

Oct. 30, 1928.

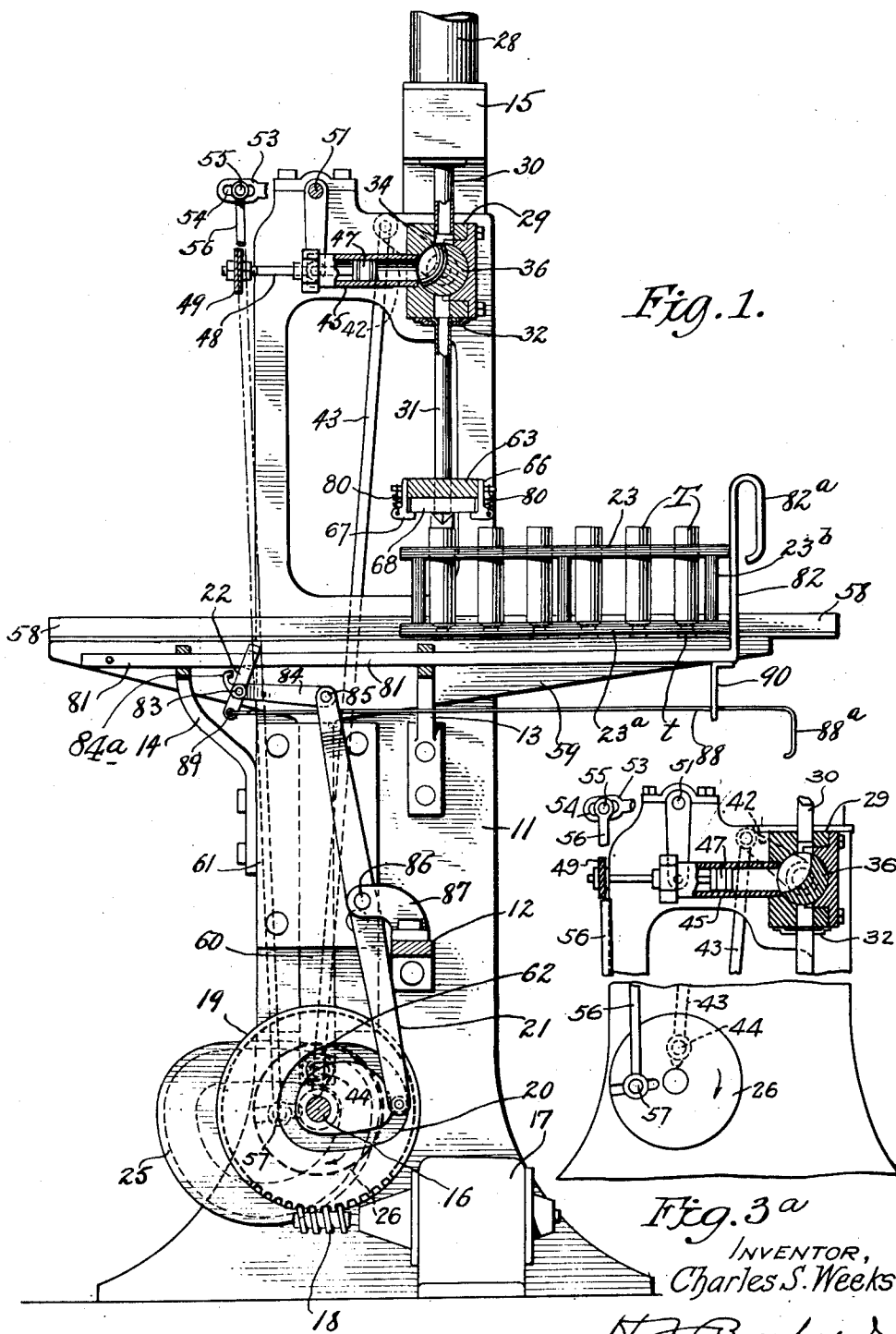
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C. S. WEEKS

FILLING MACHINE

Filed Dec. 23, 1921

5 Sheets-Sheet 1



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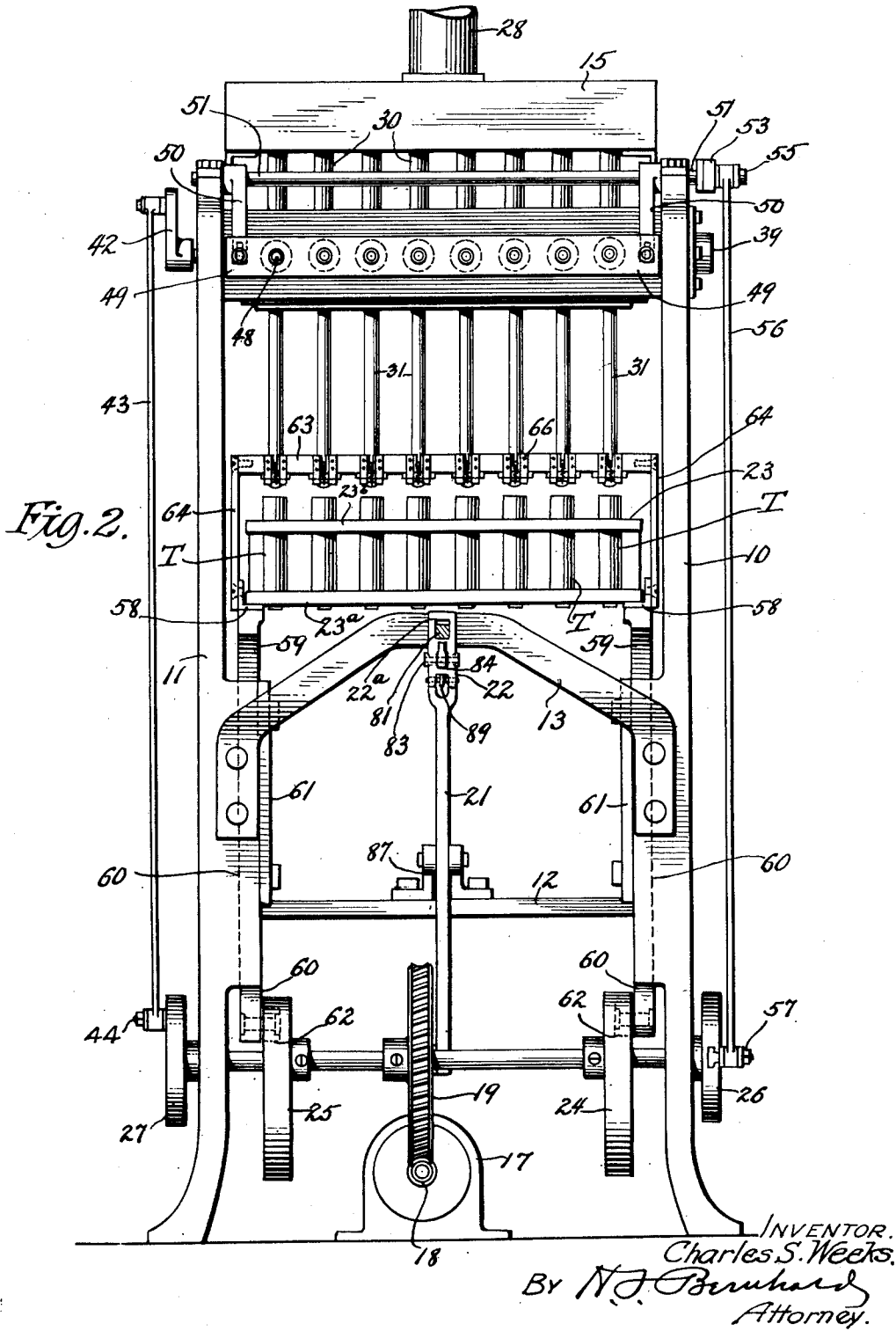
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Fig. 3.

