H. TALLEY.

MACHINE FOR FILLING SHELLS WITH EXPLOSIVES.

APPLICATION FILED DEC. 21, 1909.

995,046.

Patented June 13, 1911.

4 SHEETS—SHEET 1.

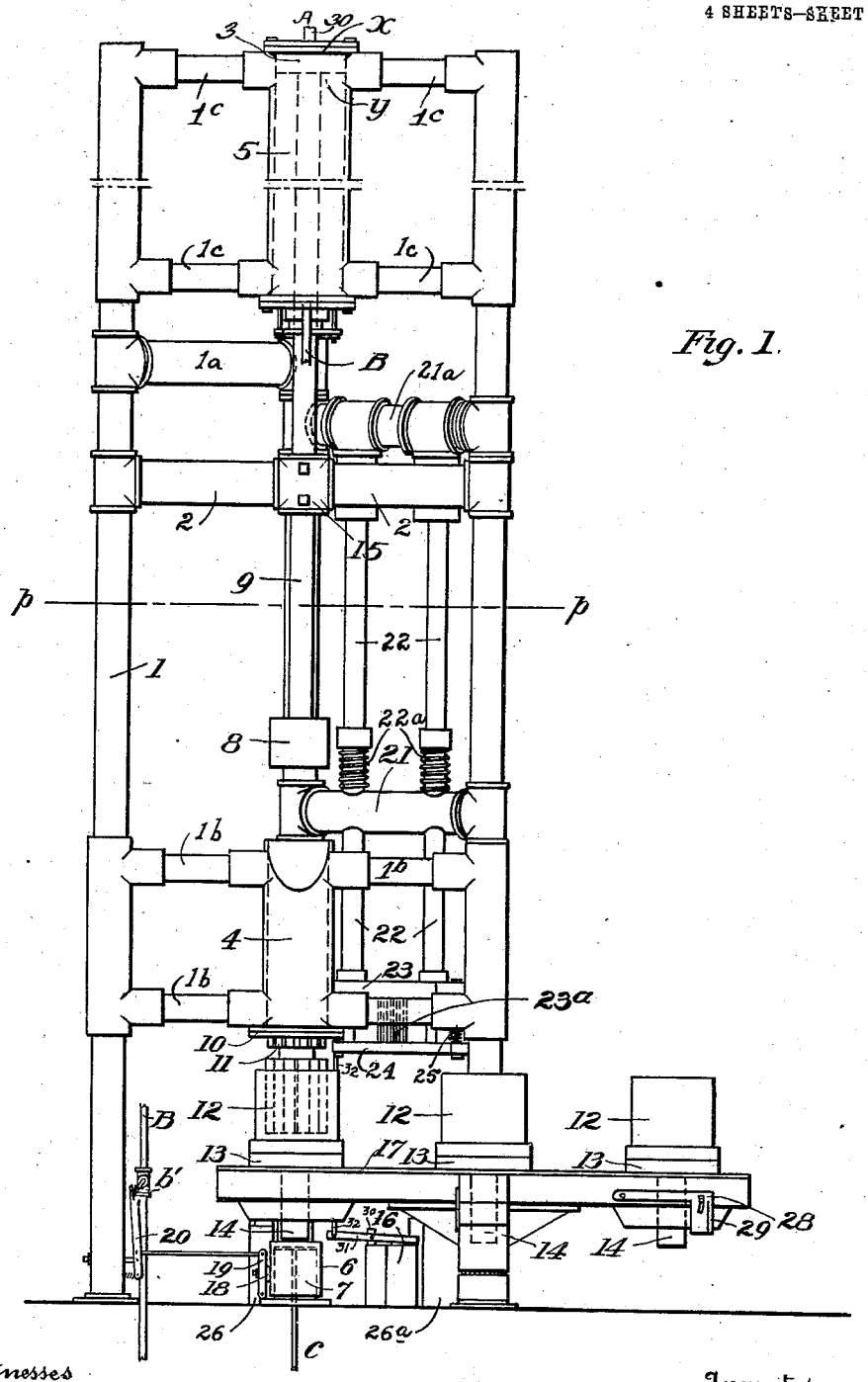

Fig. 1.

