Nov. 22, 1960 D. D. SCOTT 2,960,903

WAD SEATER FOR SHELL LOADER

Filed May 3, 1956 2 Sheets-Sheet 1

FIG_1

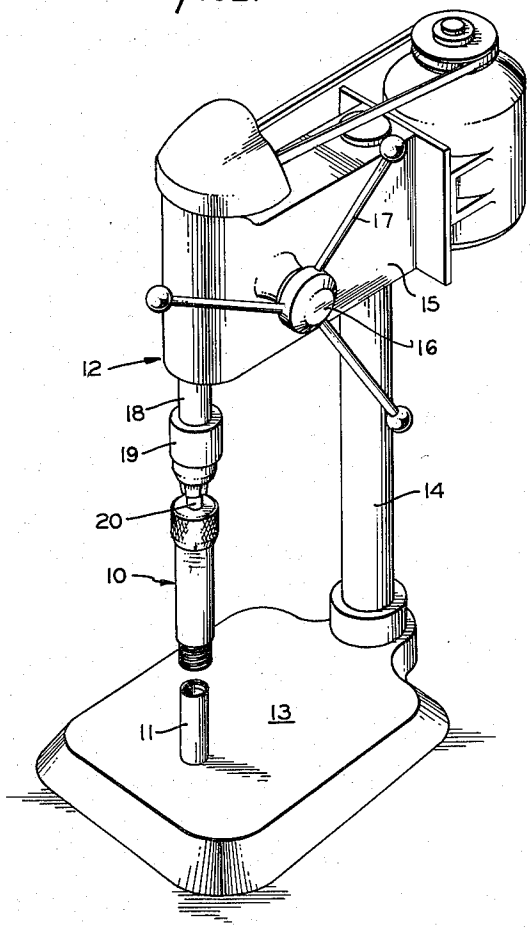


FIG_4

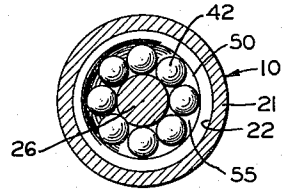


FIG_5

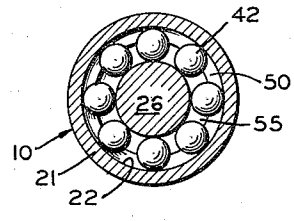


FIG_6



FIG_7



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WAD SEATER FOR SHELL LOADER

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FIG_2

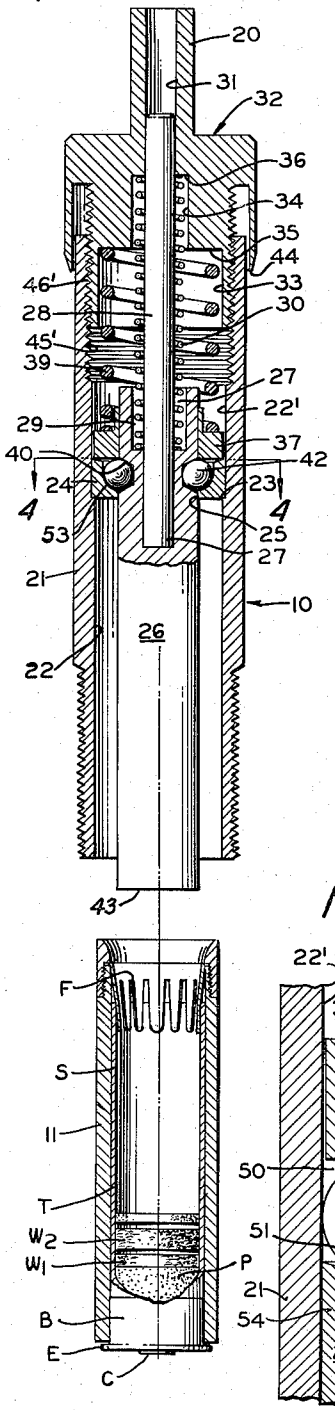


FIG_3

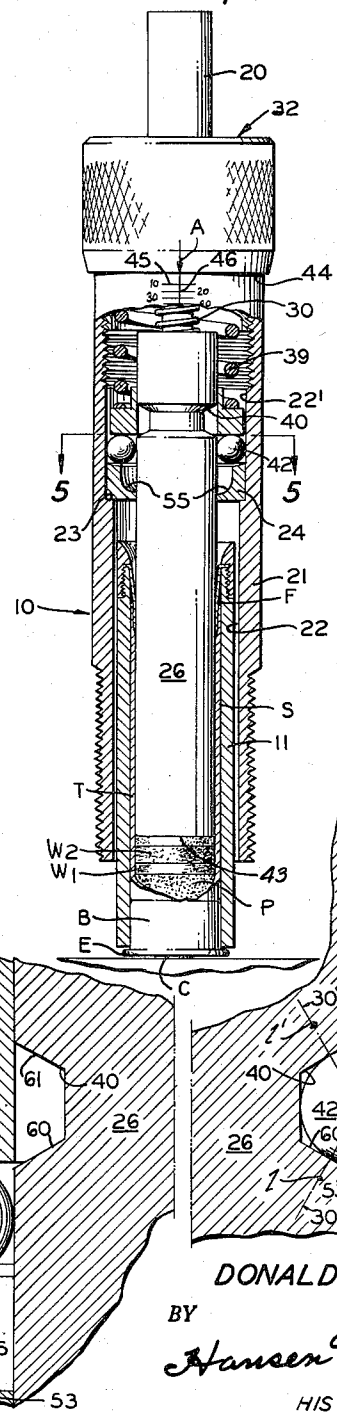


FIG_8

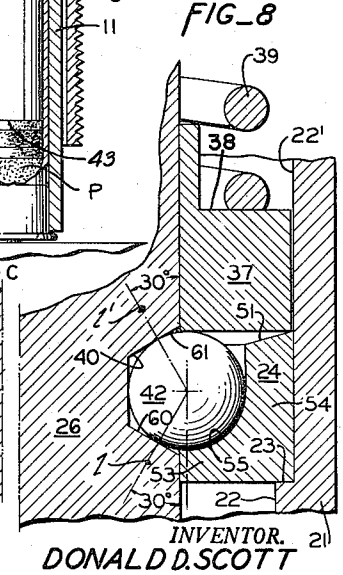
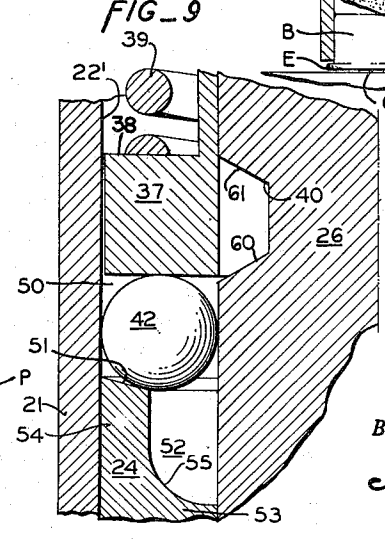


FIG_9



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WAD SEATER FOR SHELL LOADER

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8 Claims. (Cl. 86—23)

This invention relates to shell loading equipment and more particularly to a wad seating pressure applicator.

Powder manufacturers make it a practice to specify the amount of pressure required in order to obtain the maximum efficiency from gun powder. In loading shells, such as shot gun shells, the amount of wadding in a shell will differ with respect to the amount of pellets to be included in each load. Consequently variations in stroke of the wad seater necessitates changes in the pressure applied in order to assure obtaining maximum efficiency from the powder being used.

Very many hunters and trap shooters find it desirable to reload their used shells. There are on the market many good reloaders by which used shells can be reloaded for reuse. However, great care must be taken to apply just the right amount of pressure in compressing the powder and in seating the wads over the powder. True, some reloaders have gauge marks or stops for limiting each stroke of the wad applicator but even with such stops or a personal effort to cease applying pressure at a sight mark or by feel can result in too great a difference in pressure or lack of pressure thus affecting the impact afforded at detonation of each load. Thus some shells will have a definite kick while others will be weak. Most marksmen and/or hunters who pride themselves on being a good shot are reluctant to sacrifice accuracy for the difference in cost between new loads and reloaded shells. Consequently they find themselves in the dilemma of whether to reload their own shells and save money, at the risk of getting a bad shooting record; or to use only new shells for which they must pay top price.

The present invention has as its object to provide a pressure applying wad seater which will apply the desired pressure, no more, no less. In connection with this concept it is a further object to provide a wad seater calculated to give way when a predetermined pressure is applied thereto.

Another object is to provide a spring loaded wad seater with a trip mechanism adapted to hold a wad engaging plunger rigid to the pressure applying carriage until the desired pressure is attained. Conversely, it is an object to provide a trip mechanism normally holding a wad engaging plunger rigid to the pressure applying carriage but adapted to release such hold when the resistance of the powder and wadding to pressure attains a pressure comparable to the spring loaded wad seater.

