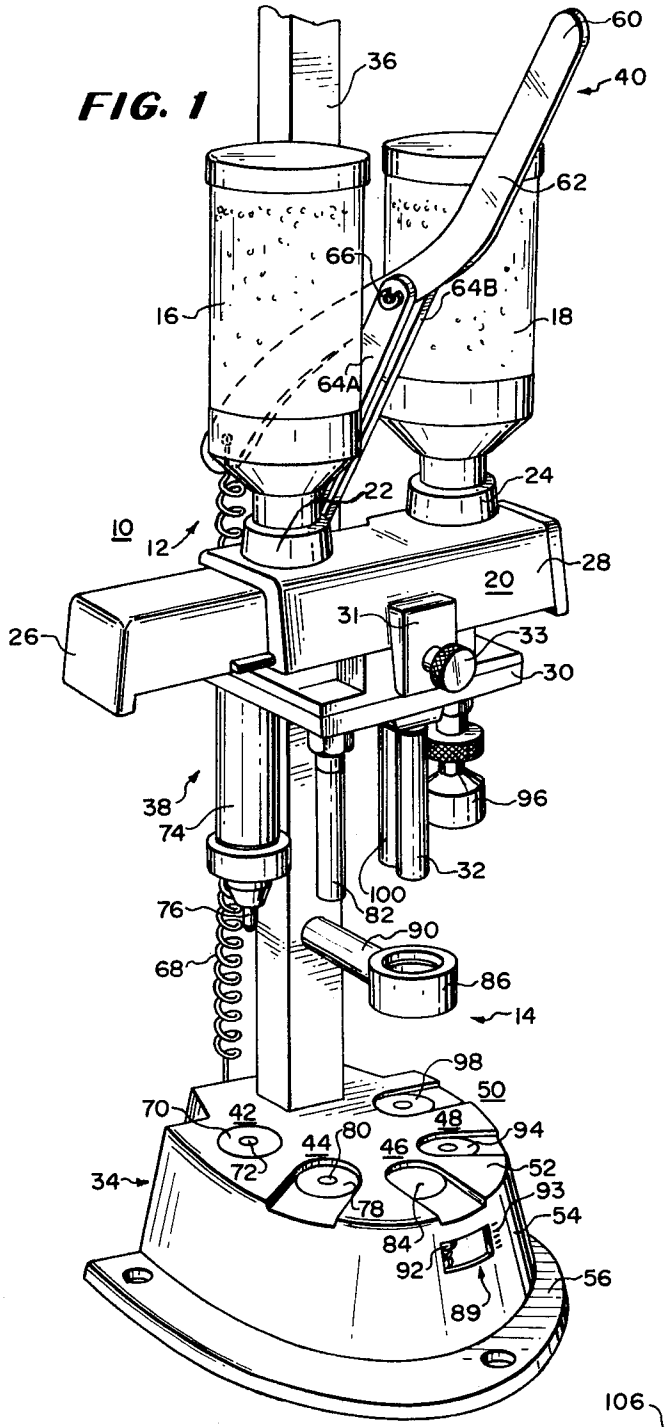


FIG. 1



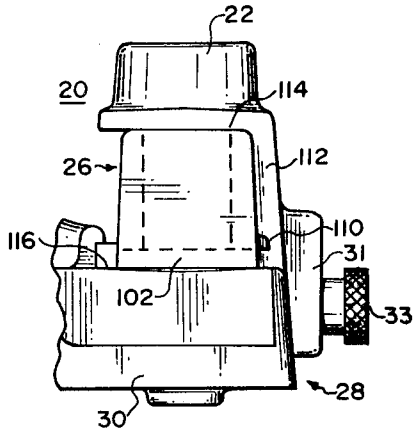


FIG. 4

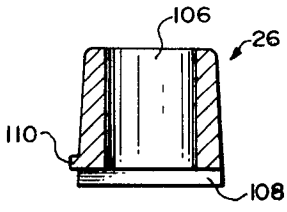


FIG. 3

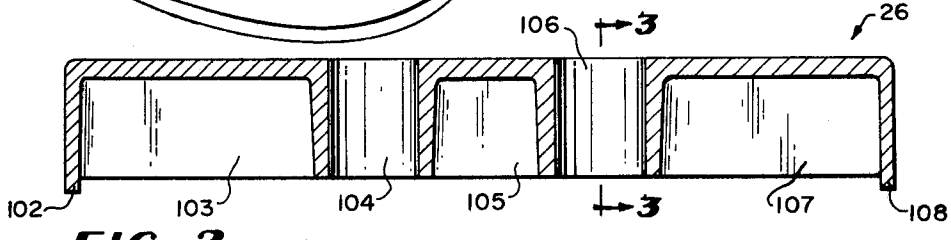


FIG. 2

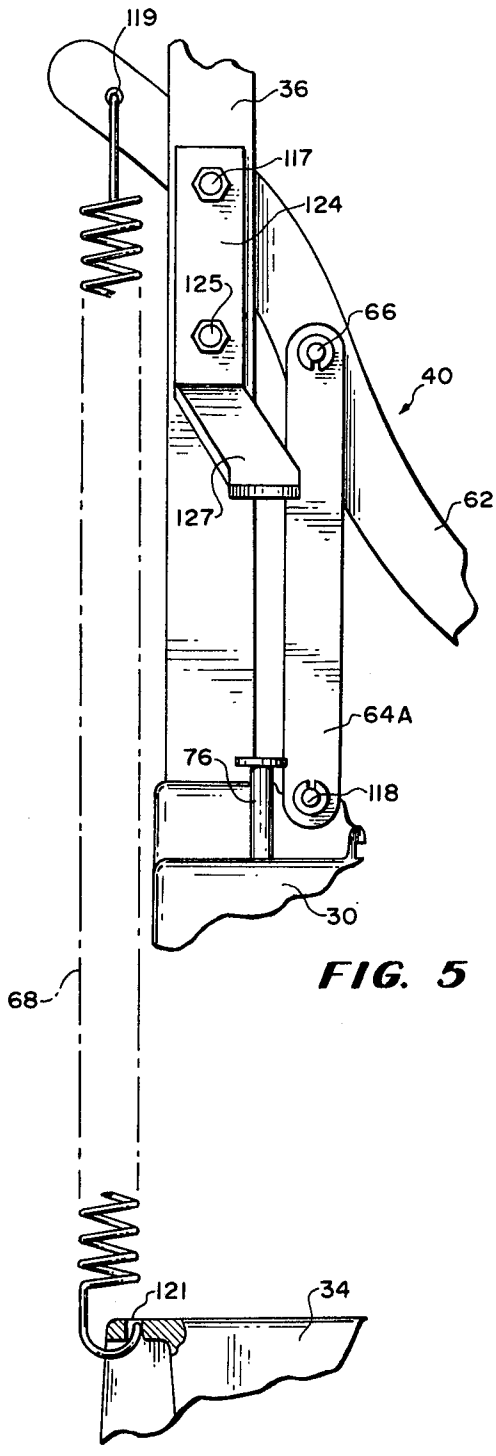

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FIG. 5

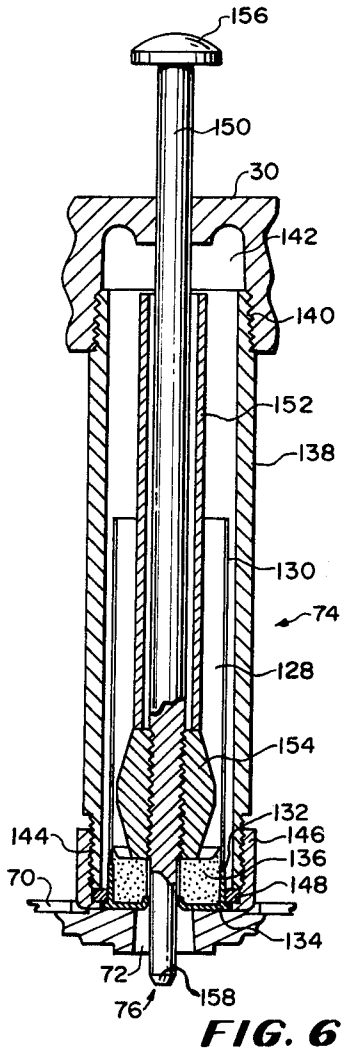
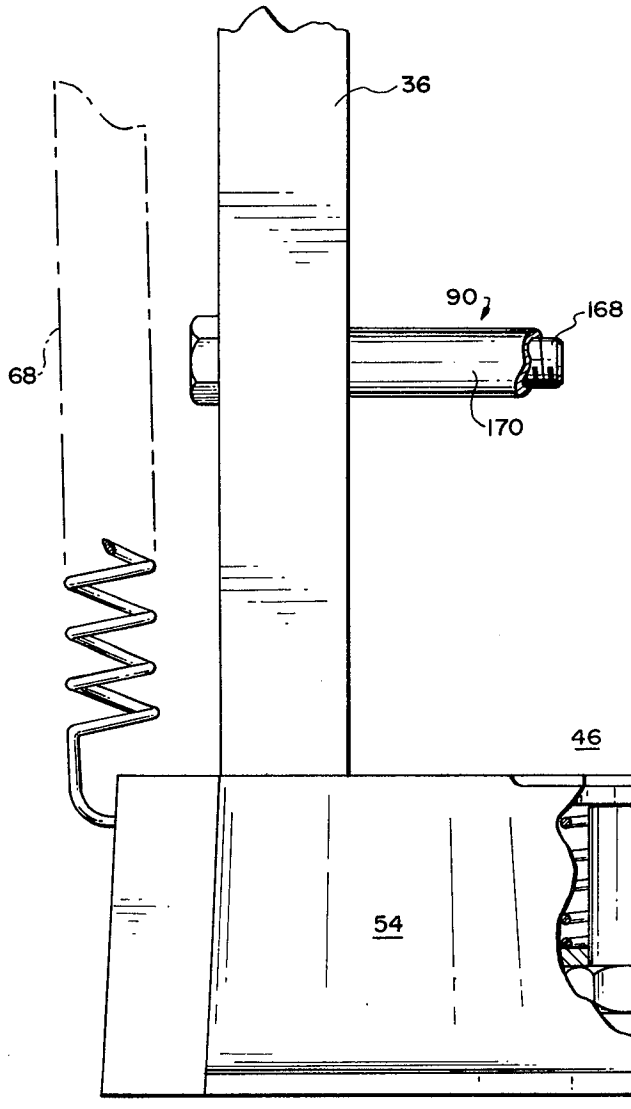

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FIG. 6

FIG. 7



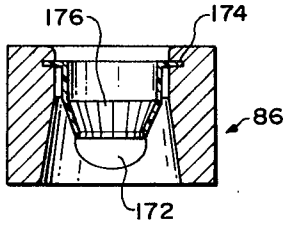


FIG. 8

SHELL RELOADER WITH IMPROVED SIZING DIE

SPECIFICATION

This invention relates to shell reloaders.

In one class of shell reloader, the sizing of the shell is accomplished by a steel die that moves downwardly across the ferrule and forces it back into shape if it was expanded by the previous use of the shell. At the same time, a steel punch moves downwardly against the spent primer, forcing it out of the shotshell. The shell is then reprimed and loaded with powder, an over-powder wad, and shot in the loading station.

The powder and shot are applied from storage containers mounted to the shell reloader through a metering valve having a charge bar in which there is a powder metering aperture and a shot metering aperture of the proper sizes to deposit sufficient powder and shot respectively in a single cartridge. The powder metering aperture and shot metering aperture in the charge bar are moved beneath containers to be filled with powder and shot respectively and are moved beneath an outlet tube to enable the shot and powder to drop into the shell. Between the loading of powder and shot in the shell, an over-powder wad is deposited in the shell through a wad guide and a measured amount of pressure is exerted against the top of the over-powder wad before applying the shot to the shell.

In one type of prior art shell reloader of this class, the sizing die and primer punch are each machined from a different piece of steel with the primer punch having a tapered end to flare the base of the shell outwardly near the spent primer.

In the loading station, the wad guide body is formed of two parts, with the wad guide being held between them. Beneath the wad guide body, the scale for indicating the pressure applied to the over-powder wad when it is being pressed against the powder includes a feeler that measures the amount that the shell is moved downwardly and an indicator moved by the feeler with respect to markers on the scale to indicate the pressure. The charge bar which measures the powder and shot that are to be applied to each shell is mounted within two piece charge bar holder with the charge bar resting upon a flat base which is the first piece and being held on three sides by a housing that also receives containers for powder and shot, which housing is the second piece.

