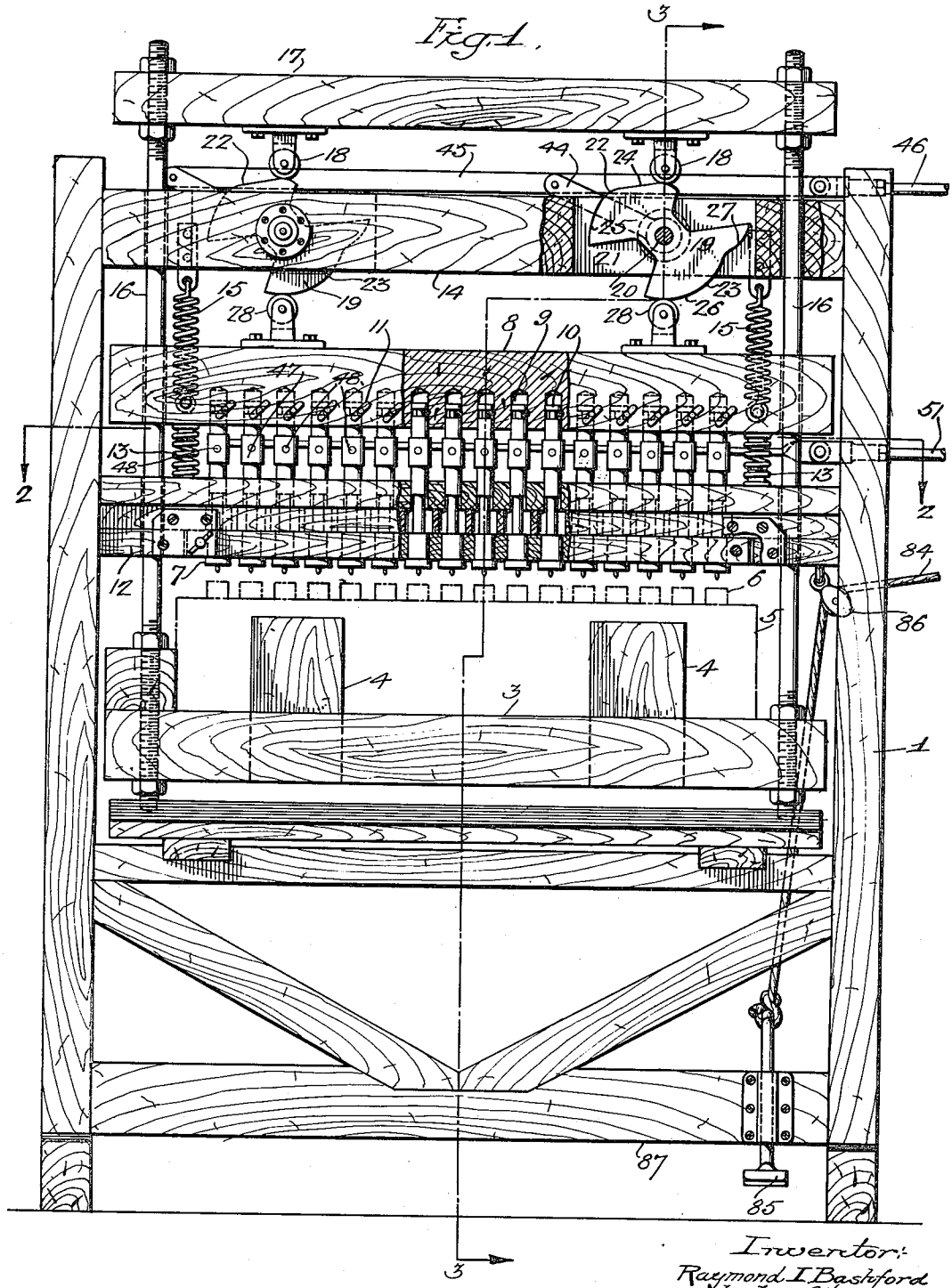
Nov. 21, 1933. R. I. BASHFORD 1,936,494

MACHINE FOR EVENING THE ENDS OF EXPLOSIVE SHELLS

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Fig. 1.



Inventor:
Raymond I. Bashford
by his Attorneys
Howson & Howson

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Fig. 2.