In addition to the foregoing it is an object to provide a calibrated spring loaded wad seater by which the latter can be set at a predetermined pressure required for the particular powder and the amount and size of shot to be packed into a shell. In this connection it should be understood that powder manufacturers mark or label the containers of all bulk gun powders with a schedule of pressures found by tests to be the most suitable for that specific powder and the volume of shot to be packed in the shell therewith. This requisite pressure has been proven to give the maximum impact for the shot or missiles ao be contained in the shell. The pressure upon

the powder is obtained by pressing a wad, usually of felt, tightly down against the charge of powder. These felt wads are usually somewhat larger in diameter than the internal diameter of the shell casing so as to fit tightly against the inner walls of the latter while being pressed firmly down upon the powder. As previously stated the volume of the shot to be placed in the shell must also be considered. In other words, since each shell of a specific caliber or gauge has a uniform space available for loading, the amount of powder as well as the volume of shot will occupy only a portion of this available space. The remaining portion of the internal space of the shell is therefore filled by a wad or several wads to compensate for the balance of the space in the shell. While these wads act as separators between the powder and shot they serve as movable baffles or piston-like plugs ahead of the powder so that when the powder explodes the impact thereof pushes these plug-like wads against the charge of shot thus forcing the same out of the shell.

From the foregoing it will be seen that since the wads vary in thickness or height depending on the amount of space they must fill within the shell casing, there will be difficulty in obtaining the proper pressure from a wad seater which has previously been set to operate for a predetermined distance or stroke. In other words, even though the wad seaters of the present design may be precisely set to operate from an up position to a down position and to stop at a predetermined horizontal plane, if the thickness of the wads varies it is obvious that the amount of pressure applied thereto and to the powder beneath the wad will also vary thus rendering the load not in conformity with the specification or requirement of the powder manufacturer.

With the foregoing in mind, it is a further object of the present invention to provide a wad seater so constructed as to transmit a predetermined pressure or load against a wad in seating the same upon a charge of powder within a shell casing irrespective of any variation or deviation in the thickness of wad employed.

In addition to the foregoing it is a further object of the present invention to provide a wad seating ram so constructed and arranged as to apply a specific pressure load against a wad in seating the same against a charge of powder in a shell casing irrespective of the deviation in volume or space occupied by the powder or the wadding.

These and other objects and advantages of the present invention will appear more fully in the following description when read in the light of the claims and drawings in which:

Fig. 1 is a perspective view of a press having a wad seating device embodying the present invention associated therewith.

Fig. 2 is a longitudinal section through the wad seating device of Fig. 1 as well as the shell and supporting mold therefor.

Fig. 3 is a view comparable to that of Fig. 2 illustrating the seating of a wad in the shell illustrated in Fig. 1.

Fig. 4 is a horizontal section through a portion of the pressure release or tripping feature of Fig. 2 as seen along lines 4—4 thereof.

Fig. 5 is a section through Fig. 3 as seen along lines 5—5 thereof.

Fig. 6 is a side view of a wad.

Fig. 7 is a side view of a wad differing in dimension from that illustrated in Fig. 6.

Fig. 8 is an enlarged, fragmentary detail view of the tripping feature or mechanism only illustrated in Fig. 2.

Fig. 9 is an enlarged fragmentary section of the trip mechanism as seen in Fig. 3.

Referring to Fig. 1 of the drawings the wad seating device embodying the present invention is generally designated **10**; the shell supporting mold is designated **11**;

and a press for moving the wad seating device 10 toward the shell and its casing 11 is designated 12.

The press 12 may be any conventional press feed having the usual construction of a drill press in which a press bed 13 is stationarily secured to a standard or post 14 projecting upwardly and having attached to its upper end a housing 15. A shaft 16 journaled for rotation in the housing 15 about a horizontal axis is provided with a hand operated lever or levers 17 by which the shaft 16 may be turned.

A push rod 18 also mounted in the housing 15 but for up and down movement on a vertical axis, is offset from but adjacent the shaft 16, the shaft 16 being provided with a gear meshing with a rack formed on the push rod 18 in the conventional manner so that upon operation of the shaft through the levers 17, the push rod 18 will be forced downwardly under extreme pressure in the usual manner. The lower end of the push rod 18 has secured thereto a conventional chuck 19, the jaws of which are adapted to receive the reduced shaft-like upper end 20 of the wad seating device 10 so as to secure the same to the push rod 18 in coaxial alignment therewith.

From the foregoing it will be seen that the push rod 18 and its chuck 19 serve as a press carriage movable up and down upon operation of the levers 17 in the usual manner of operating a drill press. This carriage enables a person to cause the wad seating device 10 to move downwardly toward the stationary base or press bed 13 under extreme pressure.

In general, the wad seating device 10 embodying the present invention consists of a housing 21 which is cylindrical in form. This housing 21 has an axial bore 22, the lower zone of which is dimensioned to receive the shell supporting form or mold 11, leaving sufficient clearance to allow easy up and down movement of the cylindrical body 21 relative thereto. About midway up the internal bore 22 of the housing 21 an internal shoulder or shelf 23 is provided by a bore 22' which is of slightly larger diameter than the bore 22 previously mentioned.

An annular, ring-like partial ball seat and plunger guide 24 is press fit into the bore 22' snugly against the shelf or shoulder 23 substantially midway the ends of the housing 21. This ring-like ball seat has a central hole or bore 25 axially of the body 21 providing a guide for a plunger 26 so that the latter can reciprocate relative to the ring-like ball seat 24 as well as the housing 21.