The prior art shell loaders of this type have the disadvantages of being relatively expensive and difficult to construct. These prior art shell loaders are expensive because: (1) the wad guide body and the pressure measuring apparatus require several parts which must be assembled together; and (2) a large amount of machining is required to form the tapered primer punch and the sizing die. It is relatively difficult to assemble the prior art shell loaders because it is difficult to properly assemble the charge bar and charge bar holder to the apparatus.

Accordingly, it is an object of this invention to provide a novel shell reloader.

It is a still further object of the invention to provide a novel shell reloader that is economical to manufacture.

It is a still further object of this invention to provide sizing and depriming tools for shell reloaders which require a minimum of machining during their manufacture.

It is a still further object of this invention to provide a metering valve for a shell reloader in which the charge bar and containers are easily assembled to the metering valve.

It is a still further object of the invention to provide an economical wad guide body for a shell reloader.

It is a still further object of the invention to provide a wad pressure indicator and a wad guide body requiring a minimum number of parts not used for other purposes in the shell reloader.

In accordance with the above and further objects of the invention, the sizing and depriming station and the powder, shot and wad loading station of the shell loader are especially designed to be economically manufactured.

In the sizing and depriming station, the sizing die and the punching die are formed of parts that are easily fabricated and are easily assembled to the shell reloader. The sizing die is a hardened steel ring held in place by an aluminum retaining tube that is threaded onto an aluminum sleeve to hold the sizing die in place. The depriming punch is a hardened steel pin held by an aluminum pilot threaded onto it and spaced within the sizing tool by an aluminum sleeve.

