

May 19, 1942.

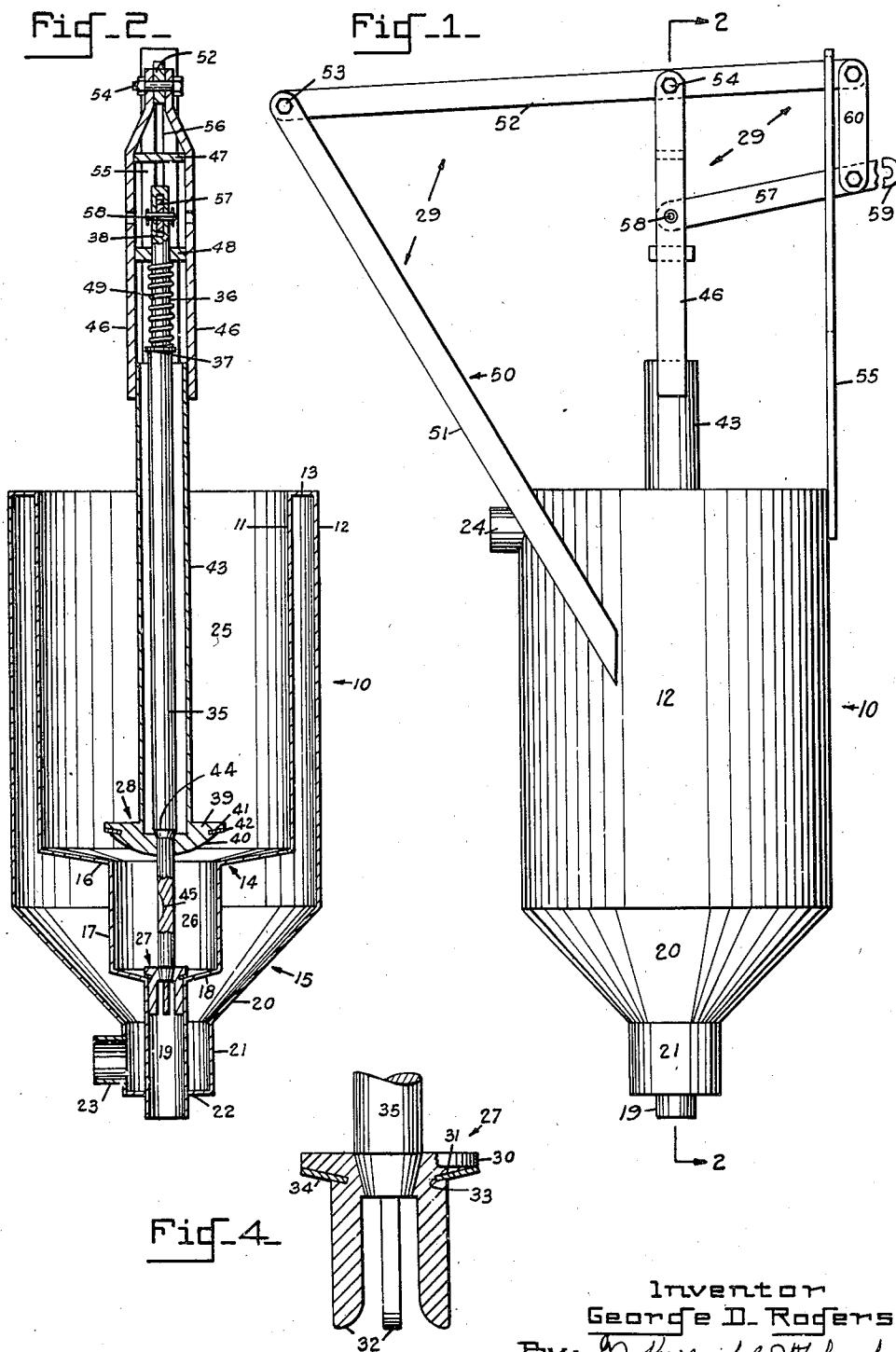
G. D. ROGERS

2,283,230

FILLING DEVICE FOR SHELLS

Filed Dec. 9, 1940

4 Sheets-Sheet 1



Inventor
George D. Rogers
By: *J. H. Hosenick & J. H. Church*
Attorneys

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Fig-3-

