

March 21, 1939.

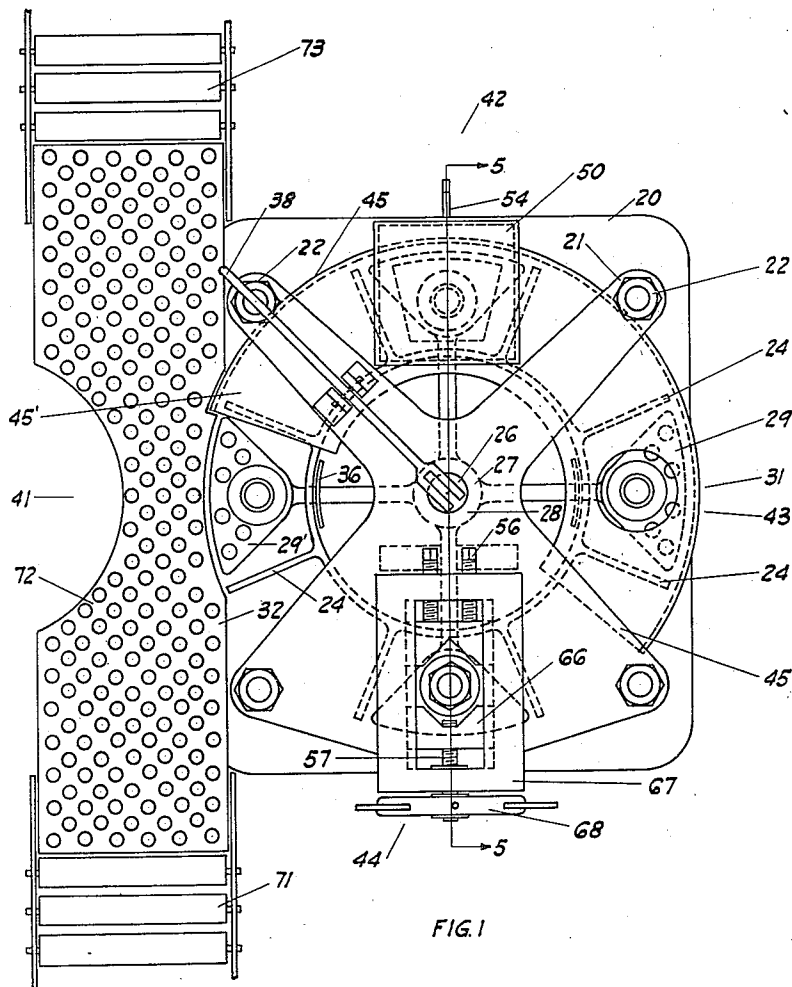
F. L. DREW

2,150,913

SHELL FILLING AND CLOSING MACHINE

Filed Jan. 6, 1936

9 Sheets-Sheet 1



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SHELL FILLING AND CLOSING MACHINE