In the loading station, a charge bar holder includes an open back and a longitudinally extending locating groove in the inside surface of the front wall so that the charge bar is inserted into the open back with a locating ridge fitting within the locating groove to insure proper placement. The charge bar holder includes threaded openings to receive the necks of powder and shot containers which are assembled after the charge bar is inserted but before the charge bar holder is assembled to the shell reloader. The charge bar has locating stops on both ends to aid in positioning the charge bar during operation.

The charge bar holder together with the powder and shot containers and the charge bar are assembled to the shell reloader by mounting the charge bar holder to the base of the metering valve by a thumbscrew, in which position the column of the shell reloader blocks the open back of the charge bar holder to hold the charge bar in place.

The wad guide body is a cylindrical aluminum tube, having an annular groove in its inner wall, with the inner walls sloping outwardly and downwardly from the annular groove and having a shoulder above the annular groove so that a nylon wad guide may be inserted into the large opening at the bottom of the wad guide body and pushed upwardly until the outwardly extending rim of the nylon wad guide snaps into the annular groove to hold the wad guide in place. The wad guide body is mounted to the column of the shell reloader by a bolt threaded into a hole in its cylindrical wall and passing through the column of the shotshell reloader, with an aluminum sleeve spacing the column from the wad guide body.

Beneath the wad guide body in the loading station, the spring mounted pressure pad that supports the shell during loading is exposed to view through a cut-away portion of the base and scale marks are provided along the side of the cutaway portion so that the height of the pressure pad within the loading station indicates the amount of pressure being applied to the over-powder

wad when the over-powder wad is pressed by the drop tube to pack the powder within the shell.

The above-noted and other features of the invention will be better understood from the following detailed description when considered with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of a shell reloader including an embodiment of the invention;

FIG. 2 is a longitudinal sectional view of a charge bar included in the shell reloader of FIG. 1;

FIG. 3 is a sectional side view of the charge bar of FIG. 2 taken through lines 3—3;

FIG. 4 is a side view of a metering valve included in the shell reloader of FIG. 1;

FIG. 5 is fragmentary side elevational view of a hand-operated lever for moving the tools toward and away from a shell in a reloading operation performed by the reloader shown in FIG. 1;

FIG. 6 is an enlarged elevational view, partly broken away, of a sizing and depriming tool used in the shell reloader of FIG. 1;

FIG. 7 is a simplified fragmentary elevational view, partly broken away, of the powder, shot, and over-powder wad reloading station used in the shell reloader of FIG. 1; and

FIG. 8 is a sectional view of a wad guide body and wad guide used in the embodiment of FIG. 1.

GENERAL STRUCTURE

In FIG. 1, there is shown a perspective view of a shotshell reloader 10 having a metering and storage section 12 and a shotshell operating section 14. While a shotshell reloader 10 is described in the description of the preferred embodiment herein, the invention can obviously be used with other types of forming and loading equipment such as rifle shell reloaders and the like.

To store the shot and powder for filling the shotshells, the metering and storage section 12 includes two containers: a powder container 16 and a shot container 18, with the containers being mounted in vertical positions parallel to each other above the shotshell operating section 14. The containers 16 and 18 are plastic bottles having threaded tops and are mounted in an inverted position with the threaded tops communicating with the metering and storage section 12 to permit the powder and the shot to be moved downwardly by gravity unless blocked.

While the containers 16 and 18 in the preferred embodiment are plastic bottles, any other type of suitable containers may be used. Moreover, the containers may have open bottoms and open tops to permit them to be filled with powder and shot from the top without removing them from the shotshell reloader 10. The ends of the containers that are mounted in the shotshell reloader 10 to permit the powder and shot to flow downwardly by gravity may also be other than the threaded necks of plastic bottles, any type of opening being appropriate which permits the flow of powder and shot downwardly by gravity unless blocked by another mechanism within the shotshell reloader 10.

To load measured amounts of the powder and shot into a shotshell, the metering and storage section 12 includes a metering valve 20 having a first inlet portion 22, a second inlet portion 24, a charge bar 26, a charge bar holder 28, and a mounting plate 30. A vertically positioned drop tube 32 in the shotshell operating section 14 communicates at its upper end with an outlet in the metering and storage section 12 to permit powder and shot to be loaded therefrom into a shotshell.

The mounting plate 30 is a generally flat horizontally positioned member having first and second vertical apertures (not shown) with the first aperture movably receiving the column of the shotshell loader to permit vertical movement of the mounting plate 30 with respect thereto in a manner to be described more completely hereinafter and with the second aperture providing an exit port communicating with the downwardly extending vertically positioned drop tube 32 to permit metered portions of the powder and shot to leave the metering and storage section 12.

The charge bar holder 28 is an elongated reversed C-shaped member that movably confines the charge bar 26 against the column of the shotshell reloader and has: (1) an open back to receive the charge bar 26 during assembly, which open back is closed by the column of the shotshell reloader during operation of the shotshell reloader; (2) a first port in its upper side communicating with the first inlet portion 22, which inlet portion includes internal threads to receive the threaded neck of the container 16 and to permit the passage of powder into the charge bar holder 28; (3) a second aperture in its upper surface communicating with the second inlet portion 24, which inlet portion has internal threads to receive the threaded neck of the container 18 and to permit the passage of shot into the charge bar holder 28; (4) a downwardly extending bracket 31 integrally formed with the front surface of the charge bar holder 28 and adapted to receive a thumbscrew 33 which may be threaded through the bracket 31 and into the mounting plate 30 to hold the charge bar holder 28 to the mounting plate 30; and (5) a downwardly extending exit port aligned with the exit port in the mounting plate 30 and the drop tube 32 to permit metered portions of powder and shot to pass into the drop tube 32.

The charge bar 26 is an elongated bar having two laterally spaced vertical metering apertures which in one embodiment, may be positioned so that: (1) in a first location of the charge bar 26 within the charge bar holder 28, the first metering cavity is located between the first inlet portion 22 and the bottom side of the charge bar holder 28 and the second metering cavity is not aligned with either inlet portion nor the drop tube 32; (2) in a second position of the charge bar 26 within the charge bar holder 28, the second metering cavity is aligned with the second inlet portion 24 and the bottom of the charge bar holder 28, with the first metering cavity not being aligned with either inlet portion nor the drop tube 32; (3) in a third position of the charge bar 26 within the charge bar holder 28, the first metering cavity is aligned with the drop tube 32 and the second metering cavity is not aligned with either inlet portion nor the drop tube 32; and (4) in a fourth position of the charge bar 26 within the charge bar holder 28, the metering cavity is aligned with the drop tube 32 and the first metering cavity is not aligned with either inlet portion nor the drop tube 32.

To prepare a shotshell to be filled with powder and shot, to fill it, and to seal it after it has been filled with powder and shot, the shotshell operating section 14 includes a supporting base 34, a vertically positioned supporting column 36, a reciprocating tool section 38, and a hand-operated lever 40. Between the base 34 and the receiprocating tool section 38 are five shotshell operat-

ing stations, which are: (1) a depriming and sizing station 42; (2) a priming station 44; (3) a powder, shot and wad loading station 46; (4) a crimp starting and taper locking station 48; and (5) a final crimping station 50.