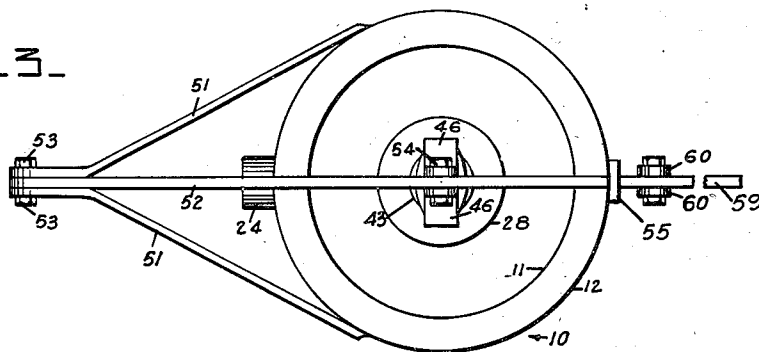
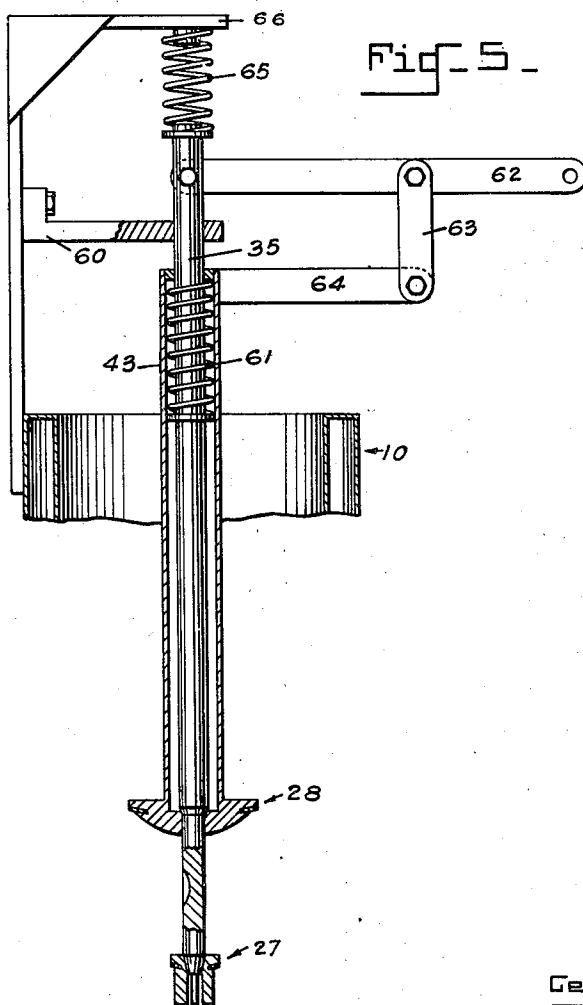


Fig-5-



Inventor
George D. Rogers
By: *DJ. Kessenich & J. H. Kunk*
Attorneys

May 19, 1942.

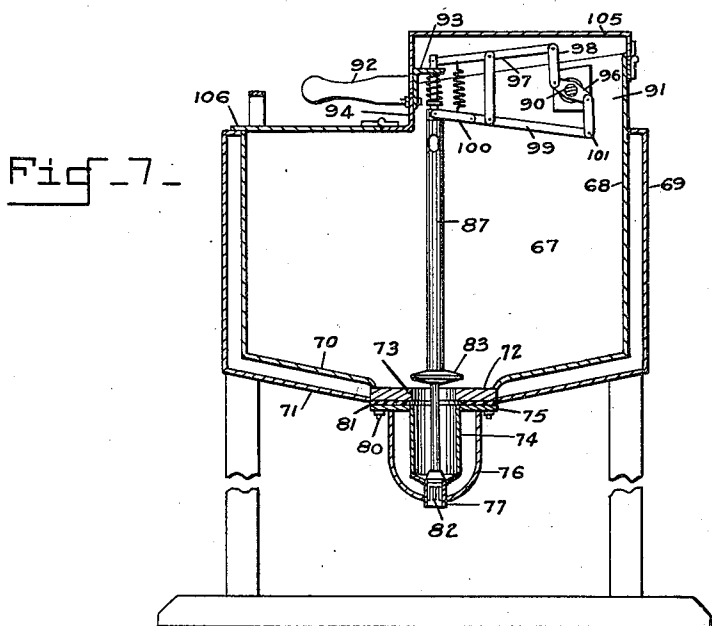
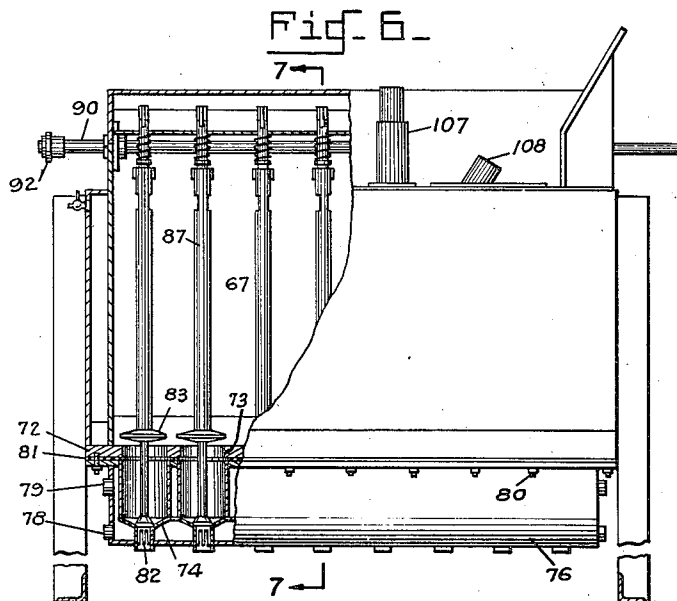
G. D. ROGERS

