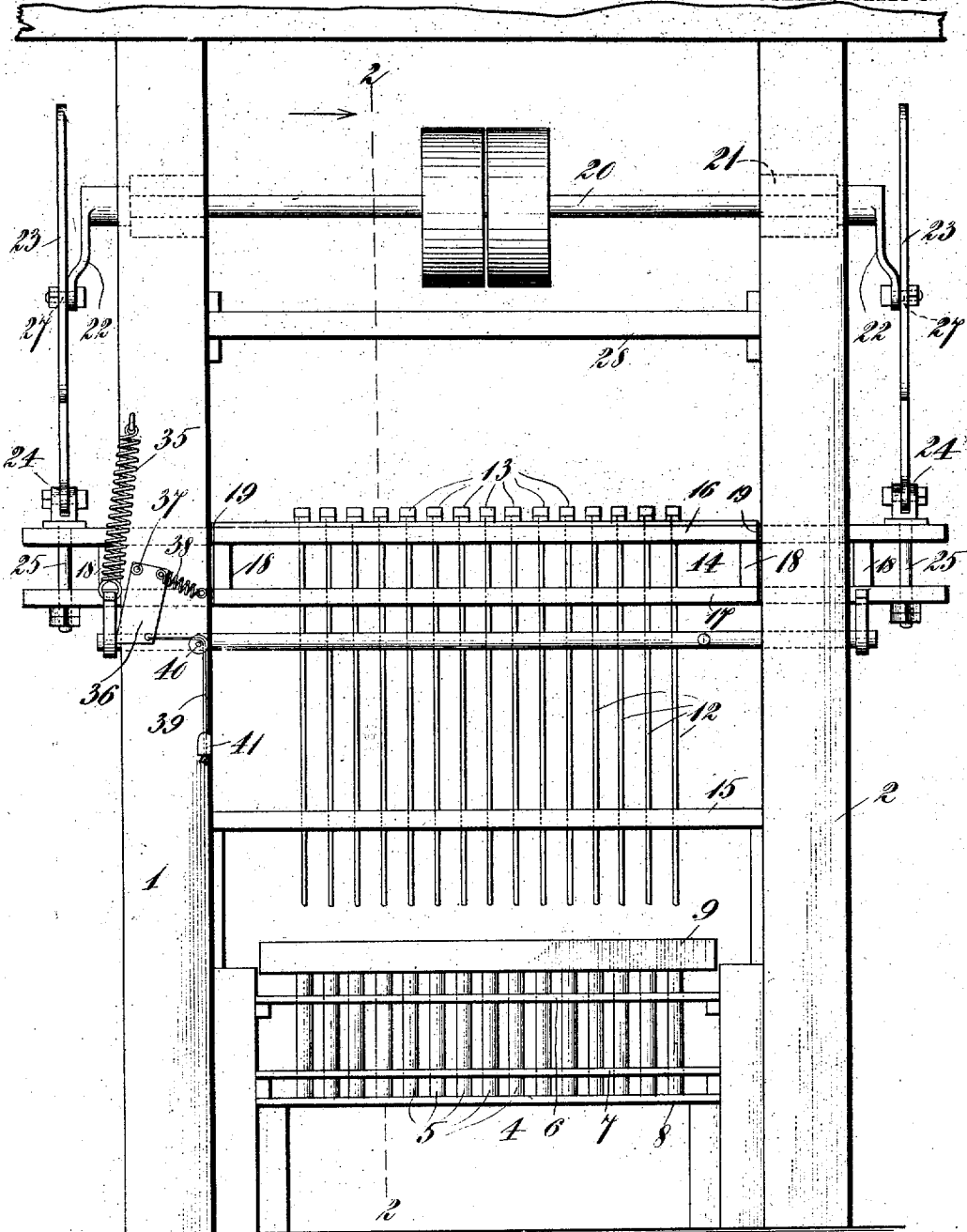


R. M. & C. J. CLARK.
TUBE FILLING MACHINE.
APPLICATION FILED JUNE 14, 1909.

961,428.

Patented June 14, 1910.

3 SHEETS—SHEET 1.



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Fig. 1.

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3 SHEETS—SHEET 2.