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9 Sheets-Sheet 2

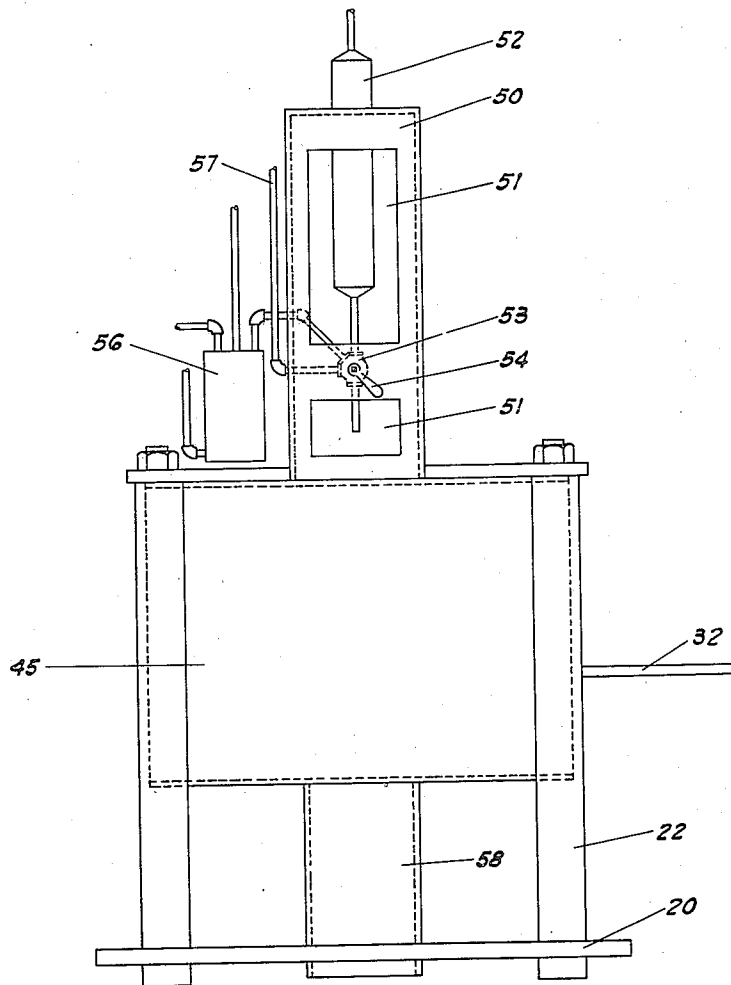


FIG. 2

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SHELL FILLING AND CLOSING MACHINE

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9 Sheets-Sheet 3

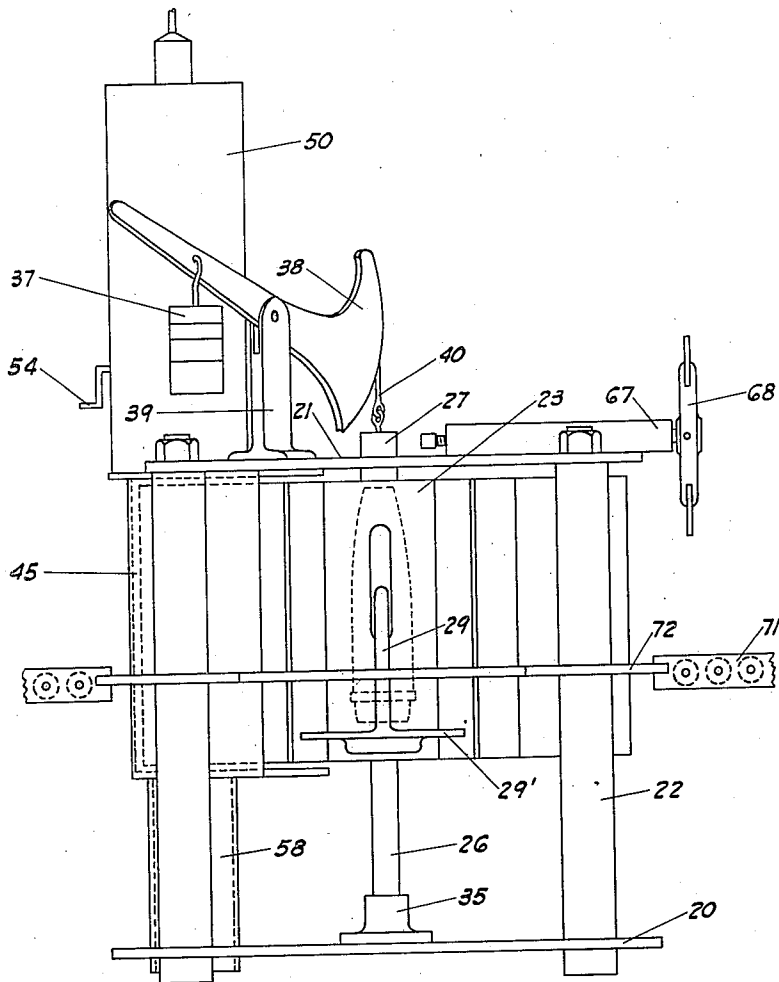


FIG.3

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SHELL FILLING AND CLOSING MACHINE