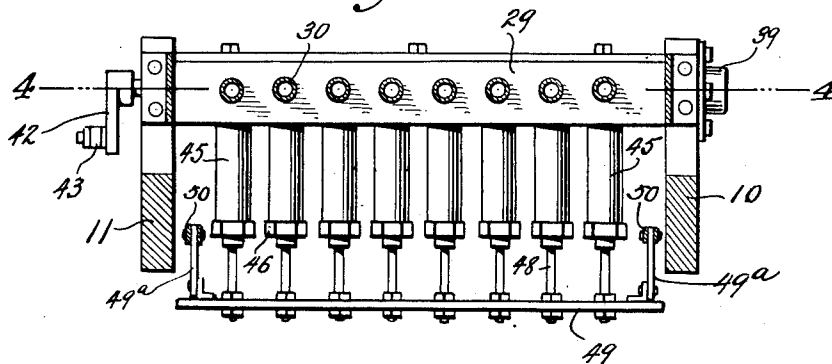


Fig. 4.

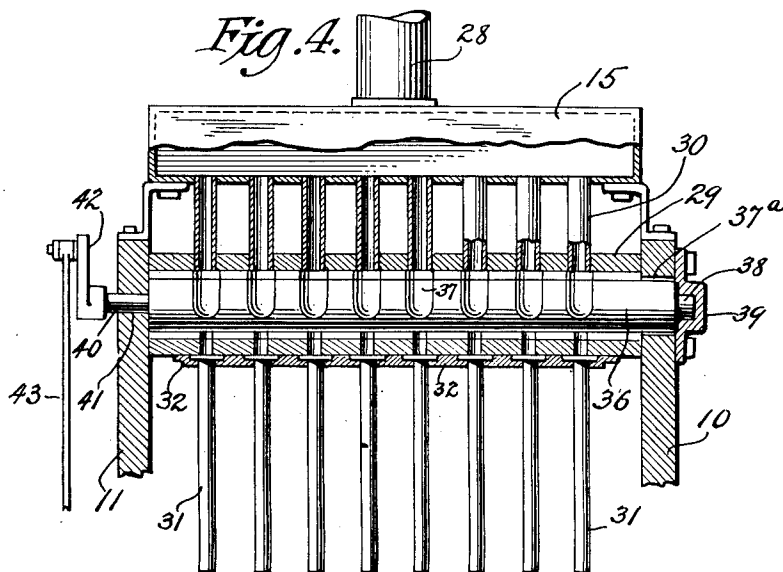
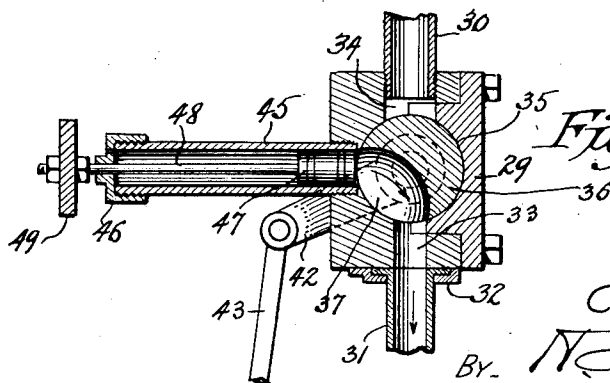


Fig. 5.