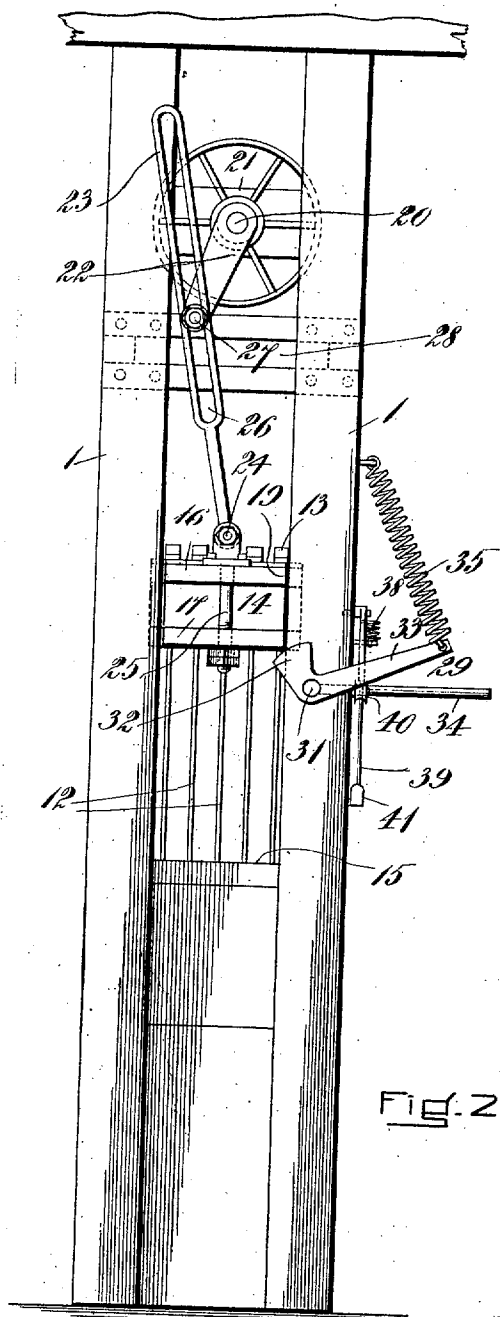


FIG. 2.

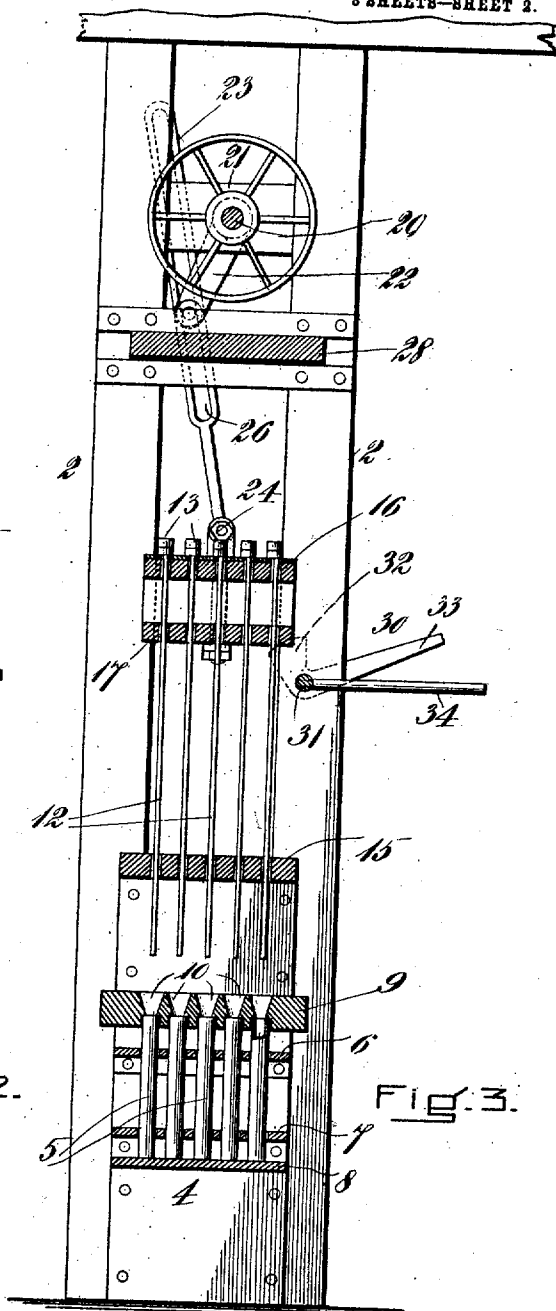


FIG. 3.