To support the shotshell reloader 10, the base 34 includes a horizontal flat upper surface 52, curved downwardly sloping walls 54, and an outwardly turned apertured bottom flange 56 adapted to receive bolts for mounting the base 34 on a horizontal support surface. The upright column 36 has a square cross section mounted by a bolt (not shown) in the base 34 and extending upwardly to: (1) pivitally support the hand-operated lever 40 at an upper location; and (2) guide the reciprocating tool section 38 and the storage and metering section 12 during their reciprocating motion with the mounting plate 30 movably receiving the column 36 in a square aperture.

To reciprocate the reciprocating tool section 38, the hand-operated lever 40 includes a hand grip 60, a shank portion 62, two parallel levers 64A and 64B, each pivotally mounted at one end to the shank portion 62 by a pivot pin 66 and mounted at their other ends to the mounting plate 30 to move the reciprocating tool section 38 and the metering and storage section 12 upwardly and downwardly as the hand grip 60 is moved upwardly and downwardly. The shank portion 62 of the hand-operated lever 40 is pinned to the column 36 and to the pivot pin 66, with the far end of the shank portion being biased downwardly by a tension spring 68 to normally hold the hand grip 60 in an upward position.

Each of the five operating stations 42–50 includes a different one of a plurality of reciprocating tools mounted to the base 30 in the reciprocating tool section 38 and a corresponding recess in the horizontal flat surface 52 of the base 34 aligned with a tool so that each reciprocating tool is able to cooperate with a shotshell located in one of the mounting recesses.

To deprime and size the shotshell, the depriming and sizing station 42 includes: (1) a cylindrical recess 70 in the flat upper plate 52 of sufficient diameter to embrace the bottom portion of a shotshell to support the shotshell therein; (2) a cylindrical opening 72 in the center of the recess 70 of sufficient size to overlie the used primer or cap of a shotshell supported within the cylindrical recess 70; (3) a cylindrical sizing tool 74 mounted to the reciprocating tool section 38 for motion therewith; and (4) a depriming punch 76 mounted concentrically with the sizing tool to move downwardly.

To insert a new primer cap, the priming station 44 includes a cylindrical recess 78 having a small central opening 80 within it, with the cylindrical recess being of sufficient size to support the base of a shotshell and with the central opening being of sufficient size to permit a new priming cap to pass upwardly therein into the aperture provided in the shotshell for the cap. Above the central opening 80 is a tubular priming tool 82 attached to the reciprocating tool section 38 for downward movement therewith to move the base wad within the shotshell against the priming cap which is supported by a pedestal within the central aperture 80 so that the primer cap is tightly fitted within the base wad which holds it within the shotshell.

To load the shotshell with powder, shot, and an over-powder wad, the powder, shot and wad loading station 46 includes: (1) a cylindrical recess 84 having a centrally located opening to protect the primer of a shotshell mounted therein; (2) a tubular wad guide body 86 mounted above the recess 84 to support a wad guide thereover; (3) the drop tube 32 mounted to the plate 30 for reciprocating motion therewith and extending downwardly with its longitudinal axis in line with the central opening through the wad guide body 86 and the recess 84, whereby powder and shot may pass through the drop tube 32 and the center of the tubular wad guide body 86 into the open end of a shotshell positioned with its base in the recess 84; and (4) a pressure measuring section 89 for indicating the amount of pressure on a shotshell located within the recess 84.

The wad guide body 86 is mounted to the column 36 by a tubular supporting member 90 with its cylindrical opening in line and between the drop tube 32 and the recess 84.

The pressure measuring section 89 is formed as part of the pressure absorbing base in the recess 84 and includes a spring having a pressure pad mounted to its upper end at 92, whereby the pressure pad moves downwardly as pressure is exerted upon the shotshell. The location of the pressure pad is shown by indicator marks 93 along the side of the measuring section 89 which indicate the amount of pressure placed upon the shotshell.

With this arrangement, the drop tube 32 moves through the center of the wad guide body 86 after the powder has been deposited into the shotshell to force an over-powder wad supported by a wad guide within the wad guide body downwardly into the open end of the shotshell. Further downward movement of the drop tube 32 packs the powder, with the pressure being indicated by the location of the pressure pad 92 with respect to the indicator marks 93 along the side of the measuring section 89. Later, the drop tube permits shot to be dropped into the shotshell on top of the over-powder wad.

To start a crimp in the top edge of the shotshell and to lock the proper taper into the top of the started crimp, the crimp start and taper locking station 48 includes a recess 94 and a crimp tool 96 attached to the reciprocating tool section 38 for starting the crimp on the top of the casing of the shotshell. To put a final crimp on the shotshell, the final crimping station 50 includes a recess 98 to hold a shotshell and a crimping tool 100 mounted to the plate 30 for reciprocation therewith to put a finished crimp on the shotshell when the hand grip 60 is moved downwardly. The crimp start and taper locking station and the crimping station 50 are conventional and will not be described further herein.

GENERAL OPERATION

Before operating the shotshell reloader 10 to reload a shotshell, the charge bar 26, the charge bar holder 28, and the containers 16 and 18 are assembled together and mounted to the first and second inlet portions 22 and 24 of the charge bar holder 28 while they are in an upright position with the charge bar holder 28 being inverted by threading the necks of the first and second containers 16 and 18 into the internal threads of the first and second inlet portions 22 and 24.

Either before or after the first and second containers 16 and 18 are mounted to the charge bar holder 28 but before the first and second containers and charge bar

are turned to the position in which they are to be mounted, the charge bar 26 is inserted within the charge bar holder so that its surfaces prevent the escape of the powder or shot. With the charge bar 26 and the first and second containers 16 and 18 assembled to the charge bar holder 28, the charge bar holder is assembled to the metering and storage section 12 so that the first and second containers 16 and 18 are inverted, the column 36 blocks the open side of the charge bar holder 28, and the thumscrew 23 is aligned with the threaded opening in the mounting plate 30. The thumbscrew 33 is then threaded into the plate 30 to fasten the charge bar holder 28 in place.

Before reloading a shotshell, the shotshell is redimensioned and the spent primer is replaced by a new primer. The shotshell is then loaded and closed.

To redimension the metallic ferrule at the base of the shotshell, the shotshell is inserted in the first station 42 with its base within the cylindrical recess 70. With the shotshell positioned in the first station 42, the hand-operated lever 40 is moved downwardly.

As the hand-operated lever 40 moves downwardly, the reciprocating tool section 38 moves downwardly carrying the resizing tool 74 and the punch 76 with it. As the resizing tool 76 and punch 76 move downwardly, the spent primer is ejected by the punch 76 which forces it through the central aperture 72 in the bottom of the cylindrical recess 70 and the sizing tool moves the ferrule inwardly if it was expanded during the previous use of the shotshell. When the hand grip 60 of the hand-operated lever is released, the hand-operated lever and the reciprocating tool section return to their upper positions.