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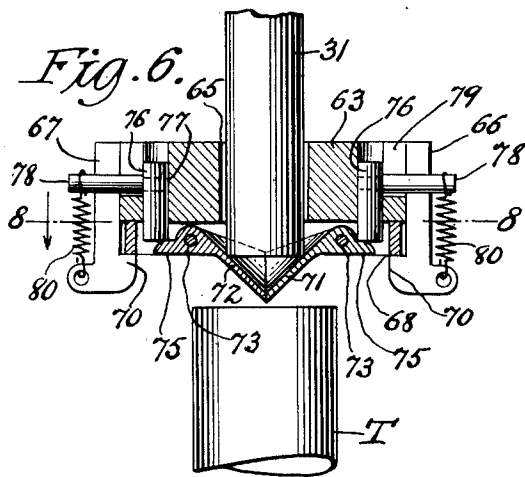
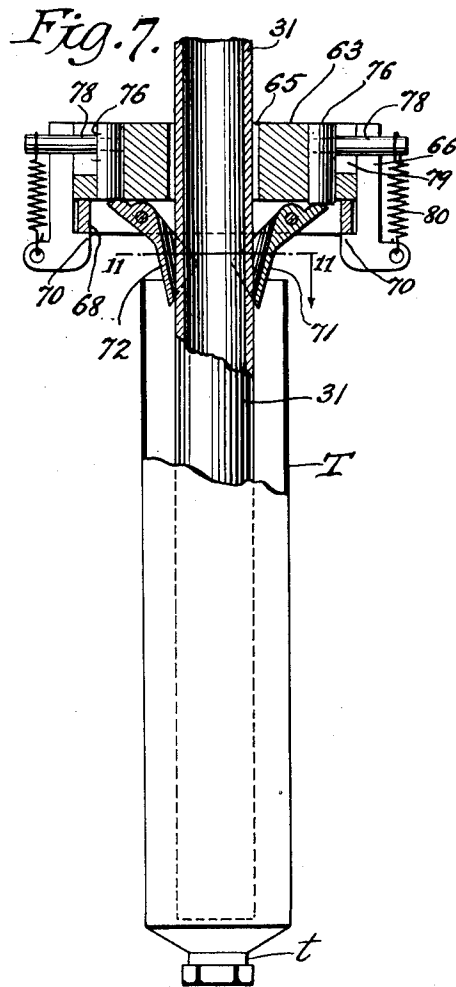
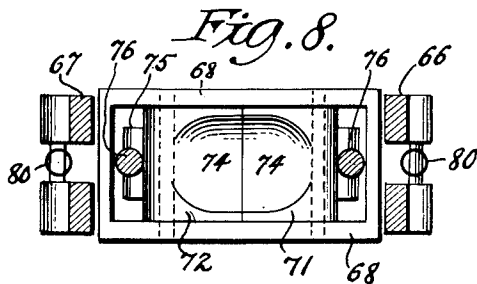
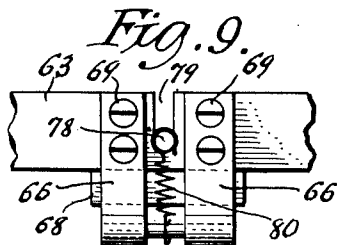
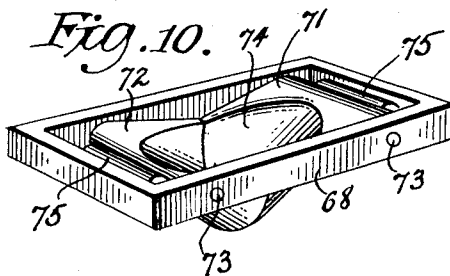
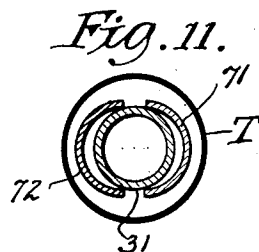
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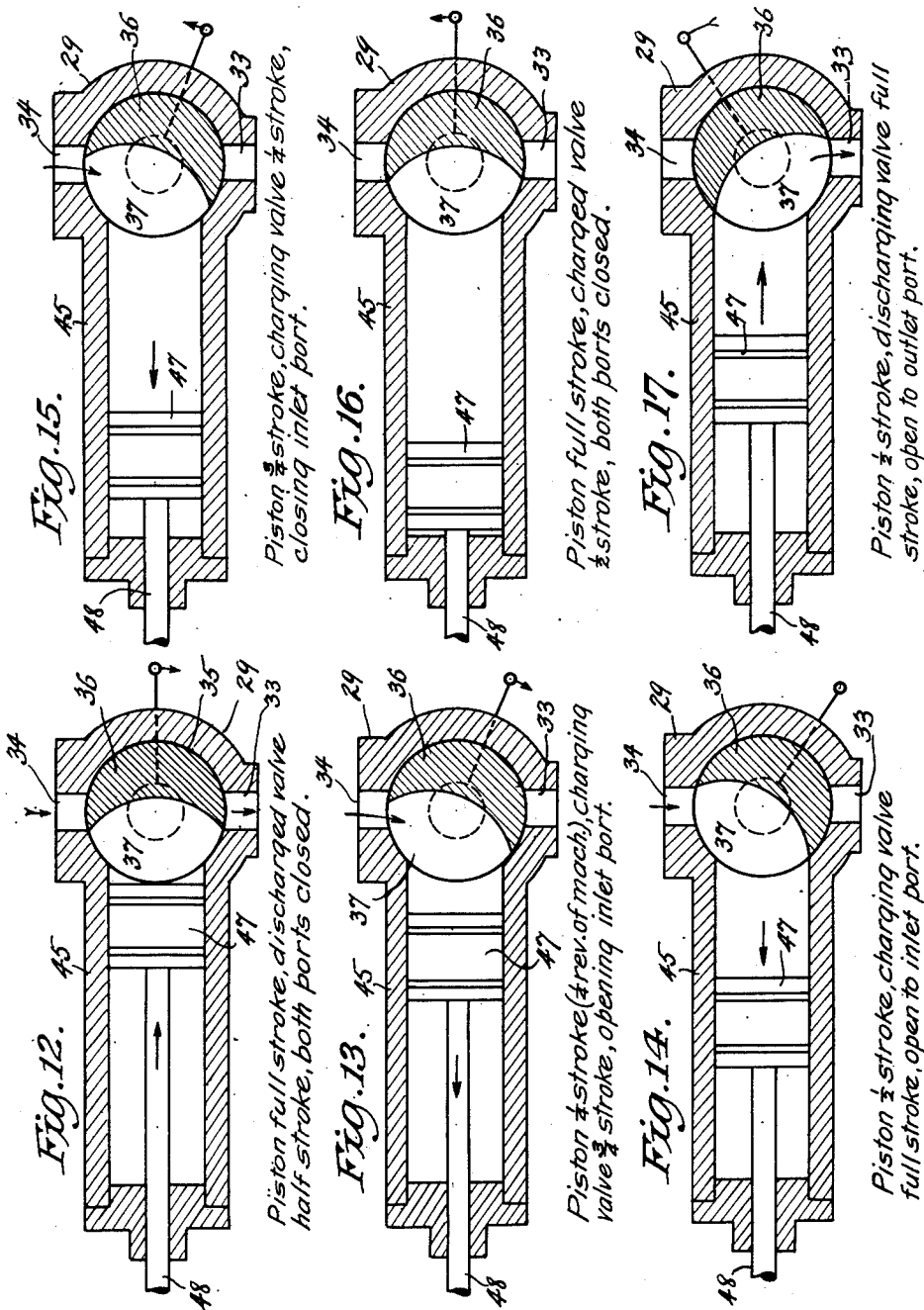
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE.

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FILLING MACHINE.

Application filed December 23, 1921. Serial No. 524,338.

This invention is a filling machine, the same being useful in charging material into a container of one form or another, and being adapted, more particularly, for charging at one operation a plastic material into a number of containers such as collapsible tubes.

One object of the invention is to automatically feed a determined quantity of material, and in a positive manner, from a source of supply to a number of containers, such as collapsible tubes, whereby the operation of filling a number of containers may be performed rapidly and economically.

A further object is to automatically cut off the flow of material to the containers, and to collect the drip of material from the filling tubes, and to provide for ejecting the accumulated material from said collecting and cut off means into the containers, whereby the waste and loss of material is precluded and at the same time the containers remain in a clean condition by the absence of the drip and the filling devices are kept in a sanitary condition.