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3 SHEETS—SHEET 3.

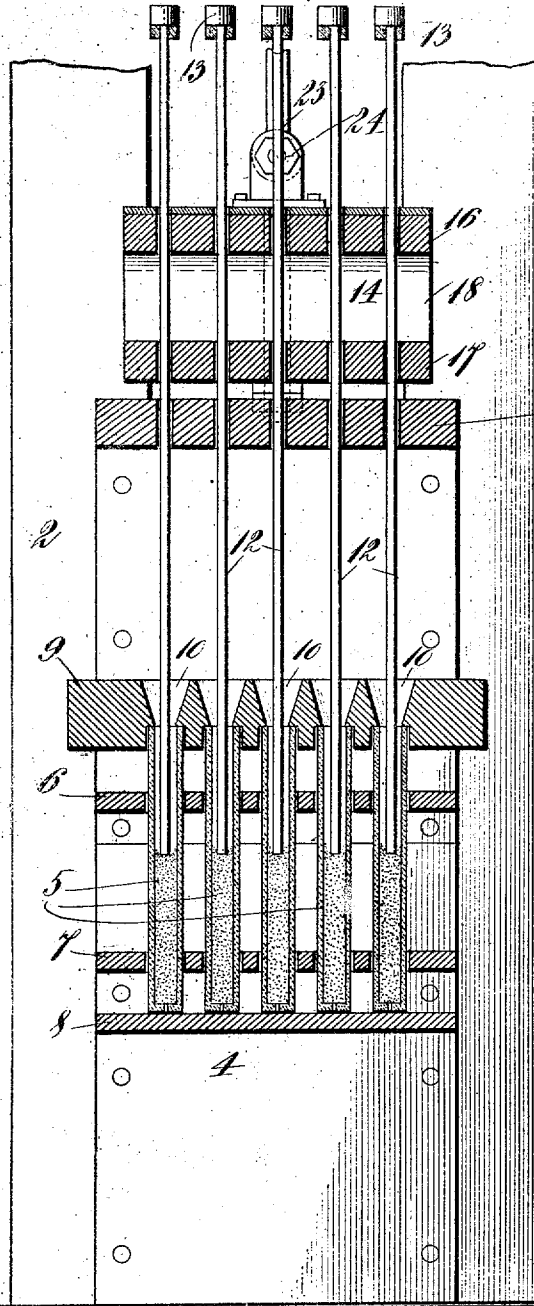


Fig. 4.

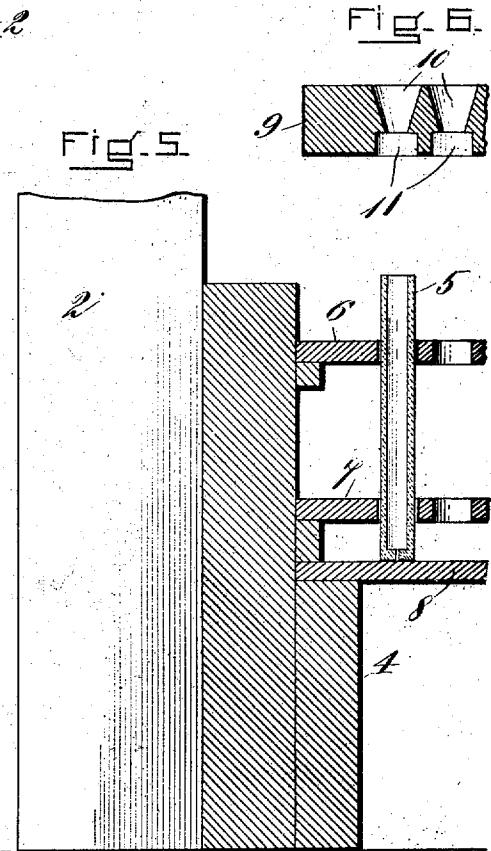


Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

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TUBE-FILLING MACHINE.

961,428.

Specification of Letters Patent. Patented June 14, 1910.

Application filed June 14, 1909. Serial No. 502,086.

To all whom it may concern:

Be it known that we, ROBERT M. CLARK, of Newton, in the county of Middlesex and State of Massachusetts, and CADWALLADER J. CLARK, of Needham, in the county of Norfolk, in said State, both citizens of the United States, have invented a new and useful Improvement in Tube-Filling Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

Our invention relates especially to a machine for filling tubes with a combustible material.