After the metallic ferrule of the shotshell has been redimensioned and the spent primer has been ejected, the shotshell is moved to the second station 44, which is the priming station, where a new primer cap has been inserted in the central aperture 80 of the cylindrical recess 78. With the new primer cap inserted into the central aperture 80, the shotshell is positioned with its base within the recess 80 and the hand-operated lever 40 is moved downwardly carrying the reciprocating tool section 38 and the priming tool 82 downwardly with the priming tool 82 entering the top of the shotshell and forcing the bottom wad of the shotshell downwardly until it grips the new primer cap, holding it firmly in place within the base of the shotshell. The hand-operated lever 40 is then released, permitting it and the reciprocating tool section to return to their original positions.

With the new primer cap in place in the shotshell, the shotshell is moved to the third station 46, which is the powder, shot, and wad loading station. With the base of the shotshell within the cylindrical recess 84, the hand-operated lever 40 is moved downwardly until the drop tube 32 is within the upper end of the shotshell. With the drop tube 32 within the shotshell, the charge bar 28 is moved to the right (FIG. 1) until its left locating edge abuts the left side of the mounting plate 30, in which position the powder flows from the first metering cavity within the charge bar 26 downwardly through the drop tube 32 into the shotshell and against the primer cap and the bottom wad. After the powder has fallen to the bottom of the shotshell, the hand-operated lever is released, causing the drop tube 32 to return to its upward position.

After the powder has been inserted into the bottom of the shotshell, an over-powder wad is inserted into the wad guide within the wad guide body 86. With the over-powder wad in the wad guide, the hand-operated lever 40 is moved downwardly, moving the reciprocating tool section 38 and the drop tube 32 downwardly through the wad guide body 86 to force the wad out of the wad guide and into the shotshell. The hand-operated lever 40 is moved downwardly to apply pressure between the wad and the powder within the shotshell until the position pressure pad 92 with respect to the indicator marks 93 indicates a predetermined pressure. Once this predetermined pressure has been applied, the hand-operated lever 40 is released, permitting the drop tube to return to its uppermost position.

After the over-powder wad has been inserted and packed into the shotshell with the required pressure, the hand-operated lever 40 is moved downwardly until the drop tube 32 is inserted into the end of the shotshell. With the end of the drop tube 32 inserted in the end of the shotshell, the charge bar 26 is moved to the left (FIG. 1) until its right locating edge abutts the right edge of the plate 30. In this position, shot from the second metering aperture of the charge bar 26 drops through the drop tube 32 into the shotshell where it rests on top of the over-powder wad. After the shot has been inserted into the shotshell, the hand-operated lever 40 is released, permitting the drop tube 32 to return to its uppermost position.

After the shot has been loaded into the shotshell, the shotshell is moved to the fourth operating station 48, which is the crimp-start and the taper locking station. In the fourth station, the base of the shotshell is mounted within the cylindrical recess 94 and the hand-operated lever 40 is pulled downwardly moving the reciprocating tool section 38 and the crimping tool 96 downwardly over the outer surface of the upper edge of the shotshell. The crimping tool 96 creases and bends the upper edge of the shotshell inwardly to begin crimping the upper edge and tapering the top of the shotshell.

After the crimp has been started in the top of the shotshell, it is moved to the fifth operating station 50, which is the final crimping station. In the fifth station, the base of the shotshell is positioned in the cylindrical recess 98 and the hand-operated lever 40 is pulled downwardly to move the reciprocating tool section 38 and the crimping tool 100 downwardly. As the crimping tool 100 moves downwardly, it engages the tapered end of the shotshell, bending it inwardly to recess the crimped margin of the shotshell over the charge of shot.

METERING VALVE

As best shown in FIGS. 2 and 3, the charge bar 26 has the general outline of an elongated parallelpiped having: (1) a first downwardly extending stop 102 formed integrally with one of the ends of the charge bar; (2) a first recess 103 opening from the bottom of the charge bar 26; (3) a vertical powder metering aperture 104 extending through the charge bar and having a longitudinal axis transverse to the longitudinal axis of the charge bar 26 spaced a distance from the downwardly extending stop 102 that is equal to the distance from the end of the charge bar holder 28 to the drop tube 32; (4) a second recess 105 opening from the bottom of the

charge bar 26; (5) a shot metering aperture 106 extending through the charge bar 26 and having a longitudinal axis transverse to the longitudinal axis of the charge bar 26 spaced from the longitudinal axis of the vertical powder metering aperture 104 a distance equal to the distance between the stop 102 and the longitudinal axis of the powder metering aperture 104; (6) a third recess 107 opening downwardly toward the bottom of the charge bar 26; and (7) a second stop 108 formed integrally with and extending downwardly from the opposite longitudinal end of the charge bar 26 from the first stop 102.

The top of the charge bar 26 is continuous and solid except for the powder and shot metering apertures 104 and 106. As best shown in FIG. 3, an elongated locating ridge 110 is formed integrally with and extends from one side wall of the charge bar 26, having a longitudinal axis parallel to the longitudinal axis of the charge bar 26 and being located near the bottom of the side wall.

As best shown in FIG. 4, which is a fractional side view of the metering valve 20, the charge bar holder 28 includes an elongated vertical front wall 112, an elongated horizontal top wall 114 formed integrally at one end with the top edge of vertical front wall 112 and an elongated horizontal bottom wall 116 formed integrally at one end with the bottom edge of the front wall 112 and resting upon the mounting plate 30, the rear of the charge bar holder 28 being open to receive the charge bar 26 therein. A bracket 31 is formed integrally with the front wall 112 and extends downwardly therefrom, having a thumbscrew 33 threaded therein by which the charge bar holder 28 is fastened to the mounting plate 30 with the thumbscrew threaded into the plate. An elongated groove, formed complementarily with the locating ridge 110, extends near the bottom of the inside of the front wall 112 so that the charge bar 26 fits within the charge bar holder 28 in only one general orientation but is longitudinally slideable therein. The first and second inlet ports 22 and 24 (inlet port 22 only being shown in FIG. 4) extend outwardly from the top wall 114, having inner threaded holes extending vertically through the top wall 114.

To provide a measure of the proper amount of powder and shot for each shell, the powder metering aperture and shot metering aperture are sized to contain the proper amount of powder and shot respectively for a shell between the top wall 114 and the bottom wall 116 of the charge bar holder 28.

In the preferred embodiment, the first and second inlet portions 22 and 24 include internally threaded holes extending through the top wall 114 of the charge bar holder 28 and having their longitudinal axis spaced from the ends of the charge bar holder 28 and from the drop tube 32 (FIG. 1) such that: (1) when the charge bar 26 is extended fully to the left (FIG. 1) so that the second stop 108 abutts the bottom wall 116 of the charge bar holder 28, the powder metering aperture 104 is aligned with the first inlet portion 22 and the shot metering aperture 106 is aligned with the drop tube 32; and (2) when the charge bar is extended all the way to the right with the first stop 102 abutting the bottom wall 116 of the charge bar holder 28, the powder metering aperture 104 is aligned with the drop tube 32 and the shot metering aperture 106 is aligned with the second inlet portion 24.