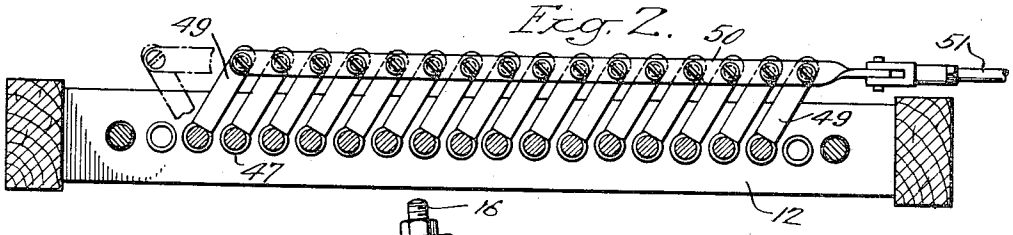
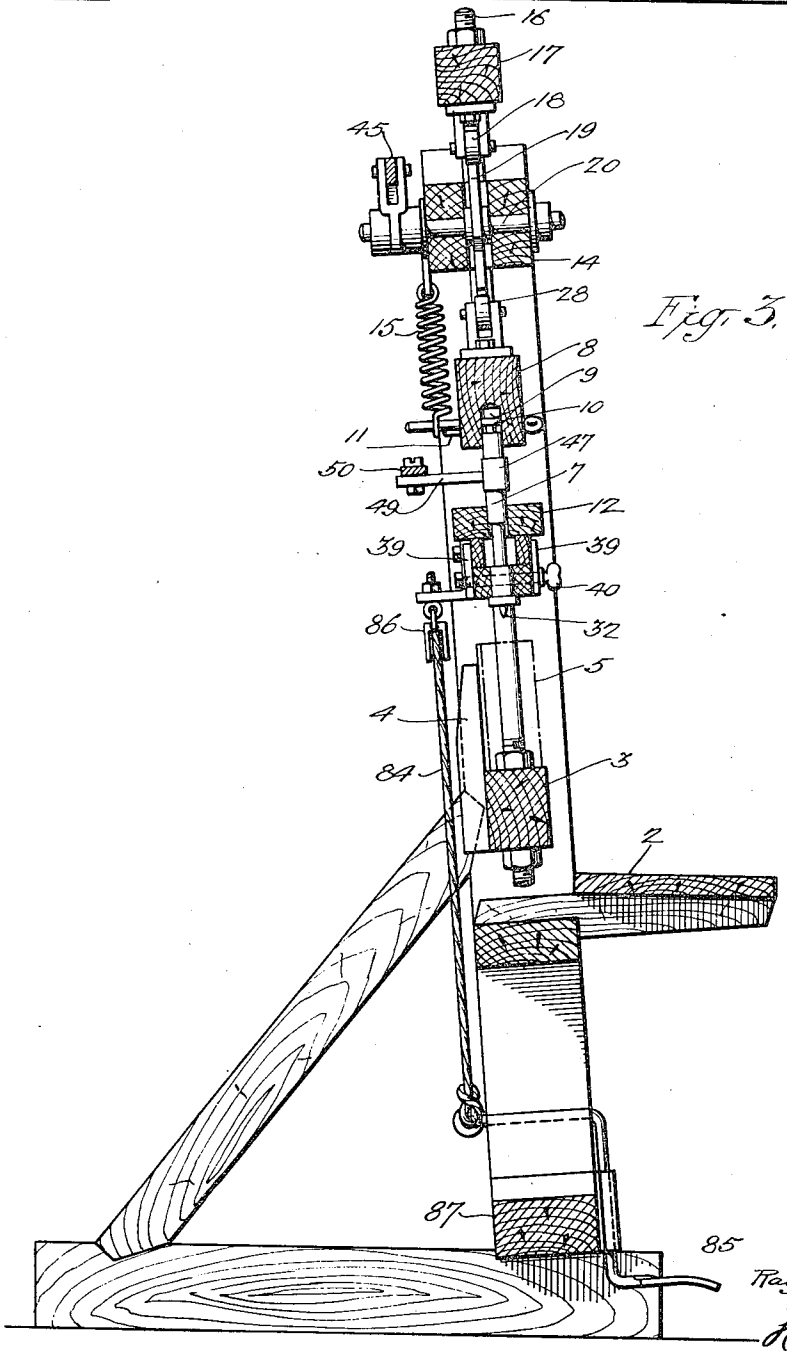


Fig. 3.



Inventor:
Raymond I. Bashford
by his Attorneys.
Howson & Howson

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Fig. 4.