Witnesses

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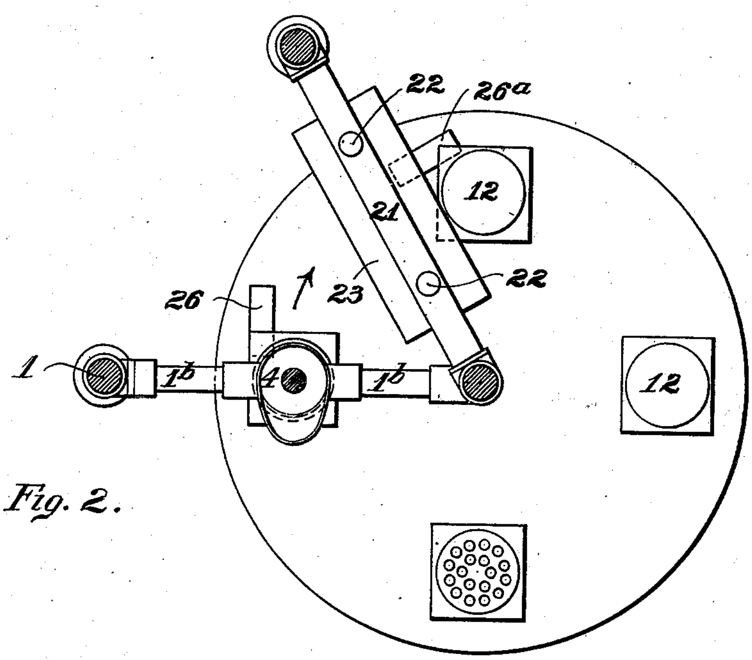

Fig. 2.

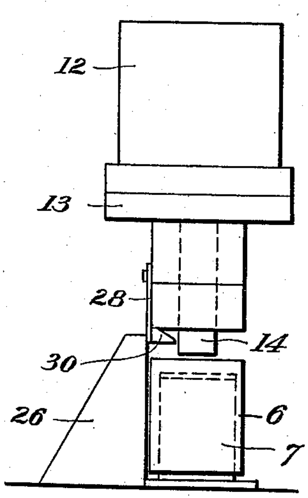

Fig. 3.

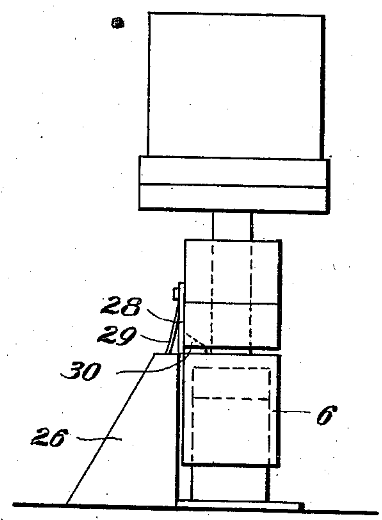

Fig. 4.

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4 SHEETS—SHEET 3.

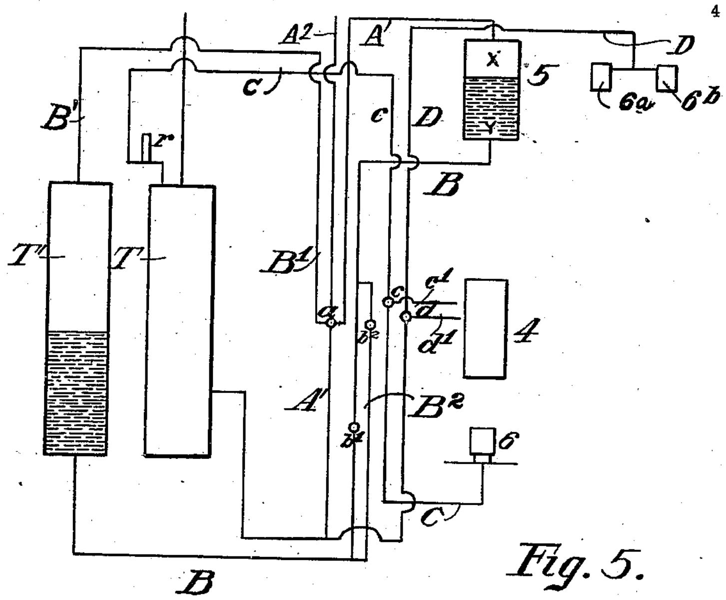

Fig. 5.