In assembling the charge bar 26 within the charge bar holder 28, the charge bar 26 is inserted through the open end of the charge bar holder 28 with the locating ridge 110 fitting within the complementarily formed groove in the inner surface of the front wall 112 of the charge bar holder 28. The charge bar is assembled within the charge bar holder either before the containers 16 and 18 are threaded into the first and second inlet portions 22 and 24 or after they are threaded into the inlet portions 22 and 24 but before the charge bar holder 28 is put in an upright position so that the containers 16 and 18 are inverted.

After the charge bar 26 and the containers 16 and 18 are assembled to the charge bar holder 28, the charge bar holder is assembled on the mounting plate 30 of the shotshell reloader 10. It is held in place thereon by threading the thumbscrew 33 into the threaded hole within the plate 30 provided for that purpose. With the charge bar holder 28 properly assembled, the column 36 (FIG. 1) lies across the open end of the charge bar holder 28 to retain the charge bar 26 within the charge bar holder 28.

To load powder, an over-powder wad and shot into a shotshell in the powder, shot and wad loading station 46, the charge bar 26 is first positioned to the left (FIG. 1) with the second stop 108 abutting the edge of the bottom wall 116 of the charge bar holder 28 and the plate 30. In this position, the shot metering aperture 106 is aligned with the drop tube 32 and the powder metering aperture 104 is aligned with the first inlet 22 to receive powder from the container 16. The amount of powder that fills the powder metering aperture 104 is a proper amount of powder for the shotshell.

To deposit the powder into the shotshell within the station 46 and to fill the shot metering aperture 106 with shot, the charge bar 26 is moved to its extreme rightward position with the first stop 102 abutting the bottom wall 116 of the charge bar holder 28 and the plate 30 while the hand-operated lever 40 is depressed so that the drop tube 32 is inserted into the upper end of the shotshell. In this position, the powder metering aperture 104 is aligned with the drop tube 32 to enable the powder in the metering aperture 104 to drop downwardly under the force of gravity through the drop tube 32 into the shotshell. While the charge bar 26 is in this position, the shot metering aperture 106 is aligned with the second inlet 24 to receive the shot from the container 18. The amount of shot that fills the shot metering aperture 106 is the proper amount of shot for a single shotshell.

After the powder has been inserted into the shotshell, the hand-operated lever 40 is released to raise the drop tube 32 to its elevated position. While the drop tube is in its elevated position, an over-powder wad is inserted in the wad guide and forced into the shotshell with the proper amount of pressure by depressing the hand-operated lever 40 to force the over-powder wad into the cartridge and against the powder, packing the powder to the proper pressure.

To deposit the shot from the shot metering aperture 106 into the shotshell, the charge bar 26 is moved to its extreme left position with the second stop 108 abutting the bottom wall 116 of the charge bar holder 28 and with the hand-operated lever 60 depressed so that the drop tube 32 is inside the upper edge of the shotshell. In this position, the shot metering aperture 106 is aligned with the drop tube 32 to permit the shot in the

shot metering aperture 106 to pass through the drop tube into the shotshell. At the same time, a new charge of powder drops into the powder metering aperture 104 as described above so that the next cartridge may be loaded at the proper time with powder by moving the charge bar 26 again to the right.

The metering valve 20 has an advantage over the prior art in that the charge bar 26, the containers 16 and 18 and the charge bar holder 28 are inexpensive and easily assembled together.

HAND-OPERATED LEVER

In FIG. 5, there is shown in a fragmentary elevational view the hand-operated lever 40, the column 36 to which the hand-operated lever 40 is pivotally connected, the base 34 of the shotshell reloader 10, the tension spring 68 connecting one end of the hand-operated lever 40 and the base 34, the mounting plate 30 of the metering valve 20, and one of the two linkages 64 pivotally connecting the hand-operating lever 40 to the mounting plate 30 of the metering valve.

The hand-operated lever 40 is pivotally connected to the column 36 at 117 between the handle 60 and the opposite end, with one end of the tension spring 68 being connected to the opposite end of hand-operated lever 40 at 119 to bias the handle 60 of the hand-operated lever 40 upwardly, the other end of the tension spring 68 being connected at 121 to the base 34 of the shotshell loader 10.

The double linkages 64A and 64B (64A being shown in FIG. 5) are pivotally connected at 66 to the hand-operated lever 40 between the pivot point 117 on the column 36 and the handle are pivotally connected at 118 to the mounting plate 30 so that when the handle of the hand-operated lever 40 is moved upwardly or downwardly, the plate 30 is moved upwardly or downwardly with it, carrying the metering and storage section 12 and the reciprocating tool section 38 with it. The mounting plate 30 is guided by the column 36 which passes through a square aperture in the mounting plate as the mounting plate 30 moves upwardly and downwardly. To limit the upward movement of the mounting plate 30, a stop member 124 is held at the pivot point of 117 and at another point 125 to the column 36 and includes an outwardly extending stop arm 127 positioned to engage the upper end of the punch 76 which is mounted to the mounting plate 30 as the mounting plate 30 moves upwardly.

In operation, the hand-operated lever 40 is moved downwardly to bring the tools and the drop tube (FIG. 1) into register with a shotshell. As the shank portion 62 moves downwardly, it pivots about the pivot pin 117 on the column 36 stretching the helical tension spring 68 and moving the levers 64 downwardly. As the levers 64 move downwardly, they move the mounting plate 30 downwardly about the column 36 to lower the metering and storage section 12 and the reciprocating tool section 38.

After an operation has been performed by the reciprocating tool section 38 or the storage and metering section 12, the hand-operated lever 40 is released. When the hand-operated lever 40 is released, the helical tension spring 68 raises the hand-operated lever 40, pulling the mounting plate 30, the storage and metering section 26, and the reciprocating tool section 38 upwardly. As the mounting plate 30 moves upwardly, the top of the depriming tool 76 contacts the stop 127, being forced downwardly in a manner to be explained hereinafter, until it bottoms, stopping any further movement of the storage and metering section 12 and the reciprocating tool section 38.

SIZING AND DEPRIMING TOOL

In FIG. 6, there are shown, in an enlarged elevational view, partly broken away, the sizing tool 74 and the depriming tool 76 in their downward positions where they are cooperating with a used shotshell 128.

The shotshell 128 is resting in the first station within the recess 70 with the depriming tool extending through the shotshell into the central aperture 72. The shotshell includes a cylindrical, tubular outer casing 130 extending upwardly from a cylindrical tubular brass ferrule 132 formed integrally with the disc shaped base 134. Within the shotshell and ferrule 132 is a base wad 136 with the base wad and disc 134 having aligned central circular apertures to receive a primer cap.