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4 Sheets-Sheet 3



INVENTOR
George D. Rogers
BY *D. J. Kessenich & J. M. Kunk*
ATTORNEYS

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Fig. 6.

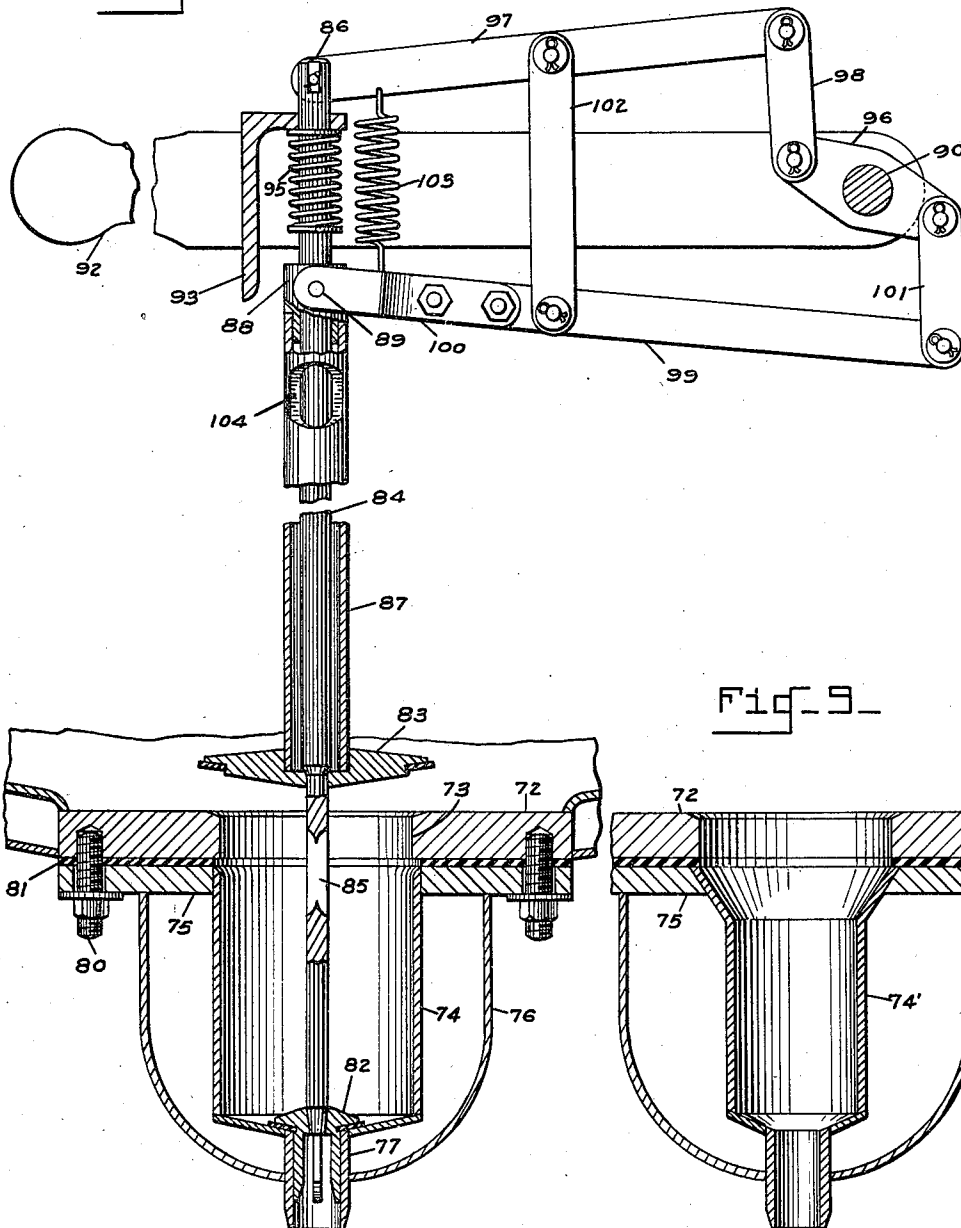


Fig-9.

INVENTOR

George D. Rodgers

BY G. J. Kessenich & JOB Kunch

ATTORNEYS

UNITED STATES PATENT OFFICE

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FILLING DEVICE FOR SHELLS

George D. Rogers, United States Army,
Dover, N. J.

Application December 9, 1940, Serial No. 369,271

10 Claims. (Cl. 221-112)

(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 me of any royalty thereon.

This invention relates to a measuring device which is particularly adapted to be used in measuring and dispensing predetermined volumes of explosive filler for introduction in explosive shells or bombs, but is not limited to the single purpose stated as it is also of utility in measuring predetermined volumes or bulks of any desirable fluent material.

It is an object of the invention to provide a simple, efficient and improved device for intermittently measuring predetermined volumes of fluent material, positive in its action, and having the moving parts arranged in compact functional relation so arranged as to permit ready and thorough cleansing.

Fig. 1 is a side elevation of a measuring device embodying the concept of this invention;

Fig. 2 is a vertical sectional view taken on the line 2-2 of Fig. 1 looking in the direction of the arrows;

Fig. 3 is a top plan view of the structure shown in Fig. 1;

Fig. 4 is an enlarged fragmentary view of the lower valve of Fig. 2 shown partially in section;

Fig. 5 is a partial section of the measuring device showing a modified valve actuating linkage in elevation;

Fig. 6 is a view partially in elevation and partially in section showing a gang measuring device embodying another modified valve actuating linkage;

Fig. 7 is a sectional view taken upon the line 7-7 of Fig. 6;

Fig. 8 is an enlarged view showing the details of one of the valve actuating linkages of Figs. 6 and 7, and

Fig. 9 is a view of a modified measuring sump or cup for use with the device shown in Figs. 6 to 8.