The essential object of our invention is to provide a machine of the above type having not only an improved construction but possessing also various adaptabilities in its operation as incident to its improved construction, all of which features can best be seen and understood by reference to the drawings, in which—

Figure 1 shows the machine in front elevation. Fig. 2 shows the machine in side elevation. Fig. 3 shows the machine in vertical cross section. Fig. 4 is a vertical section of a portion of the machine to which special reference will hereinafter be made. Fig. 5 is also a vertical section of a portion of the machine, and Fig. 6 is a cross section of a detail of construction to which special reference will hereinafter be made.

In the drawings:—The frame of the machine comprises two sets of uprights or posts 1—1 and 2—2 and a connecting head bar or beam 3. The posts 1—1, 2—2 are rectangularly arranged, each post forming a corner of the frame with the two sets of posts widely separated from one another and the posts of each set sufficiently separated to form an ample clearance between them. The posts may be supported in any suitable manner.

Arranged in the base portion of the frame between the separate sets of posts is a rack 4 for holding the tubes 5 during the filling of the tubes. The rack comprises the two perforated boards or plates 6 and 7 and a base or foot board 8. All these parts are preferably built into the base portion of the frame between its opposite sets of posts. The perforated boards 6 and 7 have holes

or openings formed in them through which the tubes are passed to stand in a vertical position with their bottom ends resting upon the base or foot board 8 acting to support the same. The rack is of such size as to support a plurality of tubes. We prefer to make the rack large enough to accommodate several rows of tubes. Each tube has its own hopper located above the same for receiving material or filling to be plugged into the tube during the operation of the machine. We have arranged whereby these hoppers may be combined in a single frame, 9 representing the frame of hoppers and 10 the individual hoppers in the frame which correspond in number with the number of the tubes in the rack. The frame 9 is adapted to rest on the ends of the tubes after they have been placed in the rack. In order that the frame 9 may be properly located for the several hoppers to empty into the several tubes it will be observed that the frame on its under side at the points forming the mouths of its several hoppers is provided with sockets 11 into which the ends of the tubes are adapted to fit as the frame of hoppers is placed upon the top ends of the tubes.

Arranged in the frame above the tubes when in place with the frame of hoppers resting upon them are a series of what may be termed plungers 12, the same comprising rods having heads 13. These plungers or rods correspond in number with the maximum number of tubes possible to place in the rack of the machine and the plungers are so arranged and adapted to operate in such manner that they will pass through the respective hoppers and ram the material or filling contained in the hoppers into the tubes. To this operation, however, reference will be made in further detail. The plungers 12 are carried by what may be termed a carrier 14, the plungers passing loosely through this carrier to vertically depend therefrom and point in the hoppers and ends of the tubes with the heads 13 of the plungers drawing against the upper or top side of the carrier, the plungers hanging as it were by their heads. Located in the frame below the carrier is a perforated plate 15 through which the depending shanks of the plungers extend, the same acting to guide the plungers during the opera-

tion thereof. The carrier 14 is adapted and arranged to be vertically reciprocable in the frame while the guide 15 is fixed. Although the carrier may be made in one piece or beam we prefer to make it by combining separate members 16 and 17, horizontally and parallelly arranged and separated from one another by space blocks 18. The combined members forming the carrier are extended to pass between the two sets of posts at either side of the frame and to extend some little distance beyond the same. That portion of the carrier or the members comprising the carrier located between the separate sets of posts are wider than the spaces between the posts of each set on which account the carrier will at either side have bearing against the inner faces of the posts by shoulders 19 and the posts will accordingly act as guides restraining and directing the carrier during its reciprocation. The operation of reciprocating the carrier is induced primarily by a pulley-driven shaft 20 the ends of which are journaled to turn in boxes 21 located in the head portion of the frame. On the ends of the shaft 20 extended beyond the frame at either side thereof are arranged cranks 22. These cranks connect with the projecting ends of the carrier each by means of an interposed link connection 23 forming a pivotal connection 24 with a bolt 25 passed through the projecting end of the carrier and properly secured thereto. By reference to Figs. 2 and 3 it will be observed that the links 23 which connect the respective cranks with the ends of the carrier are slotted links, there being formed in each of the links an elongated slot 26 and the crank coöperates with the link by means of a headed pin 27 extending from the end of the crank and located in said slot. Now the form and arrangements of the cranks and slotted links with respect to one another and to the carrier present various adaptabilities tending to a proper and successful operation of the machine. In the first place these parts when operated will act to cause a vertical reciprocation of the carrier in the frame, assuming of course that the carrier is free to have such reciprocatory movement. When free to reciprocate the carrier and plungers carried by it will by their own weight draw upon the slotted links until the pins on the respective cranks coöperate with the links at the ends of the slots therein. Thereupon as the cranks are turned they will act to intermittently lift the links and carrier carried by them to an elevated position and then allow the same to fall by gravity, this operation being repeated as long as the carrier is unrestricted in its movement. Moreover the adaptation of the actuating mechanism is preferably such that the carrier will act to lift the plungers clear of the