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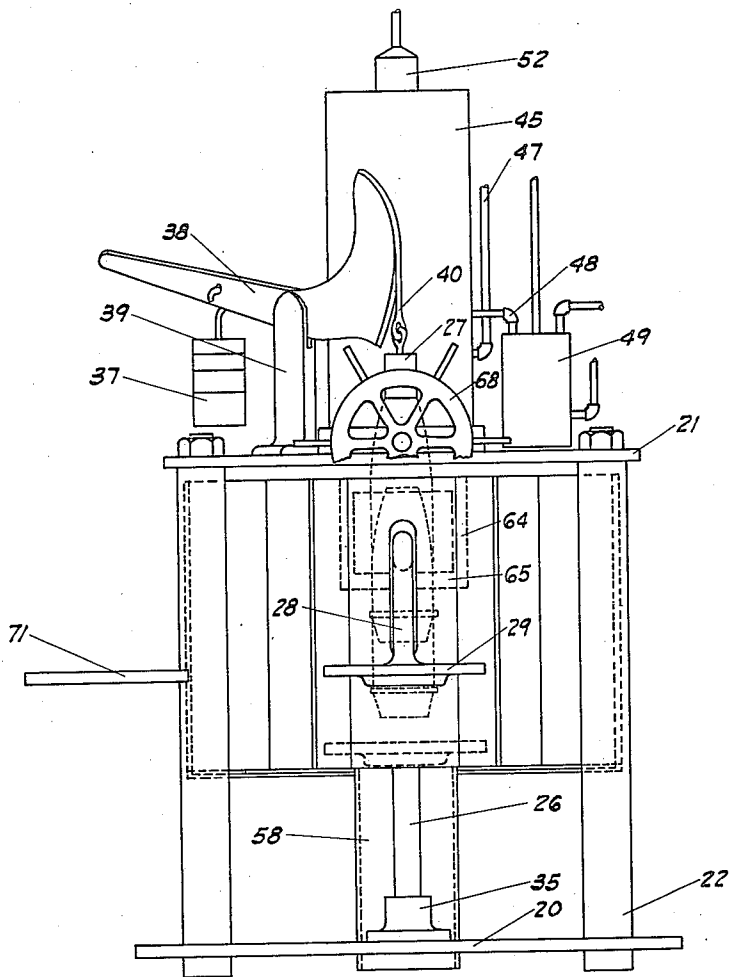


FIG. 4

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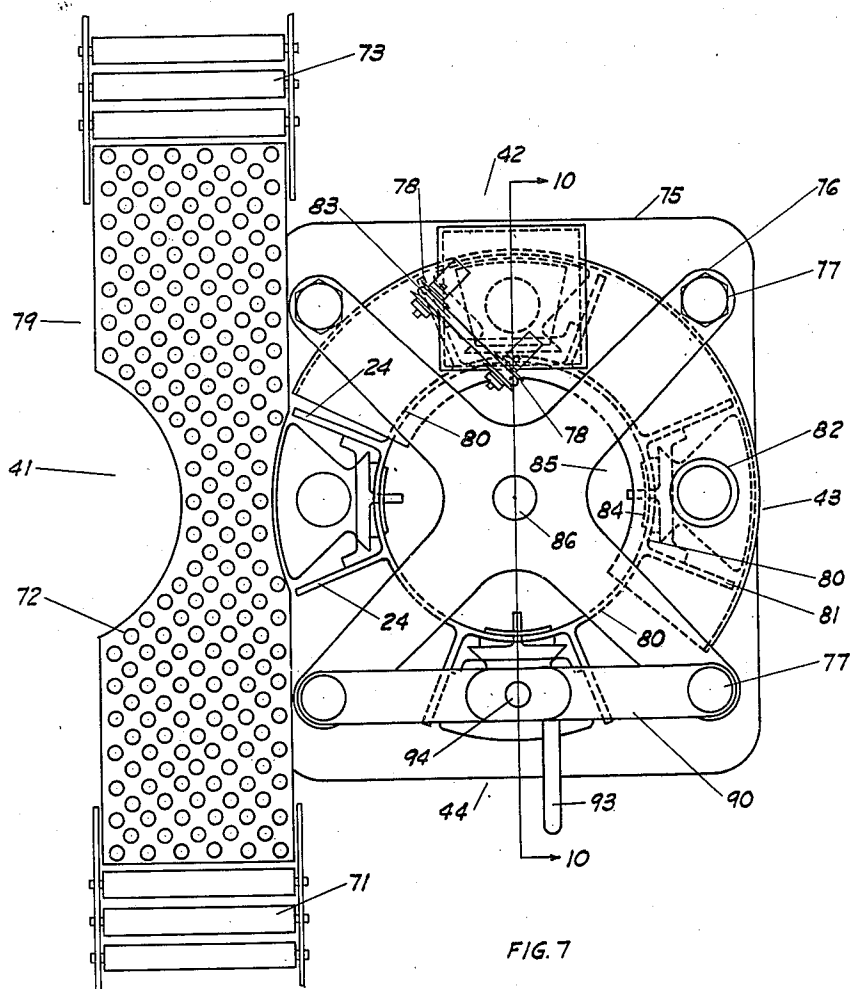
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SHELL FILLING AND CLOSING MACHINE