A further object is to provide for the rapid replacement of a large number of filled tubular containers by a corresponding number of empty tubular containers in a manner to minimize the manual labor in attendance on the machine, thus contributing further to the economy of operation.

A salient feature of the invention is a charging mechanism positioned intermediate a source of supply and a gang of filling tubes, said charging mechanism including a chambered head or member somewhat in the form of a valve chest, a plurality of cylinders and pistons in communication with said chambered head or member, and a valve mechanism seated in said chambered head or member at a point intermediate the intake to said head or member and the outlet from said chambered head or member, together with operating means for imparting movement to said valve mechanism and to the charging pistons in the required times and in due order.

It is preferred to employ as the valve mechanism a single element in the form of a rocking plug seated for rotative movement within the chambered head or member, said rocking valve plug being provided with a plurality of ports corresponding in number to

the cylinders and the filling tubes, and said rotative movement of the valve being so timed with relation to the travel of the charging pistons that the said valve will open and close the intake to the chambered head or member during the stroke of the pistons in one direction, whereas during the stroke of the pistons in the opposite direction said rotative plug operates to open and close the outlet from the chambered head or member to the filling tubes. The valve mechanism and the charging pistons thus mutually co-operate for effecting the feed of material from the source of supply to the filling tubes in a positive manner and in regulated or predetermined quantities, as a result of which the filling tubes are constantly supplied with the material for delivery to the containers, and the material is ejected from the filling tubes into the containers for filling the said containers without loss of time.

The invention consists, further, of a carrier, such as a rack, for the containers, whereby containers in a plurality of rows may be placed manually within the machine and removed in a filled condition therefrom. With said carrier or rack is associated an automatic means for imparting movement to the carrier or rack relatively to the filling tubes, to the end that the material expelled from the tubes will flow into the containers, and fill the latter to a desired level, said automatic means operating to impart a rising and falling motion to the carrier or rack and its load. Co-operating with the carrier or rack is another automatic mechanism operating to impart a step feed to the carrier or rack and its load in a direction transversely to the rising and falling movement, said step feed operating to shift the carrier or rack, and the rows of containers therein, in a manner to present rows of empty containers successively into aligned relation to the filling tubes.

Another feature of the invention is a cut off associated with each filling tube for automatically arresting the outflow of material from said tube into a container. The number of automatic cut offs used in the machine corresponds to the number of filling tubes, and in a practical embodiment of the invention each cut off performs the functions of collecting the material which exudes or drips from the filling tubes, whereby the exterior surfaces of the containers are adapted to re-

main in a clean condition owing to the fact that the material cannot drip from said filling tubes so as to lodge upon the outside of the containers. Each cut off device is so related to its associated filling tube that the material dripping from the tube is collected within the cut off, and in the operation of the mechanism the collected material is ejected from the cut off and deposited within the container, said cut off having a wiping relation to the filling tube.

In a practical embodiment of the invention, the filling tubes are stationary, and the series of automatic cut offs are operated with a rising and falling motion with respect to said filling tubes. In addition to the rising and falling motion specified, each cut off is mounted for a limited play or movement in a direction transversely to the axis of the filling tube with which said cut off is associated. To this end, a member or part is used, hereinafter referred to as a floating frame, and to this member or frame is hingedly connected the leaves of the cut off and the spring mechanism for imparting the closing movement to said leaves. The described means for mounting the cut off mechanism insures the proper engagement of the leaves with the end of the filling tube while functioning, and obviates the necessity in the construction of the machine for nicety of adjustment and accuracy of assemblage to attain the required relation between the filling tubes and the cut offs, each of said cut offs on its return to a normal position being spring actuated for cutting through the stream of material issuing from the filling tubes and thereby arresting the further flow of such material into the container.

Other functions and advantages of the invention will appear from the following description taken in connection with the drawings, wherein—

Figure 1 is an elevation partly in section of a filling machine embodying my invention, the carrier or rack and the tubes therein being in position ready for elevation with respect to the filling tubes.

Figure 2 is a side elevation looking toward the right of Figure 1, with the feed bar in section.

Figure 3 is a plan view partly in horizontal section of the chambered head and a series of charging cylinders supported thereby.

Figure 3* is a side elevation of a part of the machine, illustrating means for actuating the material discharging means, and also illustrating, partly in dotted lines and partly in full lines, means for actuating the valve for controlling the flow of the charge.

Figure 4 is a vertical section taken longitudinally through the chambered head and in the plane of the dotted line 4—4 of Figure 3.

Figure 5 is a vertical cross section through

the chambered head and through one of the charging cylinders and pistons.

Figure 6 is an enlarged sectional view partly in elevation of one of the automatic cut offs in operative relation to a filling tube and to a collapsible tube to be filled with material supplied by the filling tube.

Figure 7 is a sectional elevation of the parts shown in Figure 6 with the cut off mechanism opened and the collapsible tube elevated with respect to the filling tube whereby the collapsible tube is charged with material to a desired level.

Figure 8 is a sectional plan view taken in the plane of the dotted line 8—8 of Figure 6.

Figure 9 is a detail view in elevation of one of the cut off devices.

Figure 10 is a perspective view of the floating frame and the leaves or members of one cut off detached from the machine.

Figure 11 is a horizontal section on the line 11—11 of Figure 7 illustrating the scraping action of the cut off upon the exterior surface of one of the filling tubes.

Figures 12 to 17, inclusive, are diagrammatic views of the charging mechanism illustrating the various stages in the operations of the rotative valve and one of the series of pistons within one of a series of charging cylinders; said Figures 12 to 15 showing that the valve opens and closes the intake to the head during the travel of the piston in one direction for filling the cylinders, whereas Figure 16 shows that the valve is closed at the outstroke of the piston, and Figure 17 shows that the valve opens the outlet from the head to the filling tubes during the piston travel in an opposite direction.

The several mechanisms are supported in or upon an appropriate frame shown generally as comprising side members 10, 11, and cross members 12, 13, 14, although the detailed construction of the frame is not material and may be modified as desired.

The side frame members are provided with appropriate bearings for a drive shaft 16, shown as driven from a motor 17 through a worm 18 and worm gear 19, the latter being shown in Figure 1 as being provided with a box cam 20, in the groove of which rides a roller on the lower end of a rocking lever 21, the function of which is to operate a cramp plate 22 for imparting a step feed motion to the container carrier or rack 23. Said drive shaft is provided, also, with box cams 24, 25, positioned intermediate the side frame members 10, 11, and said shaft is provided, furthermore, with the crank disks 26, 27, see Figure 2, the functions of which will be described.