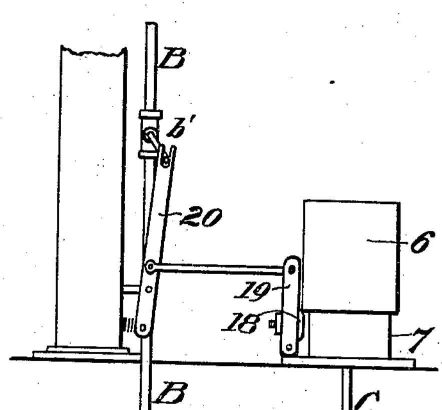

Fig. 6.

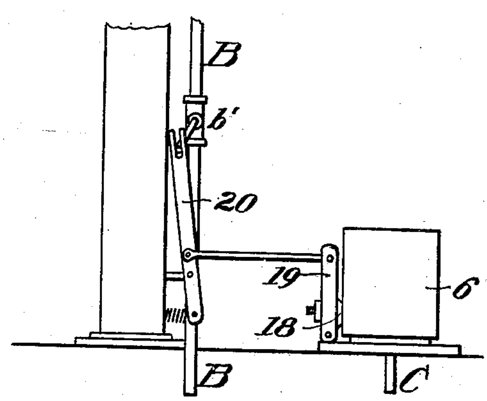

Fig. 7.

Witnesses

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4 SHEETS—SHEET 4.

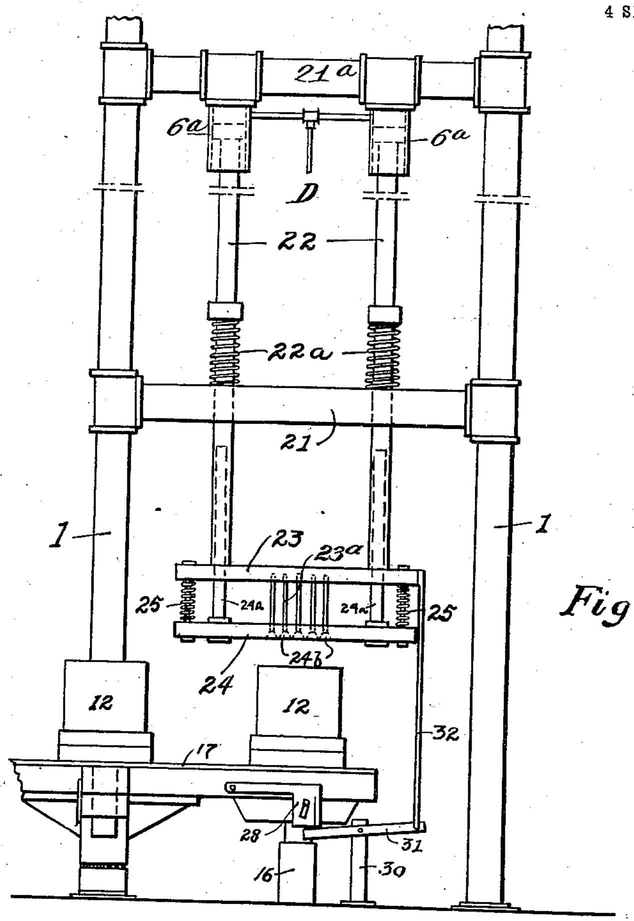

Fig. 8.

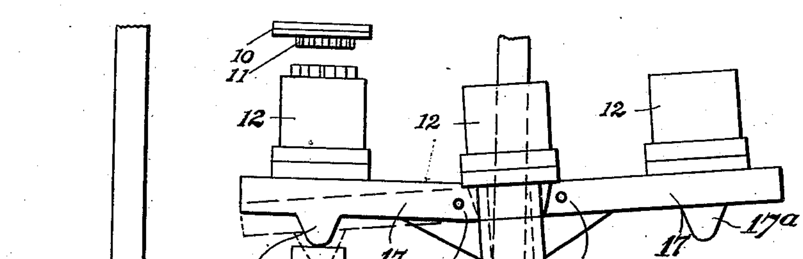

Fig. 9.

Witnesses

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UNITED STATES PATENT OFFICE.

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MACHINE FOR FILLING SHELLS WITH EXPLOSIVES.

995,046. Specification of Letters Patent. **Patented June 13, 1911.**

Application filed December 21, 1909. Serial No. 534,367.

To all whom it may concern:

Be it known that I, HERBERT TALLEY, a citizen of the United States, residing at Joplin, county of Jasper, and State of Missouri, have invented certain new and useful Improvements in Machines for Filling Shells with Explosives, of which the following is a specification.