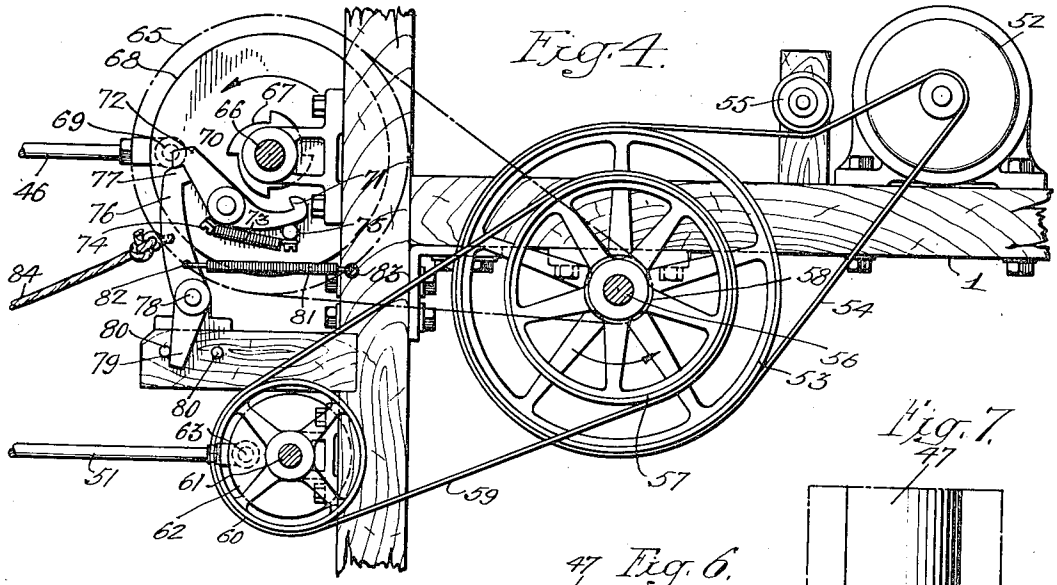


Fig. 7.

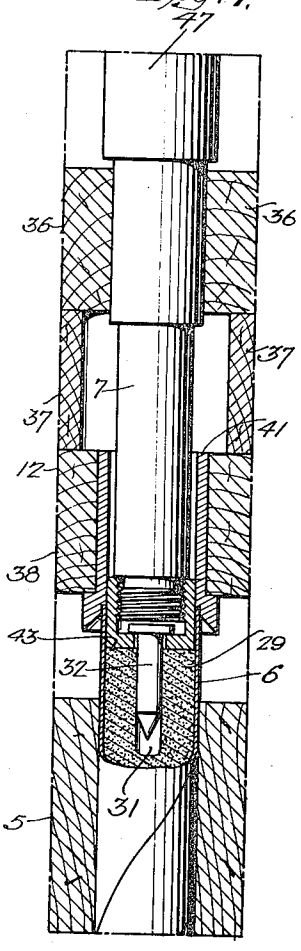


Fig. 5.

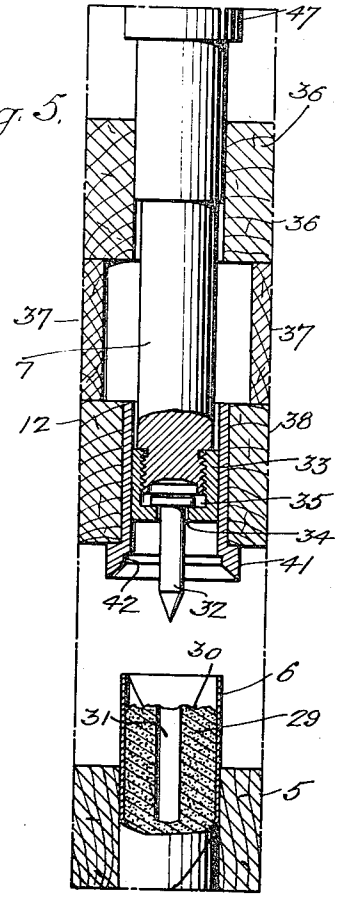
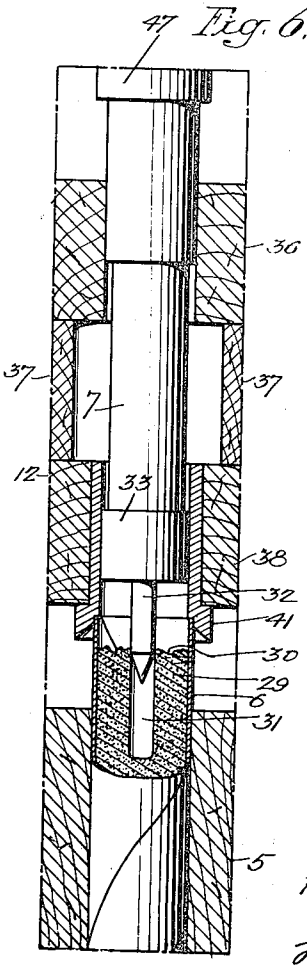