The upper end of the plunger 26 has a central bore 27 into which a stem or shaft 28 is press fit. The upper end of the shaft 28 extends slightly beyond the upper end of the casing 21. The extreme upper end of the plunger 26 is provided with a reamed out, enlarged bore providing a seat 29 for a resetting spring 30. This spring 30 is a compression spring which extends up the stem 28 to a short distance below the upper end thereof.

The upper end of the stem 28 has sliding fit with a bore 31 in a cap 32 which is formed integrally with the upwardly extending stem or shaft 20 which fits into the jaws of the chuck 19 as previously explained.

The cap 32 is provided on its opposite, lower end with an enlarged axial bore 33 and about midway the ends of the cap is a reduced bore 34 thus providing a shoulder 35 at the top of the widened bore 33 and a shoulder 36 at the top of the medial bore 34. This medial bore 34 provides a seat for the upper end of the resetting spring 30, the extreme upper end of which spring engages the shoulder 36 previously mentioned.

A ring-like ball press 37, slidably arranged on the upper end of the plunger 26 is provided with an outside shoulder portion 38 against which the lower end of an enlarged loading or pressure spring 39 engages. The upper end of the loading spring 39 is seated in the enlarged bore 33 in the cap and has its upper end engaging the shoulder portion 35 at the upper end thereof.

Slightly below the bottom end of the spring seat 29 formed in the upper end of the plunger 26 an annular groove 40 is formed in this plunger 26. This annular groove 40 provides a partial ball seat comparable to the one explained in connection with the annular ring-like ball seat 24 previously mentioned. A plurality of balls 42 are arranged in the space between the plunger 26 and the inner wall of the bore 22'. The ball presser ring 37 thus rests upon the upper end of the balls 42 as well as the upper end of the annular partial ball seat 24.

The extreme upper end of the enlarged bored portion 22' of the housing 21 is provided with an internal thread 45'. The cap member 32 is also provided with threading on a reduced portion 46' thereof and this threading portion 46' threads into the threading 45' on the inner wall of the bore 22'. In this manner the cap member 32 is secured to the main body portion 21 of the wad seating device and by the same token both the springs 39 and 30 are compressed to the desired pressure, the outer or larger spring 39 pressing firmly down upon the ball presser ring 37 while the internal spring 30 presses downwardly upon the plunger 26.

When the annular groove or recess 40 on the plunger 26 registers with the balls 42 the balls 42 seat in the annular recess 40 and engage the partial ball seat provided on the annular ring-like member 24. With the parts of the ball wad seating device thus disposed the lower end 43 of the plunger member 26 projects slightly outside of the open bottom end of the housing 21 as illustrated in Fig. 2.

The plunger 26 is dimensioned, diametrically, to have sliding fit into the open end of a cartridge or shell S. In the present disclosure there is illustrated a shotgun shell S which may be of any well known design and construction. Shotgun shells consist of a closed brass percussion end B provided with an ejector rim E and having a suitable cap C in its firing end. Such shell S also consists of a cardboard or paper tubular portion T secured well into the brass percussion end of the shell and having its open end upward.

In the case of a new shell it probably is not necessary to use a shell support or form such as the one 11 illustrated. However, in the case of shells which have already been used, the cardboard tubular portion is usually expanded somewhat from its normal gauge or dimension and must be reformed somewhat to iron out any distortion or bulges therein. Thereafter the open upper end of the shell is inserted into the lower end of the shell supporting form 11, the upper end of which has a light gauge metal, tine-like funnel of well known construction the tine-like fingers of which slip into the open upper end of the cardboard or paper tubular portion T of the shell to support the same firmly and prevent against inward crimping thereof when powder, wadding and pellets are deposited into the open upper end of the shell.

These tine-like fingers likewise form a guide for the lower end of the plunger 26 when the latter is driven under pressure into the open upper end of the shell.

First of all a charge of powder P is poured into the open upper end of the shell. Thereafter a fiber plug or wad W1 is placed into the upper end of the funnel-like upper end of the shell support, after which the shell support with shell therein is disposed in axial alignment with the wad seating device 10 as illustrated in Fig. 1, and the drill press operated in the usual manner thus forcing the plunger 26 of the wad seater down into the open upper end of the shell.

The first wad W1 is then pressed downwardly firmly to the proper pressure required for the powder P in the shell and the plunger 26 is then withdrawn. Thereafter, another wad W2 preferably of felt is inserted into the funnel upper end F of the shell support 11 and the operation of the drill press is repeated as before thus forcing the plunger firmly down against wadding 2 as well as wadding 1 and the powder P.