hoppers and ends of the tubes on the up stroke of the carrier and on its down stroke will permit the plungers following the carrier to fall through the hoppers into the bases or lower parts of the tubes.

In practice the filling or material to be filled into the tubes is placed in the hoppers in small charges which are successively forced out of the hoppers and rammed into the tubes as the plungers pass into the tubes through the mass in the hoppers. The hoppers are filled with successive small charges preferably when the plungers are held in an inoperative position, as will hereinafter be explained. When the plungers are filling the material or mass into the bases of the ends of the tubes the plungers will fall so far that the carrier will begin to raise the plungers just about on the reverse movement of the carrier following the limit of its down stroke. When, however, the tubes have become partly filled with material then the plungers on account of the filling in the tubes will fall a less distance and the carrier will accordingly not encounter the heads of the plungers for lifting the same until the carrier has returned on its return stroke a greater or less distance, the carrier in the meantime simply sliding over the plungers. In fact, when the tubes are almost filled the carrier upon its return stroke will not encounter the heads of the plungers until the carrier has well nigh reached the limit of its return or upward stroke (see Fig. 4). Moreover by reason of the fact that the plungers act independently of one another and loosely connecting as they do with the carrier, it makes no difference how much or how little material may have been filled into a tube. Its plunger will still operate properly without the application of any undue force in ramming the material into the tube. In this connection attention is directed to the fact that at no time during their drop will the plungers be permitted to gather momentum, but at all times the speed at which the plungers drop will be determined by and be commensurate with the speed at which the carrier drops, or in other words, the speed at which the carrier is being reciprocated. While the carrier during its reciprocating movement drops by gravity yet by reason of the crank and link connection the carrier can drop no faster than the rotary motion of the cranks permit. Accordingly the plungers will be so controlled that at all times during the filling of the tubes they will drive the filling material into the tubes with a substantially even, relatively slow but strong driving force or force of impaction imparted essentially by their own weight. To prevent the plungers from being raised too high or unevenly there may be fixed in the machine above the heads of the plungers a bar 28 acting as a stop. Another capa-

bility of the crank and link connection with the carrier is that the cranks coöperate with the links in such manner as to permit the continued operation of the driving shaft and cranks carried by it when the carrier and plungers are maintained in an elevated position.

It is necessary to stop the movement of the plungers and hold the same in an elevated position when tubes are placed in the machine preparatory to filling them and in order also to remove the filled tubes. The plungers are maintained in an elevated position by means of the angularly bent levers 29, 30, fixed to a rod 31 extended between the two sides of the frame and having bearings to turn therein. The levers 29, 30, each have arms 32, 33 which are so arranged, that when the rod 31 is turned to a certain position, as may be done by the handles 34 affixed to it, the arms 32 of both levers will be thrown onto the path of the carrier and will act as stops for preventing a further movement of the carrier and plungers until by a further or reverse turning of the rod 31 the aforesaid respective arms of the levers are removed from the path of the carrier when it will be free to resume its further operation. In the mechanism we have provided arrangement is made whereby the levers 29, 30, will be influenced to maintain a normally engaging position for stopping the movement of the carrier. This is accomplished by means of a spring 35 secured at one end to the arm 33 of the lever 29, the other end of the spring being secured to the side of the frame, the spring acting as a tension device to hold the levers in a normally engaging position as before mentioned. For the purpose of holding the levers in a disengaging position as against the tension of the spring 35 there is provided what may be termed a latch block 36 pivotally secured at the point 37 to the side of the frame and arranged whereby it may swing over the arm 33 of the lever 29 when it will act to prevent this lever and the lever 30 assuming their normal engaging position with respect to the carrier. The latch block is influenced by a spring 38, interposed between it and the side of the frame, to normally assume a position of engagement with the lever 29 for holding both levers in a position of disengagement with respect to the carrier as aforesaid. The latch block may be withdrawn from its normal engaging position by a cord or chain 39 affixed to it and which chain extends inwardly from the block to pass over a pulley 40 to depend therefrom with a grip 41 on the end of the chain. Assuming now that the machine is operating and the carrier and plungers reciprocating, the reciprocatory motion of the carrier and plungers may be stopped without stopping the machine simply by drawing upon the cord 40 by the grip 41, for