Fig. 6.



Inventor:
Raymond I. Bashford
by his Attorneys
Howson & Howson

Patented Nov. 21, 1933 1,936,494

UNITED STATES PATENT OFFICE

1,936,494

MACHINE FOR EVENING THE ENDS OF EXPLOSIVE SHELLS

Raymond I. Bashford, Philadelphia, Pa., assignor to Atlas Powder Company, Wilmington, Del., a corporation of Delaware

Application July 16, 1932. Serial No. 622,978

8 Claims. (Cl. 86—20)

This invention relates to explosive cartridge or shell manufacturing devices and more particularly to a device for evening the ends of the explosive powder contained in such cartridges or shells. In my co-pending application, Serial No. 622,979 filed July 16, 1932, there is disclosed and claimed a machine for packing or tamping explosive powder in shells, while maintaining a central longitudinal passage through the explosive powder for the reception of a fuse. The shells are supported in a shuttle and the tamps enter the open ends of the shells through nipples which are inserted into said ends when the loaded shuttle is placed in the machine. The explosive powder does not always break evenly when the shells are removed from the nipples and ofttimes an uneven end results.

The present invention provides a machine for evening the powder ends of shells packed by a machine such as that of the above-mentioned co-pending application. While it is adapted particularly for use in conjunction with the machine of my co-pending application, the present invention is not limited to such use, but may be used in any instance where it is desired to even the powder ends of explosive shells.

The general object of the present invention is then to provide an efficient machine for accomplishing the above-noted purpose. This object is achieved by providing a plurality of evening members, each of which is adapted to enter the end of a shell and engage the explosive powder therein. When the packed shells are each provided with a longitudinal passage for a fuse, as is the case with those formed by the above-mentioned machine, the present device is provided with pins floatingly carried by the evening members, the purpose of the pins being to maintain the central passage through the powder. The evening members are given a rotary or slight twisting movement simultaneously with their insertion in the shells to provide the desired even surface on the packed powder.

Other objects of the invention, as well as the details of construction of a preferred embodiment thereof will more clearly appear from the following detailed description when read in connection with the accompanying drawings, in which:

Fig. 1 is a front elevational view of the device;

Fig. 2 is a sectional view along line 2—2 of Fig. 1;

Fig. 3 is a sectional view along line 3—3 of Fig. 1;

Fig. 4 is an elevational view of the actuating mechanism of the device; and

Figs. 5 to 7 are sectional detail views, illustrating clearly the powder-evening operation of the device.

Referring now to the drawings, and especially to Figs. 1 to 3 thereof, the framework of the device is designated generally by reference character 1. A platform 2 is built integral with the framework and extends from the front thereof at a convenient height for use by an operator in loading and unloading the device. A movable cross-beam 3 having back members 4 is provided to support a shuttle 5 containing the powder-packed shells 6. For the purpose of the present description, it suffices to state that the shuttles 5 are formed so as to securely hold a row of shells, a plurality of empty shells being packed while thus held in the machine by my co-pending application or any similar machine. The packed shell-containing shuttle is merely removed from the powder-packing machine and is placed in the present device in the manner illustrated. When thus placed in the device, the shells are in alignment with a corresponding plurality of evening members 7, which may take the form of plungers, as will appear more clearly hereinafter.

Plungers 7 are carried by the movable cross-beam 8, the cross-beam being recessed as at 9 to receive the upper ends of the plungers. The said ends are formed with heads 10, which are engaged by transversely-extending pins 11 (see Fig. 3) to removably secure the plungers to beam 8. The plungers extend through openings in the stationary cross-beam assembly 12, such assembly providing a guiding means for the plungers. Beam 8 is resiliently supported upon the cross-beam assembly 12 on springs 13 interposed between the two. Beam 8 is also resiliently suspended from the upper stationary cross-beam 14 by means of springs 15.