Positioned at the upper part of the frame, and attached fixedly to the side members thereof, is a feed receptacle 15, to which is connected a feed main 28, leading from a source of supply (not shown) for the mate-

rial to be supplied to the containers which are adapted to be held within the carrier or rack 23.

Below this receptacle, and attached fixedly in a suitable way to the frame, is a chambered head 29, the same constituting a member of the charging mechanism whereby the material is supplied under pressure to the containers to be filled. Said chambered head is connected with the feed receptacle by a plurality of short feed tubes 30, and from this chambered head depend a plurality of filling tubes 31, the latter being shown as positioned in alinement vertically with the feed tubes 30, see Figures 1 and 5. The depending filling tubes are free, or substantially so, at their lower end portions, to permit the containers to be filled, to have free movement relatively to said filling tubes. As shown, the filling tubes are attached fixedly to the chambered head, at 32 on the under side thereof, and each filling tube is in free communication with one of a series of ports 33 provided in said chambered head, said ports 33 constituting the outlets from the chambered head to the filling tubes. The branch feed pipes 30 are fixedly attached to the receptacle 15 and to the chambered head, said pipes being in free communication with ports 34 which serve the function of an intake to the chambered head.

Positioned intermediate the intake 34 and the outlet 33 is a valve mechanism by which the movement of the material is controlled so as to feed said material under pressure and to insure a full and ample supply of said material at all times to and within the filling tubes. With a valve mechanism of one form or another co-operates a plurality of charging cylinders and pistons whereof the pistons are positively operated for filling the cylinders to any extent desired with the material and for ejecting the material from said cylinders so as to force the same under pressure into the filling tubes, whence the entering material displaces similar material already contained in the filling tubes, whereby the material is forced under pressure from the filling tubes into the containers by the action of the charging mechanism and the quantity of material thus expelled from the filling tubes is commensurate to the capacity of the containers, insuring the expeditious filling of the containers and an equal supply of material to all the containers.

Recurring now to the valve mechanism, it is preferred for simplicity, economy and efficiency to employ a valve comprising a single rotatable element in the form usually termed a plug valve, and to this end the chambered member 29 is provided intermediate the intake 34 and the outlet 33 with a bore 35 of circular cross section, the same constituting a seat for the plug 36 and said seat extending for practically the length of the cham-

bered head 29, the valve seat 35 intersecting with the ports 34 forming the intake and with the ports 33 constituting the outlet, see Figures 1, 5 and 12 to 17, inclusive. Said valve plug is provided with passageways 37 at intervals corresponding to the ports 33, 34, each passageway being of arcuate formation and of such cross sectional area as to provide for the free flow of the material through the same. The valve plug is given an oscillatory or rocking movement timed with respect to the charging pistons, which are timed with respect to the rising and falling motion of the container carrier or rack. As shown in Figures 4 and 5, the valve plug is fitted within the seat 35 for a snug fit therein and is rotatably supported within the head 29 and within an opening 37^a provided in a frame member 10. At one end, the valve plug has a journal 38 fitted in a cap 39 attached to the frame member 10, whereas at the other end, said valve plug is provided with a short shaft 40 finding a bearing in an opening 41 provided in frame member 11, see Figure 4. A crank arm 42 is made fast to the protruding end of valve shaft 40, and this arm is pivotally attached to the upper end of a rod, 43, the lower end of which is loosely fitted on a wrist-pin 44, see dotted lines in Figure 3^a, of the crank disk 27, see Figures 2 and 4, whereby the valve plug is operated with a positive movement so as to be rotated on its longitudinal axis.

Associated with the chambered head 29 is a series of cylinders 45, the number of which corresponds with the feed pipes and the filling tubes. Said cylinders are positioned horizontally, or substantially so, and are attached fixedly to the chambered head for communication with the valve ports 37 in a certain position or positions of the rocking valve, said cylinders being in the same vertical plane as the feed pipes and the filling tubes taken transversely through the chambered head, see Figures 3 and 5. Each cylinder is closed at the outer end by a cap 46, and within each cylinder operates a piston 47, the rod 48 of which passes through an opening of the cylinder head. The pistons 47 of the series are moved by a piston-operating bar 49 to which is attached the outer ends of the piston rods, see Figures 3, 3^a and 5, and to the end portions of this bar are connected by links 49^a crank arms 50 carried by a rock shaft 51, the latter being journaled in suitable bearings of the frame sides 10, 11. Said rock shaft is provided with an arm 53 having a slot 54, see Figure 1, in which slot is fitted a connecting pin 55 by which a vertical rod 56 is connected to the arm 53, the lower end of said vertical rod being attached to the wrist-pin 57 of the crank disk 26, see Figure 3^a, whereby the motion of the shaft 16 is communicated through the described train of connections to the series of pistons 47 for im-

parting reciprocating motion thereto in time with the rocking motion of the valve 36.

Referring now to the container carrier or rack 23, the same is shown in Figures 1 and 2 as a skeletonized frame composed of a base member 23^a and a plurality of other members 23^b suitably attached and adapted for introduction and removal as a unit. The carrier or rack is adapted for holding containers of suitable construction and form, but in the present instance such container is shown as a collapsible tube T the capped end *t* of which is fitted in an opening of the base member 23^a, see Figure 1, whereby the collapsible tube is held in a vertical position with the open end uppermost, see Figures 6 and 7. Said carrier or rack is constructed for holding the containers in a number of rows, the containers of each row being spaced correspondingly to the filling tubes. The carrier rests upon rails 58, two being shown in Figure 2 as comprising angle irons positioned horizontally below the filling tubes 31 and parallel to each other. The rails are fixedly attached to the enlarged upper ends 59 of vertically movable slides 60, one at each side of the machine, said slides being fitted in guide ways or boxes 61 fixedly attached to the frame members 10, 11, on the inner sides thereof. The lower ends of the slides extend below the guide ways or boxes, and to said lower ends are attached rollers 62 (see dotted lines in Figures 1 and 2) positioned in the grooves of the box cams 24, 25, on the drive shaft 16, said cams being so fashioned as to impart vertical reciprocating motion to the slides 60 and rails 58 for giving a rising and falling motion to the carrier or rack with respect to the filling tubes 31.