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9 Sheets-Sheet 6



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SHELL FILLING AND CLOSING MACHINE

Filed Jan. 6, 1936

9 Sheets-Sheet 7

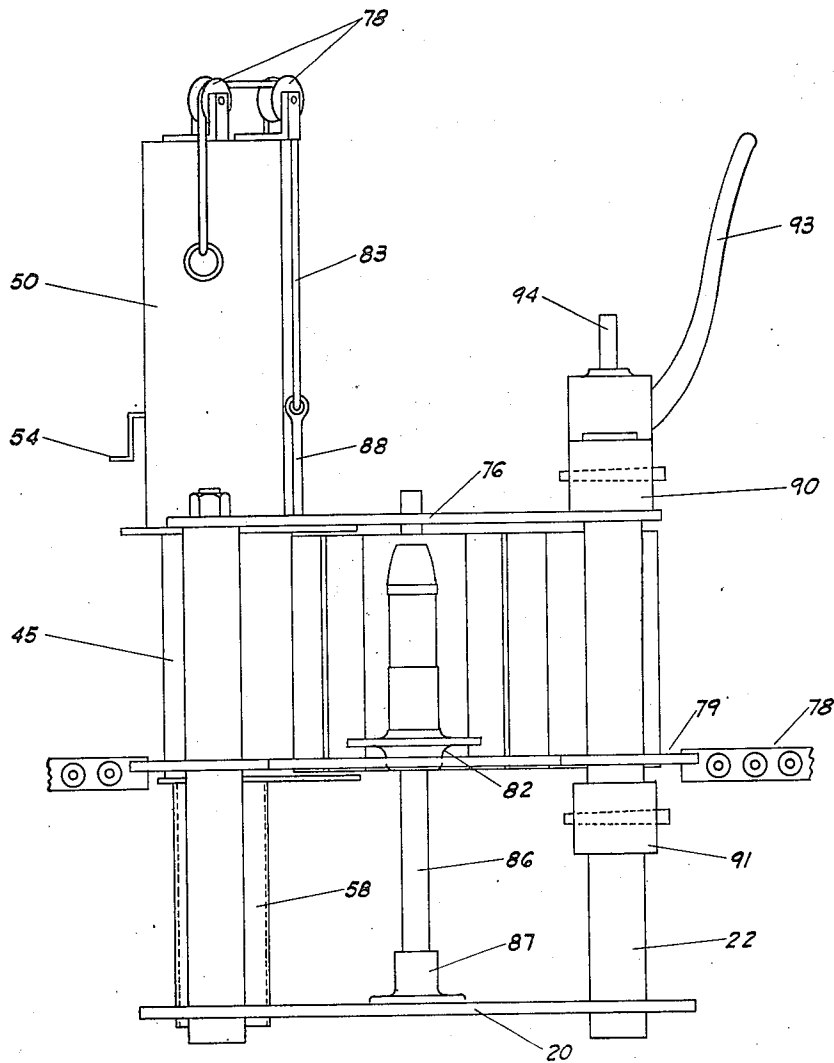


FIG. 8

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SHELL FILLING AND CLOSING MACHINE