This invention relates to machines for filling shells with explosives.

The present invention has for its object the provision of a machine of novel construction and operation adapted for automatically simultaneously filling shells or cartridges of convenient size for use with explosive gelatin or dynamite and thereafter folding or closing the open ends of the previously filled shells, subject to the control of an operator, and by which large numbers of the shells or cartridges may be filled and finished rapidly and expeditiously.

In carrying out the invention, I provide a plurality of shell carriers, each adapted to hold a number of shells or cartridges, and arranged to be advanced step by step, novel means for filling the shells, novel means for arresting or positioning the shell carriers so that accurate disposition thereof for filling will be insured, novel means for shifting the shell carriers into position for the carrying out of the filling operation, novel automatically controlled mechanism whereby the shell carrier shifting means and the means for filling the shells are made to cooperate to insure accurate filling of the shells and to guard against any dangerous operation of the parts, and novel means for folding the open ends of the shells after they have been filled, the mechanisms being so constructed and related that the groups of shells are successively brought into position for filling, are shifted to dispose them so that they will be filled, on the completion of the filling operation the feed of the explosive to the shells is stopped and the ropes of the explosive are severed, and the group of filled shells is shifted and the ends folded or closed prior to the positioning of a succeeding group of shells for filling thereof.

One embodiment of the invention is shown in the accompanying drawings, in which—

Figure 1 is a front elevation of the machine, one of the shell carriers being in position for elevation; Fig. 2, a cross-section on line *p*—*p* of Fig. 1; Fig. 3, a detail of the mechanism which insures correct positioning of the shell carrier, the shell carrier being in lowered position; Fig. 4, a similar view showing the shell carrier in raised position; Fig. 5, a diagrammatic view of the pipe connections, cylinders, valves, etc.; Fig. 6, a detail view of the automatic valve controlling mechanism operated by the shell carrier cylinder when the cylinder is raised as when the shells are being filled; Fig. 7, a similar view showing the parts when the shell carrier elevating cylinder is lowered before or after filling of the shells; Fig. 8, a detail view of the folding mechanism; and Fig. 9, a detail of a modification.

The machine frame is composed of uprights 1 connected by suitable cross-members 1^a, the uprights being disposed, preferably, at the apices of an equilateral triangle, as shown in Fig. 2. Connecting two of the uprights 1 are cross-members 1^b which support a cylinder 4, constituting the hopper of the machine, the explosive gelatin, dynamite or other material which is to be filled into the shells, being deposited within this hopper or cylinder from time to time by any suitable means. At its lower end the hopper is provided with a detachable plate or head 10 provided with a plurality of nipples 11 from which the material within the hopper 4 is extruded in the form of a number of ropes which are received within the shells.

Slidable on two of the uprights 1 is a cross-head 2 to which at 15 is secured a piston rod 9 carrying a piston or plunger 8 which is of proper size to fit snugly yet easily within the cylinder or hopper 4 and whereby the explosive or other material within said hopper is pressed out through the nipples 11 into the shells. The piston rod 9 carries a piston 3 at its upper end which travels in the cylinder 5 supported by cross-bars 1^c.

Leading to the upper end of the cylinder 5 is a pipe A which is adapted to supply to the upper side X of the piston, the compressed air which comes from any suitable source, such as reservoir T, while a pipe B supplies to the lower side Y of the piston, oil which comes from a suitable source, such as tank T′.

Journaled on one of the uprights 1 is a turn table 17 which may be rotated in any preferred manner. This turn table carries

a plurality, four in the present instance, of shell carriers 12 which are supported on bases or heads 13, being preferably hinged thereto in the manner set forth in my co-pending application Serial No. 502,392, whereby the shells may be readily dumped or discharged after filling and folding. The base 13 has a stem 14 which passes loosely through the turn table 17, whereby each of the shell carriers may be raised or lowered in relation to the turn table.

Positioned where it will be adapted to be under the stem 14 of the shell carrier whose shells are in position for filling, is an inverted cylinder 6 which telescopes over a stationary piston 7 which is supplied with air pressure from tank T by a pipe C (Fig. 5). On the elevation of the cylinder 6, it raises the stem 14 and causes the shells in the carrier 12 to telescope over the nipples 11, and the shell carrier is maintained in raised position until the shells are filled.