The automatic cut offs for the filling tubes 31 are carried by a horizontal rail or bar 63, Figures 1, 2, 6, 7, 8 and 9, the same being positioned above the channel rails 58, the plane of said rail 63 being parallel to the plane of the rails 58 and at right angles to said rails. Said rail or bar is supported fixedly on the channel rails 58 by short posts, 64, shown in Figure 2 as being attached to the end portions of bar 63 and to the channel rails 58 intermediate the ends thereof. Said rail or bar 63 is provided with openings 65 corresponding in number to the filling tubes 31, each opening slightly exceeding the diameter of the tube, whereby said filling tubes pass through the openings in the bar or rail and the latter is adapted for sliding motion with respect to the tubes, the rail or bar partaking of the rising and falling motion of rails 58 and rack or carrier 23.

The rail or bar 63 is provided with hangers 66, 67, for the movable frame member 68 associated with each cut-off of the series of cut-offs carried by said bar or rail. Said hangers 66, 67, are fastened at 69 to the respective side edges of the bar or rail, the

hangers being positioned in a plane transversely to the bar and said transverse plane intersecting the opening 65 of said bar. The hangers are used in pairs, the hangers of each pair being in parallel relation, see Figures 8 and 9, and the hangers 66, 67, are provided at their lower ends with lugs 70, said lugs of the hangers extending inwardly and affording a support for movable or "floating" frame 68. The lugs 70 are below the under face of the bar or rail so as to be spaced relatively thereto for a distance equal to the depth of the frame 68, and the hangers 66, 67, are spaced or separated for a distance exceeding the length of said movable frame. The frame 68 is thus supported by the hangers for contact with the under side of the rail or bar 63, said frame 68 resting upon the lugs 70 and being free to adjust itself in a horizontal plane with respect to the hangers, to the bar or rail, and to the filling tube. As shown in Figures 8 and 10, the floating frame 68 is a rectangular skeletonized member adapted for the support of the cut off leaves, the frame or member 68 being below the opening 65 in the rail 63 for the filling tube to pass through the frame without coming into contact therewith.

The cut off itself comprises complementary leaves or members 71, 72, each hung for pivotal movement on an axis afforded by a pin 73 which passes through the leaf or member and is attached to the floating frame 68. Said members or leaves are so fashioned as to produce depressions 74 on the upper surfaces thereof, and said leaves are relatively positioned as to occupy an inclined relation and to meet or register at their inner adjacent ends, as shown in Figures 6, 8 and 10. Each member or leaf is elliptical in cross section so as to form the depression. In the closed positions of leaves 71, 72, below the lower open end of the filling tube, said leaves meet or register so that the cut off forms a collecting pocket or receptacle (see Figure 6) within which pocket material dripping or exuding from the filling tube is accumulated, thus precluding the material from dripping out of the filling tube and lodging upon the containers T or upon parts of the machine. The formation of the leaves 71, 72, is such that they are adapted to fully engage with the end of a filling tube when the cut off passes from a closed position to an open position, as a result of which the end face of the filling tube has a wiping contact with the surfaces of the hinged leaves, and thus the material collected within the hinged leaves is ejected from the cut off into the container at the initial stage in the upward movement of the cut off, such contact of the leaves with the filling tube in the upward movement of the cut off operating automatically to open said cut off.

The leaves or members are shown as being

provided with lugs or flanges 75 projecting beyond the pivots 73, and upon these flanges are seated plungers 76 fitted for vertical movement in apertures 77 provided in the bar or rail 63. said plungers being provided with pins 78 which are fitted for slidable movement in notches 79 also provided in the bar or rail 63. Springs 80 are connected to the pins 78 of the plungers, said springs being anchored on the hangers 76, 77, in a suitable manner.

When the rail or bar 63 moves to a lowered position, as in Figures 1, 2 and 6, each cut off is closed by spring pressure across and below the open end of the filling tube so as to cut through the stream of material and to preclude the further exit of material from said tube. The upward movement of the cut offs with the rail or bar presses the leaves or members of said cut offs against the lower ends of the tubes, the leaves thus spreading apart and opening outward automatically; and during this opening movement of each cut off at the beginning of the upward movement relatively to the filling tube, the end portion of said tube has wiping contact with the depressions of the hinged leaves, so as to eject the material, which may have accumulated in the cut off, from the cut off and directly into the container below the filling tube and in telescopic relation thereto. By mounting each cut off on a frame which is free to move in a horizontal plane in any direction, the cut off adapts or adjusts automatically to the position of the suspended filling tube, but this automatic shifting adjustment of the leaves and the frame has no effect upon the spring mechanism the parts of which are normally active in applying pressure to the pivoted leaves notwithstanding the movement of said leaves and the floating frame 63 in adapting the cut off to the position of the filling tube.

The carrier or rack 23 is moved along the channel rails by means actuated by the cam driven lever 21 operating to impart a step feed to said carrier for the purpose of presenting the rows of empty containers successively into registration or alinement with the filling tubes. A feed bar 81 is positioned horizontally between the heads 59 of slides 60 and adjacent the channel rails 58, said feed bar being supported for sliding movement in openings provided in members 13, 14, of the frame. At one end, the feed bar is provided with an upstanding member 82 against which the carrier or rack is adapted to be placed, so that in the movement of the bar 81 toward the left in Figure 1 said member 82 serves the function of a pusher in imparting sliding movement to the rack or carrier along the channel rails. The feed bar 81 is square or rectangular in cross section, see Figure 2, and the cramp plate 22 is provided with an opening 22^a the shape

of which corresponds to that of the bar and the dimensions of which opening exceeds the cross sectional area of said bar. The bar passes through the aperture of the cramp plate so that in the vertical position of the cramp plate the latter fits loosely on the bar, said cramp plate co-acting with a stop 84^a to limit the pivotal movement of said cramp plate in one direction, so as to prevent it from turning too far to the left in Figure 1. When the cramp plate is turned to assume an angular position with reference to the axis of the feed bar, as shown in Figure 1, the edges of the aperture 22^a bind tightly on the feed bar so that in the further pivotal movement of the cramp plate, the latter acts to impart sliding movement to the feed bar for a definite distance, the extent of the movement thus given to the feed bar by the action of the cramp plate being equal to the distance between the centers of the collapsible tubes in successive rows contained within the carrier or rack 23. The cramp plate is hung intermediate its ends by a pin bolt 83 by which the cramp plate is connected pivotally to a link 84, the latter being pivoted at 85 to the upper end of cam-driven lever 21, which lever is fulcrumed intermediate its ends by a pin or bolt 86 supported in a bracket or lug 87 fixed on the cross rail 12 of the frame. Provision is made for manually releasing the cramp plate from the feed bar in order that said bar and the pusher member may be returned by hand to an initial position. As shown, a release rod 88 is connected loosely to the lower end of the cramp plate 22, as at 89, said rod passing loosely through a guide 90 depending from the feed bar. The release rod 88 is provided with a handle 88^a, and the pusher member 82 is also provided with a handle 82^a, for the convenient operation of said parts by hand.