Filed Jan. 6, 1936

9 Sheets-Sheet 8

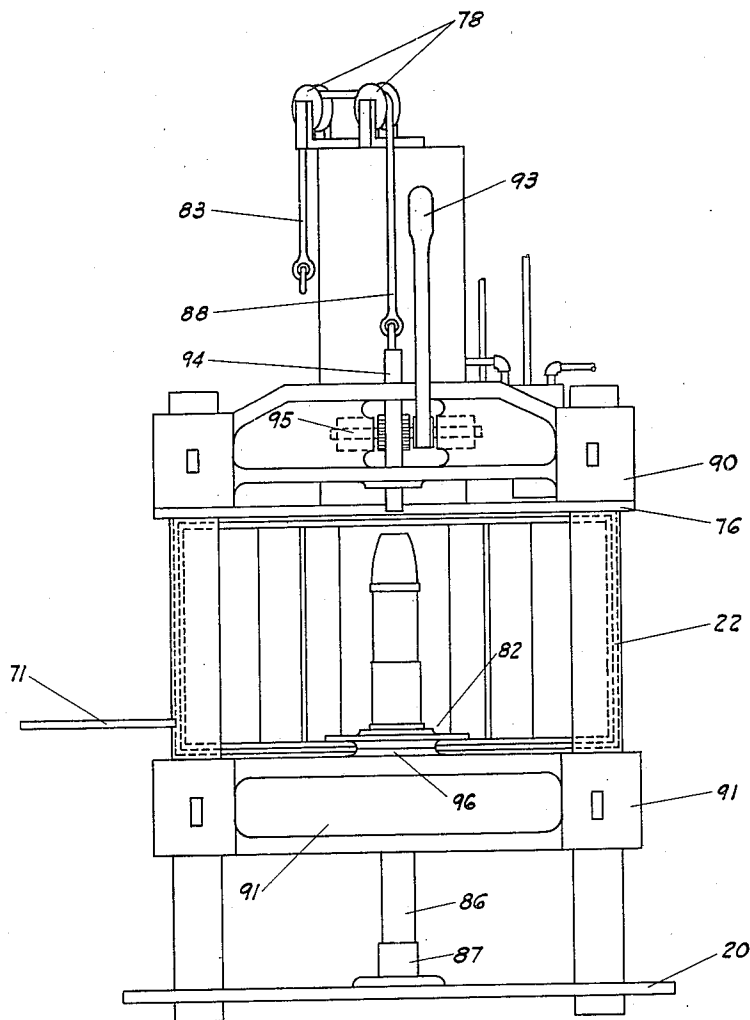


FIG. 9

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SHELL FILLING AND CLOSING MACHINE

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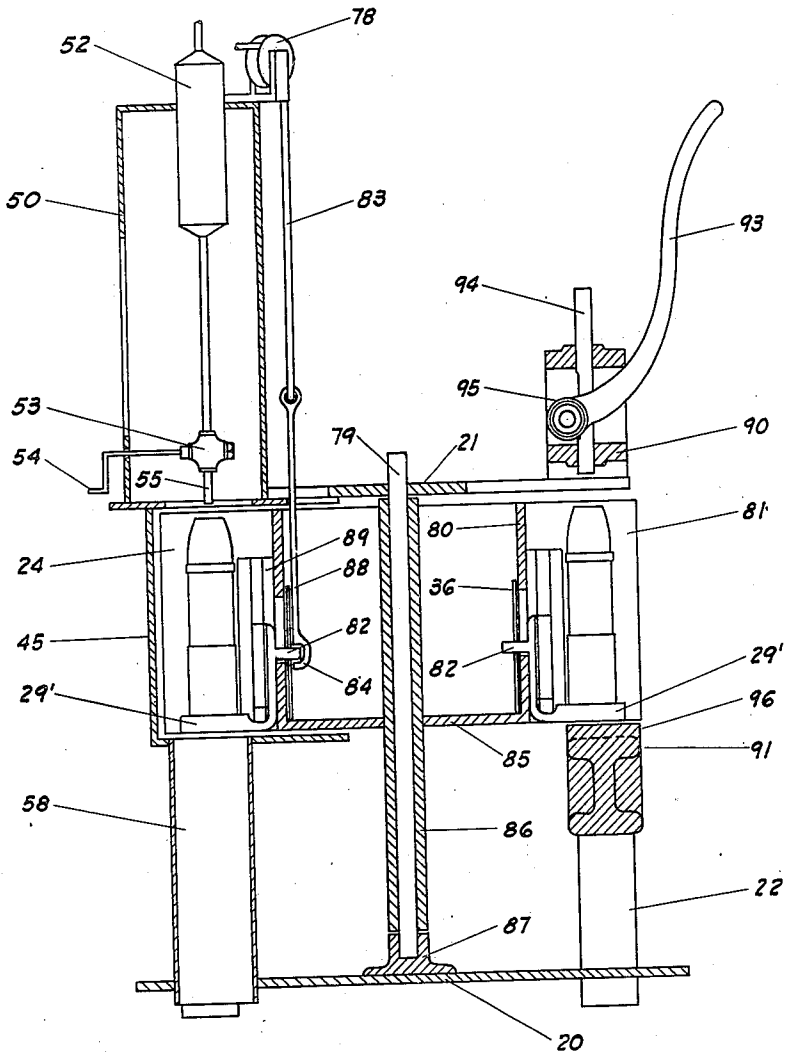


FIG. 10

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UNITED STATES PATENT OFFICE

2,150,913

SHELL FILLING AND CLOSING MACHINE

Frank L. Drew, Aberdeen, Md.

Application January 6, 1936, Serial No. 57,758

4 Claims. (Cl. 86-1)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to him of any royalty thereon.

My invention relates to improvements in machines for filling and closing portable receptacles with liquid, and more especially to such machines for filling bombs or artillery shell and the like with poisonous liquid chemicals.