Referring more particularly to Figs. 1, 6 and 7, the pipe B is provided with a valve b' which has an arm suitably engaged with a pivoted lever 20, which is spring-actuated so that it tends to open the valve by turning it to the position shown in Fig. 6, but said valve b' is normally kept closed and in the position shown in Fig. 7, by virtue of the pivoted lever 19 connected to the lever 20 and provided with a cam head or button 18 which is positioned to be engaged by the cylinder 6 so that when the cylinder 6 is down—the normal position—the face of the button or cam head 18 will bear against the face of the cylinder 6 and the valve b' will be held in closed position and, consequently, the back flow of the oil from beneath the piston 3 at Y (Fig. 5) is prevented and, consequently, the oil remaining in the cylinder 5 constitutes an incompressible support preventing descent of the piston 3, and regardless of the air pressure which may be exerted at X, above the piston.

I wish it understood that oil is not the only element which could be used under the piston 3, and in the operation of the machine, but in this aspect the invention consists, broadly, in the operation of the piston 3 by subjecting it to the action of air on one side and to an hydraulic action on the other side.

When the cylinder 6 is raised to elevate the shell carrier 12 so that the shells will telescope over the nipples 11, as when the filling of the shells is to be had, the button or cam head 18 slips under the lower edge of the cylinder 6 and the valve b' is automatically opened by the spring so that the oil or other hydraulically acting fluid beneath piston 3 will flow back, via pipe B, into tank T′ and hence on the admission of air pressure at X above the piston 3, the plunger 8 will descend into the hopper or cylinder 4 and, with sufficient rapidity, but perfect safety, force out the explosive gelatin or dynamite through the nipples 11 into the shells, during which descent of piston 3, the oil or other hydraulic fluid at Y acts as a cushion or buffer to prevent too rapid descent of the plunger 8. To control the admission and exhaust of the air which is supplied at X, above the piston 3, and to the tank T′ I provide a four-way, hand-operable valve a in the pipe A′, the exhaust pipe being shown at A^2.

Carried by slidable upright members 22 whose upper ends carry pistons located in cylinder 6^a and 6^b (Fig. 8) connected to and suspended from cross-member 21^a, and passing loosely through a cross-member 21 is a cross-plate or bar 23 to which are connected depending rods 23^a of a number corresponding to the shells. A presser member 24 which is slidably connected to the cross-head 23 by guides 24^a which telescope in the uprights 22 and is held away from said cross-head by coil springs 25, is provided with flared tubes 24^b, through which the rods 23^a loosely pass. The folding mechanism just described is disposed, preferably, at an angle of 60° to the hopper or cylinder 4 as shown in Fig. 2.

The cylinders 6^a and 6^b receive air pressure from a pipe D, (Fig. 5) controlled by a three-way valve d. Surrounding the uprights 22 are springs 22^a which hold them in raised position. After the shells have been filled, the turn table is rotated one-sixth of a revolution or 60°, thereby bringing the filled shells immediately under the folding mechanism and with the stem 14 immediately over a stationary support 16. Upon turning the valve d to admit the air pressure into the cylinders 6^a and 6^b, the pistons on members 22 are depressed causing the folding mechanism to come into operative relation with the shell carrier containing the previously filled shells, the open ends of the latter passing into the flared tubes 24^b (Fig. 8) of the presser member 24 which recedes against the action of the springs 25, the folded ends of the shells then encountering the ends of the rods 23^a which punch in or close the center part of the fold previously made, thus completing the folding operation. On turning the valve d to exhaust, the springs 22^a which have been compressed, raise the folding mechanism and the turn table is then shifted one-twelfth of a revolution or 30° to bring the next shell carrier into position for filling.

It will be understood that in the present machine the shells are alternately filled and folded, that is, when a group of shells is being filled, no folding operation is being carried on and, vice versa, when a folding operation is being carried on in connection with a previously filled set of shells, there

is no filling operation going on. This enables the machine to be under perfect control at all times and entirely eliminates any danger factor due to carelessness on the part of the operator, because his attention is only directed to one operation, viz: either filling, or folding.