The sizing tool 74 includes an elongated cylindrical aluminum sizing tube 138 having external threads on one end at 140 engaging internal threads within a recess 142 of the mounting plate 30 and having external threads at 144 on the opposite end. A cylindrical aluminum retaining tube 146 includes internal threads engaging the external threads on the cylindrical tube 138 at 144 and has an inwardly turned flange at its bottom edge of sufficient thickness to compensate for the rim of the base disc 134 of the shotshell 128. Within the retaining tube 146 and the bottom edge of the aluminum cylindrical tube 138 is a steel forming ring 148, which serves the purpose of reforming the brass ferrule 132 if it has been expanded outwardly in the previous use of the shotshell.

The depriming tool 76 includes a steel depriming punch 150, an aluminum sleeve 152, and an aluminum pilot 154, with the punch 150, the sleeve 152, and the pilot 154 each having its longitudinal axis lying along the longitudinal axis of the sizing tube 138.

The steel depriming punch 150 includes at an upper end a head 156 positioned above the top of the base 30 and at the other end a beveled punching surface 158 with an elongated cylindrical shank portion extending in one direction through an aperture in the mounting plate 30 to connect with the head 156, which head is larger than the aperture in the mounting plate 30 and extending in the other direction through the sizing tool beyond the retaining tube 146 to connect with the beveled punch surface 158, the shank having external threads near its lower end to engage with internal threads of the aluminum pilot 154.

The aluminum pilot 154 has beveled sides to permit it to center itself within the sides 130 of the shotshell 128 as the sizing and depriming tools move downwardly and is located so that its bottom edge abutts the base wad 136 of the shotshell 128 when the punching surface 158 has extended through the central aperture in the bottom surface 134 of the shotshell. The aluminum sleeve 152 is positioned concentric with the elongated shaft of the punch 150 between the upper edge of the pilot 154 and the bottom of the recess 142 and is of such a length to prevent the pilot 154 and the shank portion of the punch 150 from being moved in an upwardly direction with respect to the tube 138 beyond the point where the punching surface 158 is well withdrawn within the retaining tube 146 of the sizing tool.

Before operating the sizing and depriming tool, a shotshell is mounted in the recess 70 with a spent primer over the central opening 72 (FIG. 1). At the start of the sizing and depriming operation, the hand-operated lever 40 is in its upper position so that the sizing and depriming tool is elevated, with the head of the punch 150 abutting the stop 127 to force the pilot 154 downwardly so that its sloping bottom edge extends beyond the retaining tube 146.

To size and deprime the shotshell, the hand-operated lever 40 is moved downwardly. In a first position the beveled front edge of the pilot 154 contacts the upper rim of the casing 130 of the shotshell 128, centering the sizing and depriming tools so that the tube wall 138 moves downwardly across the outside of the shotshell wall 130 and the depriming tool 76 moves within the shotshell, with the punch 150 being centered in line with the priming cap.

Near the bottom of the downward stroke of the sizing and depriming tool, the punching surface 158 of the punch 150 contacts the spent primer cap in the center of the bottom surface 134 of the shotshell 128 and the steel forming ring 148 at the bottom of the sizing tool 74 contact the brass ferrule 132 of the shotshell 128. As the sizing and depriming tool continues downwardly, the punch 150 is moved upwardly within the sizing tool 74 until the aluminum sleeve 152 abutts the top surface of the recess 142 in the mounting plate 30. During this process the aluminum tube 152 is pressed downwardly from the bottom surface of the mounting plate 30 within the recess 142 causing it to exert pressure on the punch 150 through the aluminum pilot 154 so that the punching surface 158 punches the spent primer downwardly through the central opening 72 and the steel forming ring 148 moves outside of the ferrule 132 to reshape it if it has been expanded outwardly from the previous use of the shotshell. The punch 150 is then free to move through the bottom of the shotshell 128 where the aluminum pilot 154 rests upon the base wad 136. The steel forming ring continues downwardly to reform the ferrule 132 until it reaches the rim of the shotshell, from which it is spaced by the inwardly turned flange of the retaining tube 146 so that the sizing and depriming operation is completed.

Once the sizing and depriming operation is completed, the hand-operated lever 40 is released and is pulled inwardly by the compression spring 68 (FIG. 5). This causes an upward movement of the sizing and depriming tools until the head 156 of the punch 150 contacts the stop 127 forcing it to move relative to the mounting plate 30 as the base continues upwardly. When the mounting plate 30 abutts the bottom of the head 156, the motion of the sizing and depriming tool in the upward direction is stopped, with the bottom of the punch 150 and the beveled bottom surface of the pilot 154 extending out of the retaining tube 146 so as to be in position for the next sizing and depriming operation.

The sizing and depriming tools shown in FIG. 6 have the advantage of being economically constructed. The sizing tool is economically constructed because it utilizes an aluminum holder to hold a hard steel forming ring rather than utilizing a more complicated single piece sizing tool of hard steel. Moreover, the aluminum retaining tube 146 simplifies the assembly of the sizing tool 74 and its inwardly turned flange provides spacing for the forming ring 148 to compensate for the rim of the bottom surface 134 of the shotshell 128. The steel punch 150 is economically constructed because it does not require a continuous taper and is held by relatively inexpensive aluminum cooperating parts. It has been found that a continuous taper to flare out the bottom of the primer hole is not necessary and that the steel punching surface 158 is satisfactory for use with plastic cartridges. This enables the punch 150 to be easily fabricated.

POWDER, SHOT AND WAD LOADING STATION

In FIG. 7 there is shown a simplified fragmentary side elevational view of the powder, shot and wad loading station 46 having a mounting arm 90 for holding the wad guide body to the vertical column 36, the recess 84 for supporting a shotshell in the powder, shot and wad station 46, and the pressure indicator 89. In FIG. 8 there is shown in a front, sectional, elevational view, the wad guide body 86 and wad guide.

To prevent excessive pressure from being applied to the powder when the powder is packed by pressing upon the over-powder wad, the recess 84 is spring biased, having for this purpose a helical compression spring 160 circumscribing the shank of a bolt 162, with the bottom end of the compression spring 160 resting upon the apertured frame member 164 and the upper end of the compression spring 160 supporting the pressure pad 92, the bolt 162 having its head beneath the frame member 164 and its shank extending near the top surface 154 of the base 34 to engage the pressure pad 92 whereby pressure applied to the pressure pad 92 through the shotshell forces the helical compression spring to be compressed.

To indicate the amount of pressure being applied to the over-powder wad for the purpose of packing the powder, a portion of the front frame is cut away as shown at 89 (FIG. 1) to expose the front edge of the pressure pad 92. Along the side of the frame are a plurality of pressure markers 93 by which the location of the pressure pad is indicated as it is depressed by pressure applied to the over-powder wad.

In operation, after the powder and over-powder wad have been deposited into the shotshell, the hand-operated lever 40 is pulled downwardly (FIG. 1) to cause the drop tube 32 to press upon the over pressure wad. While this is being done the pressure pad 92 is observed through the cut-away portion at 89 and when it is lowered to a predetermined one of the grade marks 93 corresponding to the desired pressure to be applied to the powder, the hand-operated lever 40 is released.