The shuttle-supporting beam 3 is carried at the lower ends of rods 16, which slidably extend through the various cross-beams. A cross-beam 17 connects the upper ends of rods 16 and carries spaced rollers 18, which engage cams 19. Cams 19 are carried upon shafts 20 which are rotatably mounted on the cross-beam 14. Beam 14 is provided with spaced openings 21 to accommodate cams 19, the spaced sides of the beam defining the openings serving as bearings for shafts 20, as illustrated more clearly in Fig. 3. Cams 19 are provided with similar upper cam surfaces 22 and similar lower cam surfaces 23. It will be noted

that cam surfaces 22 each comprise a sharply inclined portion 24 and a substantially circular portion 25. Cam surfaces 23 each comprise a circular portion 26 and a rise portion 27. The respective cam surfaces of each cam are diametrically disposed and formed as noted for a reason which will clearly appear immediately.

The lower cam surfaces 23 engage rollers 28 mounted on cross-beam 8. By virtue of this construction, it will be noted that clockwise rotation of shafts 20 from the position illustrated in Fig. 1 will cause an immediate rise of beam 17 and the shuttle-supporting beam 3 carried thereby. At this time, beam 8 and the supported plungers 7 will remain substantially stationary due to the circular formation of cam surfaces 23. After shafts 20 have rotated sufficiently to cause rollers 18 to engage the circular cam surfaces 25, the supported shuttle will have moved upward to a maximum height and will remain there due to the circular formation of surface 25. Subsequently, the rise portions 27 will engage rollers 28 to force beam 8 downward against the action of its supporting springs. All this will take place during rotation of shafts 20 through an arc of about ninety degrees or one-fourth revolution. If, after traversing such arc, the shafts are now rotated counterclockwise, the reverse action will take place, the supported plungers 7 and shuttle 5 being returned to their original positions successively.

The specific construction of the evening plungers and the detailed evening operation may now be more clearly understood from a consideration of Figs. 5 to 7. The shells 6, when placed in the device, are, as previously stated, packed with powder 29 usually having an uneven edge, as illustrated at 30 in Figs. 5 and 6. A longitudinal passage 31 extends through the powder. In order to maintain this passage during the evening operation, a pin 32 is floatingly carried by each of the plungers 7. The lower ends of the plungers are diminished in diameter and are threaded to receive cup-shaped heads 33 having apertures 34 therein, through which the shanks of pins 32 extend. The heads of the pins are each disposed in the space 35 between head 33 and the end of the plungers. Aperture 34 is sufficiently large to permit transverse movement of the pin. The pins are mechanically free of the plungers, being removably held by heads 34. It will be apparent then that the pins are floatingly carried by the plungers.

The cross-beam assembly 12 comprises stationary beams 36 and 37 and removable beam 38. The stationary beams are securely attached to the upright standards (see Fig. 1), while the removable beam 38 is attached to beams 37 by means of bolted plates 39 and wing bolts 40. Beams 36 and 38 are provided with apertures through which the plungers 7 extend. Sleeves 41 are securely carried in the apertures of beam 38 and serve to guide the lower ends of plungers 7 and also to snugly receive the ends of shells 6, as clearly illustrated in Figs. 6 and 7. In order that they may accomplish the latter purpose, sleeves 41 are formed, as at 42, to snugly receive the shell ends. The sleeves may be attached to beam 38 by having them fit forcibly in the beam apertures. It will be seen that the removability of beam 38, as well as the removability of sleeves 41 from the said beam, permits the use of different beams with different sized sleeves to accommodate different sized plungers. This, of course, enables adjustment of the device to operate on different sized powder-packed shells.

Bearing in mind the above-described operation of the device as thus far considered and referring to Figs. 5 to 7, Fig. 5 depicts the relative positions of one of the plungers and its corresponding shell prior to operation, the shell being spaced from the plunger at this time. Fig. 6 shows these elements in their respective positions after initial operation of the device, at which time the shell-supporting shuttle 5 has moved upward, while the plunger has remained substantially stationary. The upward movement of the supporting shuttle brings each of the shells into engagement with the respective sleeves 41, as illustrated, and also brings the central passage through the powder into cooperative relation with pin 32, the pointed end of the pin extending into the passage as illustrated. By virtue of the floating mounting of the pins, proper cooperation thereof with the passages is insured. Continued operation of the device moves the plungers downward, causing them to enter the respective shells, as illustrated in Fig. 7. The vertical movement of the plungers is such as to pack and even the powder ends, as illustrated at 43 in Fig. 7. The pins 32 move further into passages 31 to maintain these passages open during the evening operation. Simultaneously with the vertical movement of plungers 7, these elements are given a slight rotary twisting oscillating movement to enhance the evening operation, which will now more clearly appear.