The operation is as follows: The carrier or rack is filled with containers, such as collapsible tubes T, and deposited upon channel rails 58 for contact with the pusher member, the first row of containers being below the filling tubes 31, which tubes are charged with the material, such as dental paste, face cream, or any other material susceptible of being handled by the machine. The cut offs are closed below the filling tubes so that each cut off forms a pocket or receptacle within which collect any of the material that drips from the filling tube. The rocking valve and the pistons of the charging mechanism are operated in due order to open the intake to the chambered head and close the outlet therefrom for the purpose of drawing charges of material into the cylinders during the outstroke of the pistons, whereupon the valve is rocked for shutting off the intake and opening the outlet, and at the required time the pistons are moved inward for expelling the

charges of material from the cylinders and through the chambered head into the filling tubes. The channel rails 58 are raised by the slides and cam so as to lift the loaded rack 23 and simultaneously therewith the rail 63 and cut offs are lifted with the rack, said cut offs being pressed open by the resistance of the filling tubes, and said cut offs being lifted relatively to the filling tubes. At the initial upward movement of the series of cut offs, with the rail 63 and the loaded rack, the ends of the filling tubes have wiping contact with the depressions of the leaves 71, 72, thus ejecting the material collected by each cut off from the leaves 71, 72, directly into the associated container T, said containers T being lifted by the rack in the upward movement thereof whereby the containers are adapted for telescopic movement relatively to the filling tubes. The containers are thus lifted by the rack for raising said containers until the filling tubes reach nearly to the bottoms of the containers, see Figure 7. Upon the descent of the containers with the rack, the valve 36 is rotated to the position for opening the communication between the charging cylinders and the outlet in the chambered head, and concurrently therewith the charging pistons are moved inwardly with respect to the cylinders, thus forcing into the filling tubes charges of material which flow under pressure from the filling tubes into the containers until the series of containers in one row of the rack are filled with material to the desired level. By feeding the material from the filling tubes into the containers during the period of the downward movement of said containers with the rack, and by beginning the feed of material into the containers when they occupy the raised positions of Figure 7 relatively to the filling tubes, the material flowing into the containers meets with no resistance from the air present within the containers, the rate of flow of the material into the containers being proportionate to the downward travel of the containers and the rack, and such flow of the material being due to the travel of the charging pistons. By imparting telescopic movement to the containers relatively to the filling tubes, the material is wiped from the cut offs and is discharged from the filling tubes directly into the containers, the volume of material passing from the filling tubes into the containers being determined by the charging cylinders and pistons so that all the containers of a row are filled to a desired level and with the required quantities of the material. On the downward movement of the containers with the rack, the cut offs travel with the bar 63 and the leaves 71, 72, of said cut offs slide upon the outer surfaces of the filling tubes; but as the containers approach the fully lowered positions, said cut offs are closed by spring pressure across and below the delivery

ends of the filling tubes, each cut off operating to cut through the stream of material and to close the lower end of one filling tube, so as to preclude the further egress of the material. During the period of rest intervening the fall of the rack and the next rise thereof, the cut offs remain at rest below the filling tubes for the purpose of collecting the material which may drip from the filling tubes. The cam 20 acts on the lever 21 for imparting movement to the cramp plate 22 and the feed bar 81, so that the pusher member 82 forces the rack along the channel rails 58 for a distance necessary to move the filled row of containers out of alinement with the filling tubes and to bring the next row of empty containers into alinement with said filling tubes, whereupon the operations are repeated for charging the second row of containers with the material. In the continued operation of the machine, the rows of containers present in the rack are filled successively until all the containers are charged, whereupon the attendant operates the release rod 88 to free the cramp plate 22 from the feed bar, and operates, also, the pusher member 82 for drawing the feed bar and the loaded rack back to the starting position depicted in Figure 1. The rack with the filled containers is now lifted out of the machine, and a fresh rack, loaded with empty containers, is placed within the machine to rest upon the channel rails 58 and for the pusher member 82 to contact with said rack.

The valve 36 and pistons 47 of the charging mechanism mutually co-operate in positively ejecting the material into the filling tubes, and in determining the quantity of material forced into said filling tubes upon each complete in and out movement of the pistons. In the initial positions of the valve and pistons, see Figure 12, the outlet 33 and intake 34 of the chambered head are closed by the valve, the ports 37 of which face the cylinders and the pistons 47 are completing the instroke. In the cycle of operations, the valve rocks to a number of successive positions to graduate the area of the port in said valve according to the piston speed, one of which positions is shown in Figure 13, the arrow in which shows the piston at the beginning of the outstroke and the valve is partly open at the intake and fully closed at the outlet, whereby the valve opens the intake to, while closing the outlet from, the chambered head; said valve reaching the full open position with respect to the intake when the pistons are at one-half the outstroke movement, see Figures 3^a and 14, at which time the pistons are moving at the greatest speed due to the action of the crank motion 44 and disk 27, and then said valve turns to begin its reverse motion (for closing the intake) when the pistons are near the end of the outstroke thereof, see Figure 15. The cylinders are

thus filled with material upon the outstroke of the pistons, the latter drawing the material through the branch pipes 30 from the receptacle 15. By the time the pistons reach the limit of the outstroke (Figure 16), the valve 36 will have turned to close the intake 34 and the outlet 33, but as the pistons begin the instroke, the valve continues to turn so as to open the outlet 33 while closing the intake 34, so that by the time said pistons will have made one-half of their instroke, see Figure 17, the valve will have turned to fully open the outlet 33, thus making provision for the free movement of the material, under the impulse of the pistons, from the cylinders into the filling tubes, said valve being slowly in motion but opening the way as in Figure 17 for the flow of material to the filling tubes during the greater portion of the instroke of the pistons. The valve and the pistons are, for practical purposes, continuous in operation due to the action of the crank motions, although the speed of movement may vary, noticeable more especially in the case of the pistons. In the cycle of operations, the valve turns, finally, to the position of Figure 12 at the time the pistons reach the end of the instroke, in which Figure 12 the valve closes the outlet 33 prior to opening the intake 34 upon the next outward movement of the pistons.