Additional wadding W3 may be inserted if desired or necessary dependent upon the volume of pellets or shot

later to be deposited into the open upper end of the shell. These wads usually differ in depth as exemplified by comparison between Figs. 6 and 7. In each instance however the plunger **26** must be pressed firmly down upon each wad in succession and the pressure applied by way of the plunger **26** must in all cases correspond so that the proper compression requirements of the powder P within the shell remains the same after each operation.

The construction and arrangement for obtaining this accuracy in compression or pressure of the plunger **26** against the wadding either singly or collectively is accomplished by the ball-lock and tripping arrangement hereinbefore briefly mentioned and now to be more specifically described.

Refer now to Figs. 8 and 9 which are enlargements of the locking and tripping portion of the wad seater as shown in Figs. 2 and 3, respectively. It will here be noted that the plunger **26** is of lesser diameter than the internal bore **22'** of the housing **21**. The annular space **50** between the outer wall of plunger **26** and the inner wall of the bore **22'** is such as to receive the radially arrayed balls **42** therebetween. This affords a roller-like supporting action between the plunger **26** and the inner wall of the bore **22'** when they are moved relatively with respect to each other. This is illustrated in Figs. 3, 5 and 9. As seen in Fig. 5 the balls **42** are all exteriorly of the plunger **26**, in the annular space **50** surrounding the same. The balls **42** thus disposed, rest upon the upper surface **51** of the ring-like partial ball seat **24** which is securely held against the shelf-like shoulder **23** in the bored center of the housing **21**.

The partial ball seat **24** is formed to provide a half ball race **52** in its inner-upper zone thus leaving an inwardly projecting lower portion **53** through which the previously mentioned bore **25** is formed and an upwardly projecting sleeve-like outer portion **54** which fits snugly within the bore **22'**. Where these lower and outer portions, **53** and **54** respectively, merge, a quarter round cove **55** is formed. This cove **55** is struck on a radius conforming with the radial measurement of each of the balls **42** and in effect provides a partial raceway **52** for receiving one half of each ball.

The upper surface **51** of the outer portion **54** is tapered inwardly at a slight angle and is therefore funnel-like in shape. Each ball **42** tangentially engages this tapered surface **51** thus tending to move radially inwardly relative to the funnel-like top surface of the member **24**, especially when downward pressure is applied to all of the balls **42** by the presser ring **37** under the influence of the loading spring **39**. However, due to the disposition of the plunger **26** relative to the housing **21**, the groove **40** in the plunger being out of register with the balls **42**, all of the balls are maintained in their outermost radial position between the plunger and housing.

As previously stated the upper end of the plunger **26** is under the influence of a return spring **30** circumscribing the stem **28** and having its upper end bearing against the cap **32** secured to the housing **21**. Moreover, this stem **28** has its upper end guided axially of the housing **21** by the guide bore **31** formed in the cap **32**. The plunger **26** is guided by the central bore **25** in the partial ball seat **24** and therefore the plunger can only move coaxially with respect to the housing **21**. Therefore, downward pressure exerted on the plunger **26** by the return spring **30** causes the plunger **26** to move axially downward relative to the housing **21**. This downward movement ceases when the annular groove **40** in the plunger **26** registers with the radially arrayed balls **42** whereupon all of the balls move radially inward over the funnel-like beveled surface **51** and enter the groove **40**. Thereafter, that part of each of the balls projecting radially outwardly from the groove **40** enters the raceway **52** within the ring-like member **24** and come to rest on the quarter round cove portion **55** thereof as seen in Figs. 2 and 8. The load spring **39** pressing down upon the presser ring **37** maintains the balls **42** down firmly on the cove portion **55** of the raceway **52** and by the same token locks the plunger **26** in its fully extended position (Figs. 2 and 8).

In this manner the plunger **26** is locked to the housing **21** for movement therewith in an up and down direction, as for example by operation of the push rod **18** of the press **12**. This locking action is created by reason of the radially arrayed balls **42** projecting partially into the grove **40** in the plunger and partially into the raceway **52** in the partial ball seat **24**. The plunger **26** is thus completely locked against further downward movement relative to the housing **21**. However, as to upward movement of the plunger relative to the housing, the locking action is releasable under a predetermined pressure differential. In other words, when the wad seater **10** is forced downwardly by operation of the press **12**, and the lower end **43** of the plunger **26** meets with resistance, the plunger will cease moving with the main body or housing **21** of the unit **10**. Upon first meeting with resistance, the plunger **26** stops while the housing **21** continues. Thus the projected halves of the balls **42** rise off of the cove **55** and move upwardly with the groove **40** and plunger **26**. As the radially arrayed balls **42** pass over center of the upper end **51** of the member **24** the balls snap outwardly thus effecting a tripping action releasing the plunger **26** from latching engagement with the balls **42**.