The mechanism for actuating the various parts, as above indicated, may now be considered, reference being had to Fig. 4 in connection with the other figures, particularly Fig. 1. In order to oscillate shafts 20 to effect movement of cams 19 in the manner above described, rocker arms 44 are connected at one end to shafts 20 and at their opposite ends to a reciprocally movable bar 45. This bar is connected to rod 46 which is reciprocally moved by the actuating mechanism hereinafter described. Plungers 7 are provided with collars 47, which collars may be attached to the plungers by pins 48. The collars carry transverse integral arms 49 (see Fig. 2), the ends of which are connected to a reciprocally movable bar 50. This bar is connected to rod 51 which is also attached to and reciprocally operable by the actuating mechanism.

Referring now particularly to Fig. 4, the framework of the device carries a suitable motor 52, or like power-actuated device, which drives pulley-wheel 53 through the medium of belt 54. A belt-tightening idler pulley 55 may be provided if desired. Shaft 56, upon which pulley-wheel 53 is mounted, is carried by the framework and also has mounted thereon pulley-wheel 57 and sprocket wheel 58. Pulley-wheel 57 is connected by belt 59 to pulley-wheel 60, the shaft 61 of which also carries disk 62. Rod 51 is eccentrically attached to disk 62, as at 63. It will be obvious that the continuous operation of motor 52 drives disk 62 through the various connections just described to impart a reciprocating movement to rod 51 and thereby impart the desired slight rotary or slight oscillating movement to plungers 7. Thus, these plungers are continuously oscillated or given a twisting movement.

Sprocket wheel 58 is connected by chain 64 to the larger sprocket wheel 65, whose shaft 66 carries ratchet wheel 67. Disk 68 is loosely mounted upon shaft 66. Rod 46 is eccentrically attached to disk 68 as at 69. Disk 68 also piv-

otally carries latch 70, the ends of which are formed to provide hooks 71 and 72. Hook 71 is adapted for cooperation with ratchet wheel 67, the latch being urged into cooperative relation with the ratchet wheel by spring 73 attached at one end to latch 70 at 74 and at its other end to disk 68 at 75. It will be apparent that engagement of hook 71 with ratchet wheel 67, assuming rotation of shaft 66 to be in the direction of the arrow, will lock the loosely mounted disk 68 to shaft 66 to rotate the disk. Normally, however, the latch is out of engagement with the ratchet wheel and, while shaft 66 is continuously driven from motor 52, disk 68 is idle.

Latch 70 is normally held in inoperative position against the action of spring 73 by a second latch 76, whose hooked end 77 co-acts with the hooked end 72 of latch 70. Latch 76 is pivotally mounted at 78 and its lower end 79 operates between stops 80. The latch is normally urged into its operative position shown by spring 81 connected at one end to the latch at 82 and at its other end to the frame at 83. Latch 76 is connected by rope 84 to treadle 85, the rope passing through pulley 86 and the treadle being slidably mounted in the lower cross-beam 87. With the parts in their illustrated positions, continuous oscillating or twisting movement of plungers 7 is had, but cams 19 are not actuated due to the idle condition of disk 68, as above noted.

Assuming now that the operator has placed a shuttle containing powder-packed shells in position on supporting beam 3, in order to operate the device, he steps upon treadle 85 to actuate latch 76 against the action of spring 81. The movement of the latch allows spring 73 to urge latch 70 into locking engagement with ratchet wheel 67. Disk 68 is thus locked to shaft 66, as above noted, and the disk starts to rotate. The operator releases treadle 85, allowing latch 76 to move back into its operative position under the action of spring 81. At this time, however, latch 70 has rotated with disk 68. During one-half revolution of disk 68, cams 19 are rotated through substantially ninety degrees or one-fourth revolution to effect successive movement of the shell-supporting shuttle and plungers 7. Simultaneously, plungers 7 are being continuously oscillated and the desired evening operation, described above in connection with Figs. 5 to 7, is performed.