To insure the exact positioning of the respective shell carriers for the filling and folding operations, I provide automatic means for arresting the turn table at the proper points. Located beneath the turn table and vertically related respectively to the cylinder 4 and folding mechanism, are abutments 26 and 26ª, Fig. 2. Carried by the turn table adjacent the shell carriers and preferably pivoted to the outer parts of the crossed bars or arms of the turn table are pivoted latches 28 having depending heads 30 (Figs. 1, 3 and 4) provided with spring fingers 29 (Figs. 1 and 4). Normally the heads of these latches depend freely and they are so positioned that they will strike against the abutments 26 and 26ª. As shown in Fig. 3, when the turn table has been positioned so that a shell carrier is immediately underneath the nipples 11, further movement of the turn table is prevented by the engagement of the head 30 of the latch with the abutment 26. The shells are then in the exact position so that when elevated they will telescope over the nipples. When air is admitted to the cylinder and it rises, it first comes in engagement with the stem 14 and elevates the shell carrier and causes the shells to telescope over the nipples but it immediately thereafter engages the head 30 and lifts the latch, the latter swinging on its pivot, until the lower end of the spring finger 29 comes opposite the top of the abutment 26, whereupon the said spring finger which has been previously confined by engagement with the abutment 26, springs outwardly and rests on top of the abutment, as shown in Fig. 4, so that the latch is then clear of the abutment and, consequently, when the shell carrier is subsequently lowered to permit further rotation of the table, the latch remains in raised position until it drops and is then ready to engage the abutment 26ª at the proper time.

In the construction shown in Fig. 9, the arms 17 of the turn table are pivoted at H and the turn table is journaled so that its general extent is inclined. The shell carriers are not adapted for raising and lowering in relation to the arms which carry them, but they are adapted to rise and fall with the arms themselves. The latches are employed as heretofore described and so are the cylinders 6ª and 6ᵇ, folding mechanism, and all the other features of the machine. By providing the arms 17 with downward integral or fixed projections 17ª, the entire arm and its shell carrier are raised and lowered to accomplish filling and folding of the shells in the manner before described.

The general operation of the machine is as follows: The turn table having been rotated to bring a set of shells in position, the latch 28 strikes the abutment 26 and accurately determines the precise position which will enable the shells to exactly telescope over the various nipples. The stem 14 of the given shell carrier is then immediately over the cylinder 6. The operator then turns the three-way valve *c* and admits air pressure into the cylinder 6, whereupon the cylinder rises, carrying with it the shell carrier and telescoping the shells over the nipples. The latch is also raised (Fig. 4), spring finger 29 supporting the latch. The rise of the cylinder 6 causes its lower edge to clear the cam or button 18, whereupon the spring throws the lever 20 from the position shown in Fig. 7 to that shown in Fig. 6, thereby opening the valve *b′*, whereupon the oil or other hydraulic fluid in the cylinder 5 at Y flows back through the pipe B into the tank T′. The operator then turns the four-way valve *a* to admit air pressure via pipe A into cylinder 5 at X, above the piston 3, whereupon the piston 3 descends against the cushion action of the out-flowing oil at Y and the plunger 8 presses a certain quantity of the explosive in the hopper 4 out through the nipples 11. When the shells are nearly filled the resistance to further filling causes the shell carrier to slightly descend, whereupon the lower edge of the cylinder 6 presses against the cam or button 18 to a slight extent, in practice the smaller part of an inch, and thereby causes the valve *b′* to close. Immediately upon the closing of the valve *b′*, the further outflow of the oil from the cylinder 5 is stopped and the oil acts as an incompressible buffer to prevent further descent of the piston 3 and plunger 8, regardless of the air pressure applied at X. It will be understood that the explosive issues from the nipples 11 in the form of a plurality of ropes which are continuous as the explosive is of a plastic consistency. To enable these ropes to be broken automatically, I provide a by-pass pipe B^2 having hand valve b^2 so that the four-way valve *a* may be opened to exhaust the air above the piston 3 through pipe A^2 and air pressure may be applied in tank T′ from tank T through pipes A′ and B′, and the hand-valve b^2 may then be opened to allow the oil to flow under pressure from tank T′ through pipes B and B^2 into the cylinder 5 at Y and thereby raising the plunger 8 and creating a suction in the hopper 4 which will break off the ropes at the lower ends of nipples 11. The valve b^2 is then closed and the four-way valve *a* is turned so that the air pressure is restored to the cylinder 5 at X and air pres-