The machine herein described is of the turret or rotary type and has a separate station for each principal operation. Since some shells are closed by a screw cap and some by pressed fit cap, two forms of machine are herein described.

One object of the present invention is to provide a filling and closing machine for shell or bombs which has maximum safety as regards accidents and in which the personnel is protected from the liquid filler and the fumes thereof.

Another object of this invention is to provide a filling and closing machine of the above indicated character in which a maximum number of shells may be filled per man per hour, with a minimum of floor area per machine.

Another object of this invention is to provide filling and closing machines in which the shells may be filled to a constant level or with a constant volume of liquid, and in which they may be closed by a screw or press-fit device.

Other objects of this invention are to provide a shell filling and closing machine having a minimum of exposed and irregular shaped parts likely to be contaminated by escaping liquid; which can be shipped assembled practically ready for operation; and which can be operated by ordinary skilled workmen after minimum instructions.

These and various other objects of this invention will be apparent from the following description and appended claims, with the understanding that the several necessary elements comprising the invention may be varied in construction, proportion and arrangement without departing from the spirit of the invention nor exceeding the scope of the appended claims.

In the accompanying drawings,

Fig. 1 is a plan view of one machine adapted for closing the shells with a screw fitting;

Fig. 2 is a front elevation thereof;

Fig. 3 is a right side elevation thereof;

Fig. 4 is a rear elevation thereof;

Fig. 5 is a section on line 5-5 of Fig. 1;

Fig. 6 is a reduced section substantially on line 6-6 of Fig. 5 showing the rotatable carrier with the shells removed;

Fig. 7 is a plan view of machine modified to

fill and close shells having a press-fit closing device;

Fig. 8 is a right side elevation thereof;

Fig. 9 is a rear elevation thereof;

Fig. 10 is a section on line 10-10 of Fig. 7.

Referring now to Figs. 1 to 6, my improved machine includes a base 20, top 21, and standards 22, constituting the frame of the machine. The machine has a rotatable section and requires four operators. At the first station an operator removes a filled and closed shell and places an empty shell on the rotatable section; at the next station the operator raises the rotatable section with four shells thereon, fills an empty shell, lowers the turntable; at the next station the operator inspects the filled shell and inserts the nose of the shell with fuze or booster thereon; and at the final station the operator secures the nose into the shell to prevent leakage. These stations are indicated at 41, 42, 43 and 44 on Fig. 1.

As seen in Fig. 1, the upper member 21 is in the form of a spider so that access may be had to the shells from above. The turntable, as seen in Figs. 5 and 6, comprises a cylinder 23 having a bottom 25 secured to central shaft 26 supported in bearing 35 on base 20. Cylinder 23 has wings 24 outstanding therefrom defining four chambers for the four shells on the turntable.

Shaft 26 supports a spindle 27 for sliding movement thereon, and spindle 27 has secured thereto a shell carrier comprising a central hub 28 with four arms 29 each having a shell receiving platform 29¹. These platforms are positioned within the chambers defined by wings 24, as seen in Fig. 6. Each platform 29¹ is provided with a support 30 for firmly supporting the shells in upright position and centrally positioned on the platforms.

The arms 29 project through slots in the cylinder 23, as seen in Fig. 6, the slots being closed by flaps 36. It will be seen that the cylinder 23 and the shell carrier may rotate as a unit about the shaft 26. The shell carrier including spindle 27, hub 28, arms 29, and platforms 29¹ may also move vertically. In order to raise the shell carrier a rope or chain 40 is swiveled to the upper end of spindle 27 and is secured to a lever 38 mounted on support 39 and having a handle accessible to the operator at station 42. Lever 38 is counter-weighted as at 37 to partially balance the mechanism to be raised including the shells mounted thereon.

In order that the operator at station 42 may be protected from the fumes of the chemical filling

being placed in the shell, all filling is done within a closed hood 45. Hood 45 is generally arcuate in top plan as seen in Fig. 1, and is substantially U shaped in section with the open side facing the center of the machine. The hood is slightly larger than the wings 24 and is open at its two ends 45'.