After the eccentric point of attachment 69 of rod 46 to disk 68 has traversed its maximum horizontal path, the rod is returned during the second half rotation of disk 68. At this time, cams 19 are returned to their original position, thus effecting reversed successive operation of the shell-supporting shuttle and the plungers to move these elements away from each other. As disk 68 completes a revolution, the hooked end 72 of latch 70 engages end 77 of latch 76, since the latter latch is now in the path of latch 70. Latch 70 is moved against the action of spring 73 to move the hooked end 71 out of engagement with ratchet wheel 67. Disk 68 is thus stopped and remains idle until the operator repeats the operation with the next shell-loaded shuttle.

It will be apparent from the above description that the device operates efficiently to perform the desired evening of the powder ends of the shells. The device requires a minimum of manual operation and attention on the part of the operator and may be said to be semi-automatic in its operation. Although a preferred embodiment of the invention has been illustrated and described herein, various modifications and changes may be made without departing from the spirit and scope of the invention.

I claim:

1. A device for evening the ends of explosive shells filled with explosive material except for a central longitudinal passage through said material, comprising a plurality of evening members each adapted to enter the end of a shell and engage the explosive material therein, a pin carried by each of said members and adapted to enter the passage through said shell to keep it open, means for supporting said shells in cooperative relation with said members and their pins, and means for moving said members and their pins into said shells.

2. A device for evening the ends of explosive shells filled with explosive material except for a central longitudinal passage through said material, comprising a plurality of evening members each adapted to enter the end of a shell and engage the explosive material therein, a pin floatingly carried by each of said members and adapted to enter the passage through said shell to keep it open, means for supporting said shells in cooperative relation with said members and their pins, and means for moving said members and their pins into said shells.

3. A device for evening the ends of explosive shells filled with explosive material except for a central longitudinal passage through said material, comprising a plurality of evening members each adapted to enter the end of a shell and engage the explosive material therein, a pin floatingly carried by each of said members and adapted to enter the passage through said shell to keep it open, means for supporting said shells in cooperative relation with said members and their pins, means for moving said members and their pins into said shells, and means for simultaneously imparting a rotary movement to said members.

4. A device for evening the ends of explosive shells filled with explosive material except for a central longitudinal passage through said material, comprising a plurality of evening members each adapted to enter the end of a shell and engage the explosive material therein, a pin floatingly carried by each of said members and adapted to enter the passage through said shell to keep it open, means normally urging said members and their pins into inoperative position, means for supporting said shells in cooperative relation with said members and their pins, means for moving said members and their pins into said shells against the action of said urging means, and means for simultaneously imparting a rotary movement to said members.

5. A device for evening the ends of explosive shells filled with explosive material except for a central longitudinal passage through said material, comprising shell supporting means, a plurality of evening members each adapted to enter the end of a shell and engage the explosive material therein, a pin floatingly carried by each of said members and adapted to enter the passage through said shell to keep it open, means for moving said supporting means to bring said shells into cooperative relation with said pins, and means for thereafter moving said members into said shells.

6. A device for evening the ends of explosive shells filled with explosive material except for a central longitudinal passage through said ma-

terial, comprising shell supporting means, a plurality of evening members each adapted to enter the end of a shell and engage the explosive material therein, a pin floatingly carried by each of said members and adapted to enter the passage through said shell to keep it open, means for moving said supporting means to bring said shells into cooperative relation with said pins, means for thereafter moving said members into said shells, and means for simultaneously imparting a rotary movement to said members.

7. A device for evening the ends of explosive shells filled with explosive material except for a central longitudinal passage through said material, comprising shell supporting means, means normally urging said supporting means into inoperative position, a plurality of evening members each adapted to enter the end of a shell and engage the explosive material therein, a pin floatingly carried by each of said members and adapted to enter the passage through said shell to keep it open, means normally urging said members and their pins into inoperative position, means for moving said supporting means against the action of said first urging means to bring said shells into cooperative relation with said pins, means for thereafter moving said members against the action of said second urging means into said shells, and means for simultaneously imparting a rotary movement to said members.

8. A device for evening the ends of explosive shells, comprising at least one evening member adapted to enter the end of a shell and engage the explosive material therein, means for supporting said shell in cooperative relation with said member, means for moving said member into said shell, and means for simultaneously imparting an oscillatory rotary movement to said member.

RAYMOND I. BASHFORD.