sure in tank T′ is exhausted through pipe A^2. The operator next opens the three-way valve *c* to exhaust through *c′* to atmosphere whereupon the cylinder 6 sinks, being followed down by the shell carrier containing the previously filled shells. The turn table is then given a revolution through 60° and the latch 28, having previously dropped, engages the abutment 26^a. The valve *d* on pipe D is then opened to admit the air pressure to cylinders 6^a and 6^b whereupon the folding mechanism is lowered and the open upper ends of the shells pass into and are folded by the flared tubes 24^b, final movement of the folder causing the shells to press back the presser bar 24 against the action of the springs 25, whereupon the rods 23^a push in the center of the fold and complete the folding operation. The valve *d* is thereupon opened to exhaust through *d′* to atmosphere and the folding mechanism is raised by the action of the springs 22^a. To provide for the release of the latching head 30 from abutment 26^a there is a lever or detent 31 pivoted on a stand 30^a and positioned so its free end may lift the said head 30 when the folding mechanism descends, the detent being connected to the member 23 of the folding mechanism rod 32 (Fig. 8). The turn table *e* is then rotated a one-twelfth revolution or 30° to bring the next shell carrier underneath the nipples, and thus the operations are continued in order, a filling operation being alternated with a folding operation, which enables the operator to devote his attention entirely to either one of the two operations. When the hopper 4 becomes empty, the plunger 8 is raised clear of the hopper by opening the valve *a* so that A is connected to exhaust A^2 and pressure A′ is connected to B′, and opening valve b^2 to admit the oil pressure at Y to completely raise the piston. The hopper 4 may then be refilled and the operation of filling the shells in succession carried on. It will be understood that the hopper is of such size that it will contain enough of the explosive to fill several of the groups of shells without re-filling of said hopper.

The provision of the sliding cross-head for the piston rod 9 insures the accurate entry of the piston 8 into the hopper 4 at all times.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a machine of the character described, the combination with a hopper having an extrusion mouth, of a shiftable forcing device operating within the hopper to extrude the material through said mouth, means acting in opposition on said forcing means comprising hydraulic pressure, in the one instance, and air pressure, in the other instance, and controlling means for the said hydraulic and air pressures.

2. In a machine of the character described, the combination with a hopper having an extrusion mouth, of a shiftable plunger operating within the hopper to extrude the material through said mouth, a cylinder, a piston movable in said cylinder for operating the plunger aforesaid, means for supplying hydraulic pressure to one side of the piston, means for supplying air pressure to the other side of the piston, and means for controlling the action of the hydraulic and air pressures.

3. In a machine of the character described, the combination with a hopper having an extrusion mouth, of a shiftable plunger operating within the hopper to extrude the material through said mouth, a cylinder, a piston movable in said cylinder for operating the plunger aforesaid, means for supplying hydraulic pressure to one side of the piston, means for supplying air pressure to the other side of the piston, a valve controlling the supply of air pressure, and an independently operable valve for controlling the hydraulic pressure.

4. In a machine of the character described, the combination with a hopper having an extrusion mouth, of a shiftable forcing device operating within the hopper to extrude the material through said mouth, means acting in opposition on said forcing means comprising hydraulic pressure, in the one instance, and air pressure in the other instance, a shell carrier, a pressure operated device for shifting the shell carrier to bring it into coöperative relation to the hopper, a valve for controlling the hydraulic pressure which is controlled by the operation of the shell carrier shifting device, and a valve for controlling the air pressure.

5. In a machine of the character described, the combination with a hopper having an extrusion mouth, of a shiftable forcing device operating within the hopper to extrude the material through said mouth, means acting in opposition on said forcing means comprising hydraulic pressure, in the one instance, and air pressure in the other instance, a shell carrier, a pressure operated device for shifting the shell carrier to bring it into coöperative relation to the hopper, a valve for controlling the hydraulic pressure which is controlled by the operation of the shell carrier shifting device, a valve for controlling the air pressure, a valve controlling the operation of the pressure operated device, and a hand operated valve controlling the operation of the hydraulic pressure.

6. In a machine of the character described, the combination with a shiftable feeder, and motive fluid actuated means controlling the movement thereof, of a shell carrier movable toward and away from the feeder, and means automatically controlled by the movement of the shell carrier which

automatically controls the movement of the motive fluid operated feeder aforesaid.