The amount of resistance necessary to effect this tripping action, i.e., relative movement of the plunger with respect to the housing **21**, is determined by the strength of the compression loading spring **39**. For example, this spring **39** has a capacity ranging from 10 to 100 pounds and can be set between the cap **32** and the presser ring **37**, which rests upon the balls **42**, to yield at a predetermined weight or load. Now assume that you want the plunger **26** to yield after reaching 40 pounds pressure. The cap **32** is threaded down upon the housing **21** until the lower edge of its skirting **44** registers with the digital mark **45** indicating 40 pounds. The graduations or digital marks **45**, from 10 to 100, are etched into the body **21** along a line **46** parallel to the axis of the housing. An indicator arrow A on the beveled lower edge of the skirting **44**, when in register with the vertical line **46** indicates that the load spring **39** is set to yield at a compression corresponding with the reading along the graduation **45** aligned with the lower edge of the skirting **44** of the cap **32**. Of course yielding of spring **39** at any intermediate compression can be obtained by a half or a quarter turn of the cap **32** relative to the housing thus placing the lower edge of the skirting **44** at fractional placement between digital markings **45**. This adjusts the distance between the annular seat **24** and the shoulder **35** against which the upper end of the load spring **39** bears. As this distance is decreased the load spring **39** bears down upon the balls **42** with greater force or pressure requiring a greater resistance against the plunger **26** in order to trip or release it. Vice-versa, as this distance is increased the pressure exerted by the load spring diminishes thus requiring less resistance to effect relative movement between the plunger and housing.

In connection with this tripping or releasing feature it will be noted in Figs. 8 and 9 that the annular recess **40** is in the form of a V-groove having beveled side walls **60** and **61** disposed at approximately 30° relative to horizontal. These beveled walls **60** and **61** serve as inclined planes affording ease of rollability of the balls **42**. As seen in Fig. 8 the balls engage the lower wall **60** tangentially along a line *l* and engage the upper wall **61** tangentially along the line *l* each extending radially from the center of the ball and disposed at 30° relative to vertical so as to be perpendicular to the wall **60** and **61**, respectively. The projected hemisphere of each ball rests in the cove **55** of the annular ball seat **24** and thus the

plunger 26 is locked against further downward movement relative to the housing 21 but is yieldably held against upward movement relative thereto by the load spring 39.

Now then when the housing 21 is forced downwardly by operation of the press 12 to press the plunger 26 against wadding in the shell S as seen in Fig. 3, the load spring 39 begins to yield when the desired poundage or pressure load is about to be attained. In the example stated above this desired pressure is 40 pounds. In this case the load spring 39 begins to yield at, say 38 to 39 pounds thus in effect raising the several annularly arrayed balls 42 up off of the cove 55 of the partial ball seat 24. The balls 42 in reality remain substantially stationary while the housing 21 and partial ball seat 24 continue moving downwardly under the influence of the press 12. In any event the upper surface 51 of the partial ball seat 24 in moving downwardly passes a horizontal plane struck across the center of all of the balls 42 whereupon the inclined plane 60 on the lower wall of the groove 40 acts like a cam forcing all of the balls outwardly onto the upper surface 51 of the sleeve-like outer portion 54 of the partial ball seat 24. The plunger 26 is now uncoupled from the housing 21; it no longer moves with the same; and the sudden release of this coupling connection occurred at the moment the pressure upon the powder and wadding corresponded with the digital mark 45 in register with the lower edge of the skirting 44 on the cap 32.

In this manner the desired pressure is applied to the powder and wadding irrespective of the elevation at which the lower end 43 of the plunger engages the same. That is to say, whether the plunger engages the first wad W1, a second wad W2, or even a third wad W3, the coupling between the plunger and housing is tripped or released at the moment the desired pressure is attained.

After the wads have been seated in accordance with the powder manufacturers requirements, the plunger 26 is withdrawn from the shell S, shot of the desired size are poured into the funnel end F of the mold 11 and the latter removed from the shell after which the open upper end of the tubular shell casing is crimped over the shot and the shell is now reloaded and ready for use. As pressure against the lower end 43 of the plunger 26 is released, the return spring 30 expands thus shifting the plunger 26 relative to the housing 21 until the annular groove 40 on plunger 26 registers with the annular array of balls 42 on the outer ball seat 24 whereupon the balls 42 promptly pop into engagement with the groove 40 to recouple the plunger with the housing 21.