At station 42 there is an opening in the top of hood 45 over which is placed a vertically extending hood 50 provided with a transparent window 51 in its front wall. Vertical hood 50 supports a pipette 52 connected to a three-way valve 53 having a handle 54 which extends outside the hood. A nozzle 55 is connected to valve 53 as are also vacuum tank and trap 56 and supply line 57. When an empty shell is rotated into alignment with nozzle 55 and raised as shown in dotted lines in Figs. 2 and 5, valve handle 54 is turned to allow the liquid to fill pipette 52 from supply line 57, nozzle 55 being closed off and vacuum tank 56 applying suction to the nozzle. The valve is then turned to cut-off supply line and the vacuum tank and allow the liquid in the pipette to flow into the shell. The third position of the valve applies suction to the nozzle to prevent any drippage after the shell has been filled and during rotation of the carrier.

In order that dangerous fumes from the liquid chemical filling may be drawn off to prevent injury to the operators by contamination of the air, a suction conduit 58 is connected to the bottom of hood 45 beneath hood 50. From Fig. 1 it will be seen that hood 45 extends beyond station 42 to provide an air lock by the wings 24.

In order to avoid the hazard of the rotatable shell carrier being turned while the shells are in raised position, thus possibly overturning the shells, an interlock between the rotatable carrier and the stationary part of the machine is provided, comprising two depending arms 64 secured to the under side of stationary cover 21 and so spaced that one of the arms 29 may pass therebetween when the shell carrier is raised. By this means the shell carrier may be rotated only when in its lowered position and furthermore the carrier may not be raised unless the shells are in alignment with their respective devices such as the filling nozzle and closing device, due to the oppositely extending portions 65 on arms 64.

At station 44, mechanism is provided for securely clamping the shell while the booster and fuze device is tightened, comprising a pair of jaws 66 reciprocable in a frame 67 mounted over an opening in stationary frame member 21. Jaws 66 may be securely clamped to the shell after raising by hand wheel 68 by way of screws 69. The fuze may then be screwed tightly in place by a detachable wrench.

As seen from Fig. 1, hood 45 extends beyond station 43, a circular opening being provided in the top of the hood at this station through which the shell is raised. There is a small clearance between this opening and the shell, causing a flow of air into the hood and carrying away any fumes.

The empty shells are transported to station 41 by a roller conveyor 71 and then to a ball transfer table 72, from whence they can be placed in the machine. Filled shells are removed and placed on a similar conveyor 73.

The operation of this form of my invention will be understood from the above description. The operator at station 41 removes a filled and closed shell to the carrier 73 and takes an empty shell from carrier 71 and places it in the holder 30. At the same time, operator at station 42 raises

the rotatable carrier by handle 38, moves valve handle 54 to allow the filling liquid to flow into pipette 52, then moves handle 54 to allow flow from pipette 54 into an empty shell, then moves valve handle 54 to cut off flow into the shell and place suction on the nozzle to prevent drippage and to draw back any excess filling. Then this operator lowers the shell carriers, and they may be rotated.

If the shells on the carrier are not correctly aligned with the filling nozzle and the clamping device, the arms 64 and extensions 65 prevent raising of the carrier. Furthermore these same members interlock with one of the arms 29 of the rotatable carrier to prevent rotation thereof when in raised position.

If the shells are being filled to a constant level of liquid, the filling nozzle 55 is of such length as to just reach the level desired, whereby excess liquid will be drawn back into the suction tank. If a constant volume filling is desired, the end of nozzle 55 is above the normal level of liquid in the shell, the correct volume being controlled by allowing the predetermined volume to enter pipette 52 in accordance with markings thereon.

While the filling is being accomplished, operator at station 43 inspects the filled shell and then inserts a booster and fuze and turns it down by hand. Also during this same time, operator at station 44 turns hand wheel to clamp the jaws 66 about the raised and filled shell, then securely tightens the booster by a suitable wrench, then releases the shell from the jaws by reverse rotation of hand wheel 68.

Due to the suction applied at the nozzle after filling there can be no drippage to contaminate the exterior of the shells so they can be handled with safety. Furthermore, the suction of air through the hood 45 by conduit 58 prevents the escape of dangerous fumes.

The machine shown in Figs. 7 to 10 is adapted for filling and closing shells having a pressed-fit booster and fuze. Parts similar in construction to parts of the machine of Figs. 1 to 6 are designated by similar reference characters and need not be described in detail. In this form, the entire carrier with four shells thereon is not lifted as in the form previously described, but only the shell being filled is lifted. The rotatable carrier comprises a cylinder 80 having four sets of wings 24 defining chambers for the shells. Cylinder 80 has a bottom 85 secured to bearing shaft 86 guided by shaft 79 and supported in bearing 87.