7. In a machine of the character described, the combination with feeding means, of a piston and cylinder for operating the feeding means, sources of motive fluid pressure acting in opposition on the piston and cylinder, a shell carrier movable toward and away from the feeding means aforesaid, means for thus moving the shell carrier, and valve mechanism automatically controlled by the shell carrier which controls the relative action of the opposed pressures aforesaid.

8. In a machine of the character described, the combination with feeding means, of a piston and cylinder for operating the feeding means, sources of motive fluid pressure acting in opposition on the piston and cylinder, a shell carrier movable toward and away from the feeding means aforesaid, means for thus moving the shell carrier, valve mechanism automatically controlled by the shell carrier which controls the relative action of the opposed pressures aforesaid, and independent valves respectively controlling the opposed pressures aforesaid.

9. In a machine of the character described, the combination with feeding means, of a piston and cylinder for operating the feeding means, sources of motive fluid pressure acting in opposition on the piston and cylinder, a shell carrier movable toward and away from the feeding means aforesaid, motive fluid operated means controlling the movement of the shell carrier, a valve controlling the operation of said motive fluid operated means, a valve automatically actuated by the movement of the shell carrier which controls one of the pressures aforesaid, and independent valves respectively controlling the opposed motive fluid pressures aforesaid.

10. In a machine of the character described, the combination with a shiftable motive fluid operated feeder, of a movable shell carrier, motive fluid operated means for shifting the shell carrier, and means governing the action of the motive fluid on the shiftable feeder which is automatically controlled by the movement of the shell carrier.

11. In a machine of the character described, the combination with a feeder, of a cylinder and piston controlling the operation of the feeder, an air operated shell carrier, a source of air pressure supply acting on the piston and cylinder to set the feeder in operation, a source of hydraulic pressure acting on the piston and cylinder in opposition to the air pressure, a valve automatically operated by the movement of the shell carrier toward filling or feeding position to open the supply of hydraulic pressure to the piston and cylinder, and to close it on the completion of the filling of the shells to prevent further operation of the feeder, and valves controlling the air pressure to the piston and cylinder and to the shell carrier.

12. In a machine of the character described, the combination with a feeder, of a cylinder and piston controlling the operation of the feeder, an air operated shell carrier, a source of air pressure supply acting on the piston and cylinder to set the feeder in operation, a source of hydraulic pressure acting on the piston and cylinder in opposition to the air pressure, a valve automatically operated by the movement of the shell carrier toward filling or feeding position to open the supply of hydraulic pressure to the piston and cylinder, and to close it on the completion of the filling of the shells to prevent further operation of the piston and cylinder, and an independent valve controlling the hydraulic pressure independently of the automatic control thereof by the shell carrier.

13. In a machine of the character described, the combination with a feeder, of a movable and shiftable shell carrier adapted to be brought into and out of feeding position, means for shifting the shell carrier when in feeding position to dispose it in coöperative relation with the feeder, and an automatic latching device adapted to insure the correct positioning of the shell carrier in relation to the feeder, said latching device being automatically released on the shifting of the shell carrier into coöperative relation to the feeder.

14. In a machine of the character described, the combination with a feeder, of a plurality of shell carriers movably mounted so as to be adapted to be brought successively into position for the filling of the shells from the feeder, means for shifting the shell carriers when in such position to bring them into coöperative relation to the feeder, and automatic latches adapted to successively arrest the movement of the shell carriers to correctly position them in relation to the feeder, said latches being adapted for automatic release when the shell carrier is shifted.

15. In a machine of the character described, the combination with a feeder, of a folder, movable shell carriers adapted to be successively brought into position for the feeding of the shells carried thereby and for the subsequent folding of the filled shells, independent automatic latches for the shell carriers, and independent arresting devices adapted to engage the latches of the respective shell carriers to correctly position the shell carriers in relation to the feeder and folder, said latches being automatically released on the coöperation of the feeder and the shells and upon the coöperation of the filled shells with the folder.

16. In a machine of the character de-

scribed, the combination with feeding means, of a motive fluid operated folder, a movable shell carrier adapted to be brought into line with either the feeding means or the folder, and means for shifting the shell carrier when in line with the feeding means to thereby position the shells for filling, said shell carrier remaining in normal position when the shells are in line with the folder, and the folder being adapted to be moved toward the shell carrier to accomplish the folding operation.

In testimony whereof, I hereunto affix my signature in presence of two witnesses.

HERBERT TALLEY.

Witnesses:
E. H. LANIER,
F. A. WILBER.