While I have illustrated and described a preferred embodiment of the present invention, it will be understood however, that various changes and modifications may be made in the details thereof without departing from the scope of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desire to protect by Letters Patent is defined in the following claims:

1. A wad seater comprising a sleeve-like tubular housing, an annular outer partial ball seat on the inner wall of said tubular housing having a partial ball raceway formed thereon at its inner periphery, a funnel-like shelf on said partial ball seat just above the partial ball raceway therein, a plunger in said housing, a plurality of balls resting on said funnel-like shelf around said plunger and within the inner wall of said housing, a presser ring circumscribing said plunger and resting on all of said balls, a load spring resting on said presser ring, a cap on said housing bearing down upon said load spring to press said presser ring against all of said balls whereby the latter tend to move radially inward on said funnel-like shelf, an annular inner partial ball groove formed on said plunger for receiving the balls from said funnel-like shelf conjointly with said outer partial ball raceway, a return spring between said cap and plunger for urging the latter downwardly relative to said housing until the inner partial ball seat on said plunger registers with said balls to receive the same, said cap being threaded to said housing for movement toward and from said load spring to increase and decrease, respectively, the compression pressure of the latter against said presser ring.

2. A wad seater comprising a sleeve-like tubular housing, an annular outer partial ball seat on the inner wall of said tubular housing, a funnel-like shelf on the upper end of said partial ball seat, a plunger in said housing guided by said outer partial ball seat for up and down movement coaxially of said housing, a plurality of balls resting on said funnel-like shelf around said plunger and between the latter and the inner wall of said housing, a presser ring slidable on said plunger and resting on said balls, a load spring resting on said presser ring, a cap on said housing bearing down upon said spring to press said presser ring against all of said balls whereby the latter tend to move radially inward on said funnel-like shelf, an annular inner partial ball groove formed on said plunger for receiving the balls from said funnel-like shelf conjointly with said annular outer ball seat, said groove having side walls providing inclined planes engaged by said balls for urging the latter out of said groove upon up or down movement of said plunger, a return spring between said cap and plunger for urging the latter downwardly relative to said housing until the inner partial ball seat on said plunger registers with said balls to receive the same as they move radially inwardly over said funnel-like shelf and into the zone of said outer and inner partial ball seats, said cap being threaded to said housing for movement toward and from said load spring to increase and decrease, respectively, the compression pressure of the latter against said presser ring.

3. In a wad seater including a plunger arranged for relative movement coaxially of and within a tubular housing secured to a press carriage for movement in unison therewith toward a press bed upon which a shell is supported for applying pressure to a wad and powder within said shell; a trippable coupling between said plunger and housing for releasing said plunger from further downward movement when the resting pressure of said wad and powder against said plunger reaches a predetermined pressure, comprising an annular outer partial ball seat on the inner wall of said tubular housing, a funnel-like shelf on the upper end of said outer partial ball seat, a plurality of balls resting on said funnel-like shelf between said plunger and the inner wall of said housing, a presser ring slidable on said plunger and resting on all of said balls as they rest upon said funnel-like shelf, a load spring resting on said presser ring, a cap on said housing bearing down upon said spring to press said presser ring against all of said balls whereby the latter tend to move radially inward on said funnel-like shelf, an annular inner partial ball groove formed on said plunger for receiving the balls from said funnel-like shelf conjointly with said outer partial ball seat, a return spring between said cap and plunger for urging the latter downwardly relative to said housing until the inner partial ball seat on said plunger registers with said balls to receive the same from said funnel-like shelf.

4. In a wad seater including a plunger arranged for relative movement coaxially of and within a housing secured to a press carriage for movement in unison therewith toward a press bed upon which a shell is supported for applying pressure to a wad and powder within said shell; a trippable coupling between said plunger and housing for releasing said plunger from further downward movement when the resisting pressure of said wad and powder against said plunger reaches a predetermined pressure, comprising means within said housing for guiding

said plunger for coaxial movement within said housing including an annular outer partial ball seat, an annular groove formed in said plunger providing an inner partial ball seat, a plurality of balls arranged in radial array around said plunger above said outer partial ball seat, said outer partial ball seat having a funnel-like upper surface for urging said balls radially inwardly toward said plunger, a load spring circumscribing the upper end of said plunger and bearing downwardly upon said balls, a cap on said housing for anchoring the upper end of said load spring relative to said housing whereby said load spring exerts a predetermined pressure on said balls, and a resetting spring between said cap and plunger for urging the latter downwardly until the inner partial ball seat formed thereon receives said balls and the balls come to rest upon said outer partial ball seat, said spring means being adapted to yield upon upward movement of said plunger and balls relative to said housing and outer partial ball seat until said balls are unseated from the latter, and said inner ball seat being so formed as to urge said balls radially outward therefrom upon upward movement of said plunger relative to said housing.