The position of the crank arm 42 during the above-described operations, is indicated in Figures 12 to 17 by the dotted lines extending from the axis of the valve, and the direction of revolution thereof is indicated by the arrows associated with said dotted lines.

It will be noted that the charging pistons and the rocking valve are operated by separate crank devices acting to synchronize the movement of the valve with the stroke of the pistons, the relative movements being so timed that the valve is wide open at the period that the pistons travel at greatest speed, but as the speed of the pistons decrease, the valve is approaching the closing position, and said valve is fully closed by the time the pistons reach the end of the stroke. The foregoing functions and operations of the valve and the charging pistons apply to the relative movements of the valve and said pistons as the pistons travel in first one direction and then in an opposite direction.

Having thus fully described the invention what I claim as new and desire to secure by Letters Patent is:

1. In a filling machine, the combination with a filling tube, of a member movable relatively thereto, and a cut-off separate from the filling tube and supported by said member for movement therewith, said cut-off embodying a plurality of co-operable parts movable into contact substantially with each other below said filling tube and said filling tube and said co-operable members being positioned for

wiping contact with the exterior surfaces of said filling tube on the movement of said member and the cut-off relatively to said filling tube.

2. In a filling machine, the combination with a filling tube, of a member movable relatively thereto, and a cut off carried by said member for movement with respect to said filling tube, said cut off embodying a plurality of leaves normally contacting with each other and adapted, on the initial movement of the member, to be opened automatically by the filling tube.

3. In a filling machine, the combination with a filling tube, of a member movable relatively thereto, and a cut off embodying a plurality of spring-controlled members adapted to be held normally in contact with each other relatively to the open end of the filling tube and to be opened by the resistance of said filling tube when said cut off and the member are moved relatively to said filling tube.

4. In a filling machine, the combination with a filling tube, and a member movable relatively to said filling tube in the direction of the flow of material therethrough, of a cut off positioned for closing the delivery end of said tube, and means for supporting said cut off for floating movement in a plane transverse with respect to said tube.

5. In a filling machine, the combination with a filling tube, of a cut off embodying members and actuating means therefor operating to close the delivery end of the tube, and floating means for supporting the cut off members, said supporting means being adapted for movement in a plane transverse to the longitudinal axis of said tube.

6. In a filling machine, the combination with a filling tube, and a member movable relatively thereto, of a cut off supporting member operatively connected with said first member for movement in a plane transverse to the longitudinal axis of the tube, and a cut off carried by said cut off supporting member for movement therewith, said cut off including members adapted to be opened automatically by a relative movement between the filling tube and the cut off.

7. In a filling machine, the combination with a filling tube, of a cut off embodying a plurality of members separate from the filling tube and normally retained in closed relation thereto, and means for effecting a relative movement between the filling tube and the cut off, said cut off being opened automatically by contact of the filling tube with said members of the cut off.

8. In a filling machine, the combination with a filling tube, of a bar or rail movable relatively thereto, a floating frame supported by the bar or rail for movement in a plane transverse to the filling tube, and a cut off embodying spring actuated members supported by the floating frame.

9. In a filling machine, the combination with a filling tube, of a bar or rail movable relatively thereto, a floating frame, a tube-embracing cut off embodying hinged leaves
5 carried by said floating frame, and pressure devices supported by the bar or rail and positioned for co-operative relation to said hinged leaves of the cut off during the movement of said cut off with the floating frame.

10 10. In a filling machine, the combination with a plurality of filling tubes, of a member movable relatively thereto, and a plurality of tube-embracing cut offs, one for each filling tube, carried by the member, each cut off
15 being separate from the filling tube and said cut off embodying a plurality of leaves adapted to be opened by the tube when moved relatively thereto.

11. In a filling machine, the combination
20 with a plurality of filling tubes, of a rail through which said tubes are free to pass, means for imparting a rising and falling motion to said rail, and a plurality of cut offs, one for each tube, carried by said rail, said
25 cut offs being separate from the tubes and each cut off co-operating with a tube for closing the delivery end thereof.

12. In a filling machine, a filling tube, a cut-off embodying a plurality of members
30 mutually operable for cutting through a stream of material adapted to flow from said tube, and tension means for said members of the cut-off whereby the cut-off members are adapted to contact with each other below said
35 filling tube, and said members have wiping contact with said filling tube upon a relative movement between the cut-off and the filling tube.

13. In a filling machine, a filling tube, a
40 cut-off embodying pivoted leaves or members mutually co-operable in cutting through a stream of material below the exit from said filling tube, means for moving said cut-off relatively to said tube, said cut-off members
45 having wiping contact with the exterior of the filling tube upon such relative movement, and means for moving said cut-off members into substantial contact with each other below the exit from said filling tube.

50 14. In a filling machine, the combination with filling tubes, and a slideway, of a carrier or rack movable on the slideway, a pusher member co-operable with said carrier or rack, a cramping member co-operable with the

pusher member, said cramping member being supported in its out of service position by said pusher member and said cramping member operating on its effective stroke to impart movement to said pusher member, and means for actuating the cramping member. 60

15. In a filling machine, the combination with a plurality of filling tubes, and a slideway in a plane transverse to said tubes, of a pusher, a cramp plate co-operating with said pusher, means for actuating the cramp plate, 65 said cramp plate being pivotally mounted on its actuating means, and a rack or carrier in contacting relation to the pusher.

16. In a filling machine, a filling tube, a cut-off embodying a plurality of spring-controlled members adapted for contact one with the other below the exit from said filling tube, and means for effecting a relative movement between said cut-off and the filling tube, whereby said cut-off members have wiping 75 contact with said filling tube for removing from the surfaces of said filling tube the material adhering thereto.

17. In a filling machine, a filling tube, a cut-off embodying a plurality of members mutually co-operable for cutting through material below the exit from said tube, and means whereby relative movement between the filling tube and the cut-off acts to position said tube and the cut-off members in wiping contact. 85

18. In a filling machine, a filling tube, a cut-off embodying a plurality of members mutually adapted for contacting engagement below the exit from said filling tube, and actuating means for effecting a relative movement 90 between said cut-off and the filling tube with periods of rest intervening said movement, said members of the cut-off being separated from such contacting engagement with each other during the periods of said relative movement and said members at such periods of 95 relative movement having wiping contact with said tube.

19. In a filling machine, the combination with a filling tube, of a cut off movable relatively to said tube lengthwise thereof, and means for mounting said cut off for free play or movement in a direction transversely to the longitudinal axis of the filling tube. 100

In testimony whereof I have hereto signed my name this 21st day of December, 1921. 105

CHARLES S. WEEKS.