As in the previously described machine, the wall of cylinder 80 has vertical slots closed by slidable flaps 36 and each shell carrier 29¹ has an integral arm 32 projecting into cylinder 80 through openings in slidable flaps 36. The shell carriers 29¹ have short cylinders thereon, not shown, similar to cylinders 30, Fig. 5, for centering and holding the shells upright.

As in the prior form, the arcuate hood 45 is provided with vertical hood 50 having valve 53, filling nozzle 55 and pipette 52, and venting suction conduit 58. Each shell carrier 29¹ is free to move vertically independent of the others and is guided vertically by slotted guides 89 mounted on wings 24, Fig. 7. The mechanism for raising the shell being filled comprises a vertically movable link 93 having a slotted lower end 94 so positioned that the ends 92 of the shell carriers will enter the slot when rotated to the filling station. Link 93 may be raised by a rope or chain 93 passing over pulleys 78 mounted on top of hood 50 to

an accessible position for the operator at filling station 42.

The operations at stations 41 and 43 are similar to those previously described. However, the operator at station 43 merely places the booster and fuze in position on the shell but does not screw it into the shell.

At station 44, the machine has a heavy lower beam or anvil 91 suitably braced and supported to withstand the stresses of a forced fit. Spaced above anvil 91 is a frame 90 supporting a ram 94 having a suitable configuration to engage and force into place the booster and fuze device. Ram 94 is movable vertically in frame 90 by a pinion 95 operated by handle 93.

In order to relieve the rotary part of the machine from any strains due to the pressing operation the anvil 91 has its central upper surface slightly raised as at 96, whereby the shell carrier 29¹ rides upon and rests on this raised surface during the pressing operation.

The operation of the filling of the shells is the same as in the prior form as is also the removal of a filled shell and insertion of an empty one, and the inspection thereof at station 43. It will be understood that banks of these filling and closing machines may be so arranged that the conveyors for the empty and filled shells may supply a group of machines, the conveyors leading to and from shipping or storage points.

By the use of the machines herein described, the filling of shells or bombs with dangerous liquids is greatly expedited with entire safety to the personnel.

While I have shown and described the preferred embodiment of this invention, it is to be understood that I do not confine myself to the precise details of construction herein set forth by way of illustration, as it is apparent that many changes and variations may be made therein by those skilled in the art, without departing from the spirit of the invention nor exceeding the scope of the appended claims.

I claim:

1. A filling and closing machine for shells, bombs and the like comprising a hood substantially arcuate in plan and channel-shaped in section with the open side of the channel facing inwardly, a rotary shell carrier having means to support four shells in upright position, said shell carrier having a cylindrical wall which substantially closes the open side of said hood and having wings which may pass through the hood to

substantially close the same, a shell clamping device including means to grip a shell and prevent turning thereof whereby a closure member may be securely applied to the shell, a downwardly extending filling nozzle, and common means to simultaneously raise said rotary shell carrier to position an empty shell in proximity to said filling nozzle and a filled shell within said clamping device.

2. A filling and closing machine for shells, bombs, and the like having a filling station and a closing station, a stationary hood at the filling station having a downwardly extending filling nozzle therein, a rotary shell carrier having a plurality of shell supporting platforms, each capable of independent vertical movement, said shell carrier being arranged so that the platforms and shells may pass through the stationary filling hood when the carrier is rotated, a lifting device at the filling station for raising one platform and shell, including a vertically movable hook, an arm on each shell platform engageable with said hook when its shell is beneath the filling nozzle, said carrier having wings on both sides of each platform which substantially close the hood when a shell is in filling position.

3. A filling and closing machine for shells, bombs, and the like having a hood arcuate in plan and substantially channel shaped in cross section, means to continuously withdraw air and fumes from said hood, a rotary shell carrier having a cylindrical wall and radial wings to substantially close the hood when a shell is in filling position, means on the carrier to support a plurality of shells in upright position, a filling nozzle at the filling hood, the cylindrical wall of the carrier having a plurality of vertical slots, radially extending arms projecting through said slots for raising and lowering shells into proximity to said nozzle, and sliding shields on each arm to substantially close said slots in all positions, whereby fumes may not escape from the hood through the slots.

4. The invention as defined in claim 2 wherein said closing station has a pressure closing device and an anvil directly below the same, said anvil having an upwardly sloping surface upon which each shell platform rides as it approaches the closing station, whereby the shell being closed and its platform are entirely supported by the anvil.

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