5. In a wad seater including a plunger arranged for relative movement coaxially of and within a housing secured to a press carriage for movement in unison therewith toward a press bed upon which a shell is supported for applying pressure to a wad and powder within said shell; a tripping coupling between said plunger and housing for releasing said plunger from further downward movement when the resisting pressure of said wad and powder against said plunger reaches a predetermined pressure, comprising means for guiding said plunger for coaxial movement within said housing including an annular outer partial ball seat on the inner wall of said housing, an annular groove formed in said plunger providing an inner partial ball seat, a plurality of balls arranged in radial array around said plunger above said outer partial ball seat, said outer partial ball seat having a funnel-like upper surface tending to urge said balls radially inwardly toward said plunger, a load spring circumscribing the upper end of said plunger and bearing downwardly upon said balls, a cap on said housing for anchoring the upper end of said load spring relative to said housing whereby said load spring exerts a predetermined pressure to all of said balls and a resetting spring between said cap and plunger for urging the latter downwardly until the inner partial ball seat formed in said plunger receives said balls and the latter come to rest upon said outer partial ball seat, said spring means being adapted to yield upon upward movement of said plunger and balls relative to said housing and the outer partial ball seat therein until said balls are unseated from the latter and move radially outward from said inner partial ball seat.

6. A pressure release and locking mechanism for a plunger arranged for coaxial movement within a tubular housing having a cap secured to a press carriage for movement therewith toward a press bed to apply a predetermined pressure to wadding and powder in a shell supported on said press bed, comprising an annular outer plunger guide formed on the inner wall of said tubular housing substantially midway the ends thereof for guiding said plunger for up and down movement within said housing, said plunger guide having an outer partial ball seat formed thereon adjacent said plunger, an annular groove formed in said plunger to provide an inner partial ball seat therein, a funnel-like shelf formed on the upper end of said plunger guide just above said outer partial ball seat, a plurality of balls radially arrayed around said plunger upon said funnel-like shelf, a presser ring on top of said balls, a compression spring pressing downwardly upon said presser ring for urging said balls radially inwardly over said funnel-like shelf toward said plunger, means within said housing between said cap thereof and said plunger for urging said plunger downwardly relative to said housing to register said inner partial seat with said balls to receive the same whereby the projecting portions of said balls come to rest upon said outer partial ball seat, said compression spring being yieldable when pressure of said plunger against said wadding and powder exceeds said predetermined pressure to thereby relatively raise said balls out of said outer partial ball seat, and cam means in said inner partial ball seat for urging said balls radially outwardly from the annular groove in said plunger onto said funnel-like shelf.

7. A pressure release and locking mechanism for a plunger arranged for coaxial movement within a housing secured to a press carriage for movement therewith toward a press bed to apply a predetermined pressure to wadding and powder in a shell supported on said press bed, comprising an annular outer partial ball seat in said housing substantially midway the ends thereof and having a central bore providing a guide for said plunger, an annular groove formed in said plunger to provide an inner partial ball seat therein, said outer partial ball seat having a funnel-like upper face, a plurality of balls arranged within said housing on said funnel-like upper face in radial array around said plunger, a presser ring slidable on said plunger and resting on top of said balls, a compression load spring circumscribing said plunger and resting upon said presser ring, a cap on said housing bearing down upon said load spring for urging the presser ring downwardly upon said balls whereby the latter tend to move radially inwardly over said funnel-like upper surface of said outer ball seats, a resetting spring between the cap and upper end of said plunger for urging the latter downwardly within said housing until the inner partial ball seat formed in said plunger receives said balls whereby the latter come to rest on said outer partial ball seat, said load spring being yieldable when pressure of said plunger against said wadding and powder exceeds said predetermined pressure whereby said balls rise relatively out of said outer partial ball seat, and cam means in said inner partial ball seat for urging said balls radially outward from said inner partial ball seat and onto the funnel-like upper surface of said outer partial ball seat.

8. A pressure release and locking mechanism for a plunger arranged for coaxial movement within a housing secured to a press carriage for movement therewith toward a press bed to apply a predetermined pressure to wadding and powder in a shell supported on said press bed, comprising an annular outer partial ball seat in said housing substantially midway the ends thereof and having a central bore providing a guide for said plunger, an annular groove formed in said plunger having inclined side walls to provide an inner partial ball seat therein, said outer partial ball seat having a funnel-like upper face, a plurality of balls within said housing on said funnel-like upper face in radial array around said plunger, a presser ring on top of said balls, a load spring circumscribing said plunger and resting upon said presser ring, a cap on said housing having a bearing bore centrally thereof, said cap bearing down upon said load spring for urging the presser ring downwardly upon said balls whereby the latter tend to move radially inwardly over said funnel-like upper surface of said outer ball seats, a stem extending upwardly from said plunger for guidance in the bearing bore in said cap, a resetting spring circumscribing said stem between the cap and upper end of said plunger for urging the latter downwardly within said housing until the inner partial ball seat formed in said plunger receives said balls and the latter come to rest on said outer partial ball seat, said load spring being yieldable when pressure of said plunger against said wadding and powder exceeds said predetermined pressure whereby said balls rise relatively out of said outer partial ball seat and said balls are urged radially outward from said inner partial ball seat by the lower inclined wall thereof

onto the funnel-like upper surface of said outer partial ball seat.

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