thereupon the latch block will be withdrawn from the arm of the lever 29 when both the levers 29 and 30 will assume their normal engaging position and block further motion of the carrier. At this same time the initial driving mechanism may continue to operate inasmuch as such can operate independently of the carrier owing to the slots in the links 23, the pins 27 on the cranks simply running loosely in these slots and the cranks accordingly simply rocking the links on their pivotal supports. It will be understood of course that the time for withdrawing the latch block and releasing the levers into an engaging position for stopping the carrier and plungers is when the carrier has reached or is near the limit of its upward stroke. The carrier will then have lifted the plungers to a position away from the tubes and hoppers in which the plungers are operating and the filled tubes can be removed and unfilled ones placed in the machine. The carrier may then be released to operate simply by turning the rod 31 until the levers 29, 30 assume a disengaging position out of the path of the carrier when the block 36 controlled as it is by the tension device 38 will slip in over the lever 29 and hold it and the lever 30 in their positions of disengagement with respect to the carrier during the filling of the fresh set of tubes.

The manner of operating the machine is as follows: The carrier and plungers are first caught and held in an elevated position; tubes are then placed in the rack. The frame of hoppers is then placed on the ends of the tubes and the hoppers filled each with a proper amount of filling material. The carrier and plungers are then released to operate. After the filling of the tubes the carrier and plungers are again caught in an elevated position and the operation repeated.

Having thus fully described our invention, we claim and desire to secure by Letters Patent of the United States:—

1. In a machine of the character specified, the combination with a supporting frame, of a plunger, a carrier for said plunger reciprocable in said frame for intermittently lifting said plunger and with which carrier said plunger is adapted to coöperate in a manner whereby said plunger may fall by gravity from an elevated position when lifted by said carrier during the operation thereof, actuating means for reciprocating said carrier, and means whereby said plunger may be maintained in an elevated position during the continued operation of said actuating means.

2. In a machine of the character specified, the combination with a supporting frame, of a plunger, a carrier for said plunger reciprocable in said frame for intermittently lifting said plunger and with which carrier

said plunger is adapted to cooperate in a manner whereby said plunger may fall by gravity from an elevated position when lifted by said carrier during the operation thereof, actuating means for reciprocating said carrier, the same connecting with said carrier in a manner whereby said actuating means may continue to operate independently of said carrier when said carrier and the plunger carried by it is held in an elevated position, and means for holding said carrier in an elevated position.

3. In a machine of the character specified, the combination with a supporting frame, of a plunger, a carrier for said plunger reciprocable in said frame for intermittently lifting said plunger and with which carrier said plunger is adapted to cooperate in a manner whereby said plunger may fall by gravity from an elevated position when lifted by said carrier during the operation thereof, actuating means for reciprocating said carrier the same comprising a rotary shaft, a crank carried by said shaft and a link-forming connection between said crank and carrier, said link being adapted whereby said crank may operate to rock said link

without imparting motion to said carrier when said carrier is held in an elevated position, and means for holding said carrier in an elevated position.

4. In a machine of the character specified, the combination with a supporting frame, of a plunger, a carrier for said plunger reciprocable in said frame for intermittently lifting said plunger and with which carrier said plunger is adapted to cooperate in a manner whereby said plunger may fall by gravity from an elevated position when lifted by said carrier during the operation thereof, actuating means for reciprocating said carrier, the same comprising in part a slotted link pivotally connecting with said carrier and a rotary driving crank loosely cooperating with said link at the point of the slot formed therein, and means whereby the operation of said carrier may be stopped when said carrier and the plunger carried by it are in an elevated position.

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