The mounting arm 90 includes a bolt 168 and a sleeve 170, with the bolt 168 passing through the column 36 in a direction orthogonal thereto and extending adjacent to and above the recess 84. The sleeve 170 circumscribes the shank of the bolt leaving the threaded end of the bolt exposed so that it may be threaded into a tapped hole 172 (FIG. 8) provided for this purpose in the wad guide body 86. While a single tapped hole 172 is shown extending through the lateral side of the wad guide body 86 in FIG. 8, a plurality of tapped holes may be used to permit the selection of a different heights above the recess 84 for positioning the wad guide body 86.

To support the over-powder wad as it is moved downwardly by the drop tube 32, the wad guide body is a generally cylindrical aluminum tube having an annular

inner recess 174 near the upper end of its inner wall, with the inner walls sloping slightly outwardly from the annular recess in a downward direction. The inner walls have a narrower diameter on the top end of the wad guide body to form a shoulder above the annular recess 174. A nylon wad guide 176 has an outwardly turned flange fitting within the annular groove 176 and downwardly extending fingers to support an over-powder wad until it is moved downwardly by the drop tube 32.

To insert the nylon wad guide 176 into the wad guide body 86, the nylon wad guide 176 is positioned underneath the wad guide body 86 with its outwardly extending annular flange upward. The nylon wad guide 176 is then moved into the wad guide body, where the outward extending flange is compressed inwardly by the sloping walls until the flange snaps into place within the annular recess 174.

The over-powder wad is inserted into the top of the wad guide body where it rests within the nylon wad guide after the powder has been dropped into the shotshell. The drop tube 32 is then moved downwardly by pulling the hand-operated lever 40 down so that the end of the drop tube 32 forces the over-powder wad into the shotshell and compresses it against the powder.

The powder, shot and wad loading station shown in FIGS. 7 and 8 have the advantages over the prior art of being economical in construction. The pressure indicator is economical because it utilizes the pressure pad required to maintain a predetermined pressure while the over-powder wad is being pressed into the cartridge to indicate the pressure. This removes the necessity for a separate pressure measuring and indicating device such as the feeler commonly used in the prior art.

The wad guide body is economical in construction because it is formed in one piece rather than having two separate pieces that must be fastened together to hold the wad guide. It has been discovered that nylon wad guides are adequately held in place by an annular recess into which they can be snapped and do not require positive clamping that is provided in the prior art wad guide bodies by two separate elements that clamp upon the rim of the wad guide.

Although a preferred embodiment of the invention has been described with some particularity, many variations and modifications in the preferred embodiment may be made without deviating from the invention. Accordingly, it is to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. Shell reloading apparatus comprising:
reconditioning means for reconditioning a used shell;

loading means for reloading said used shell; and
drive means or moving at least certain portions of said reconditioning means into intimate contact with said used shell;
said reconditioning means including tool means for altering a structural characteristic of the used shell;

said tool means including a holder and a working part;
said working part and holder being fastened together;
said working part being a hard metal and said holder being a softer metal than said hard metal;
said working part being shaped to alter the structural characteristc of said used shell and to be easily manufactured;
said holder and said working part being tubular;
said working part being adapted to be held within said holder at a location recessed from one end of said holder;
said drive means including means for moving said working part into intimate engagement with a used shell such that the inner surface of said working part reshapes the outer surface of the shell, whereby said tool means resizes said shell as it moves downwardly and is spaced a distance from the bottom of the shell by the end of the holder to compensate for the rim of the shell;

2. Shell reloading apparatus according to claim 1 in which said holder is aluminum and said working part is steel.

3. Shell reloading apparatus according to claim 3 further comprising:
pressure means for applying a predetermined pressure to materials in a shell; and
wad guide means for guiding a wad into said shell
said shell reloading apparatus including means for indicating the pressure being applied to said materials by said pressure means;
said wad guide means including a tube having a wad guide holder integrally formed therewith;
said wad guide holder including internal walls forming an annular recess in the interior of said tube.

4. Shell reloading apparatus according to claim 3 further comprising:
a column;
said reconditioning means and loading means being movably mounted to said column;
a plurality of stations adapted to hold said shell;
one of said plurality of stations being a loading station including said loading means;
fastener means including at least one hole extending through said tube and one bolt passing through said column and into said hole in said tube to hold said tube within said loading station.

5. Shell reloading apparatus according to claim 4 in which:
said bolt includes external threads on one end;
said hole includes internal threads adapted to engage the external threads of said bolt, whereby said bolt may be threaded into said hole;
said tube including first and second portions;
said first portion including annular interior walls into which said annular recess is formed;
said second portion including tapered interior walls, whereby a wad guide may be forced through said tapered end until its rim snaps into said recess for easy insertion of said wad guide.

6. Shell reloading apparatus according to claim 1 in which said loading means includes:
an elongated charge bar having a longitudinal axis and at least one opening extending through said charge bar in a direction transverse to said longitudinal axis;
a charge bar holder having a front side, a back side, a bottom side, a top side, and two ends;

said top side including an elongated generally horizontal wall including internal wall surfaces defining at least one generally vertical inlet port;

said bottom side including an elongated generally horizontal wall having internal surfaces defining at least one vertical exit port offset longitudinally from said inlet port;

said back side of said charge bar holder being open, whereby said charge bar may be inserted therein;

said two ends of said charge bar holder being at least partly open, whereby said charge bar may slide from side to side within said charge bar holder extending therefrom through one of said open ends;

one of said charge bar and said sides of said charge bar holder including a longitudinally extending ridge and the other including a conformably formed longitudinally extending groove, whereby said charge bar fits into said charge bar holder in only one attitude while being movable from longitudinal location to longitudinal location with respect to each other.

7. Shell reloading apparatus according to claim **6** in which said charge bar includes a different stop at each end, whereby said charge bar is located at one or the other position with respect to said charge bar holder by said stops.

8. Shell reloading apparatus according to claim **1** in which said cylindrical tube includes:

a first cylindrical tube portion;

a second cylindrical tube portion;

said first and second cylindrical tube portions including fastener means for removably fastening said first and second cylindrical tube portions together;

one of said first and said second cylindrical tube portions including said inwardly-turned flange;

said one of said first and second cylindrical tube portions having an annular inner wall surface portion with an inner diameter greater than the outer diameter of said ring, whereby said ring rests against said flange and is confined by said inner annular wall portion;

the other of said first and second cylindrical tube portions including an annular surface having an inner diameter smaller than the outer diameter and larger than the inner diameter of said ring, whereby said surface rests upon the top of said ring to hold it from upward motion as said tool means resizes said shell.

9. Shell reloading apparatus according to claim **1** further including:

a hard metal spent cap punch and a softer holder;

said holder including a first portion and a second portion;

said first portion including said internal threads, whereby said first portion is fixed in position with respect to said working parts;

said second portion including a cylindrical spacer having a longitudinal axis coincident with the longitudinal axis of said working part;

said cylindrical spacer circumscribing said shank and being positioned between said first portion of said holder and said housing, whereby said housing forces said tubular spacer against said first portion of said holder to move said working portion downwardly as said housing moves downwardly;

the bottom surface of said first portion including a flat annular portion, whereby said flat annular portion engages the wad within the shell to force it downwardly as said working portion moves downwardly.

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