Referring now to the drawings by characters of reference and more particularly to Fig. 2 there is disclosed a container or reservoir generally indicated at 10, which may be of any desirable configuration, volume and construction; but, herein shown for the purpose at hand as comprising a generally cylindrical structure having spaced parallel inner and outer side wall members 11 and 12 joined at their upper edge portions by an annular plate 13 in sealed relation and having bottom portions indicated generally

at 14 and 15, respectively, disposed in spaced relation.

The bottom portion 14 includes an annular inwardly sloping member 16 concentrically secured at its outer peripheral portion to the wall 11 in sealed relation and a cylindrical depending measuring cup or sump 17, of any predetermined volume secured at its upper peripheral edge portion to the inner peripheral portion of the annular member 16 in flush and sealed relation. The bottom portion of the cup 17 is inwardly inclined conveniently on substantially the same slope as the annular member 16 and has secured thereto in coaxially disposed relation a depending tubular outlet member 19. The outer bottom portion 15 comprises the inwardly sloping member 20 secured at its outer peripheral portion to the lower edge portion of wall member 12 in sealed relation and an integral or similarly affixed cylindrical depending member enclosing the outlet member 19 in spaced coaxial relation with the lower portion intumed or provided with a flange as at 22 secured to the tubular outlet in sealed relation.

Inlet and outlet couplings 23 and 24 are affixed to the depending cylindrical member 21 and wall member 12, respectively, which provides for the circulation of a suitable heat transfer medium between the spaced walls of the reservoir if desired.

Mechanism for first cutting off intercommunication between the reservoir or storage chamber 25 and the measuring chamber 26 formed by the measuring cup or sump 17 and thereafter establishing intercommunication between the chamber 26 and outlet 19 and vice-versa is provided which comprises a pair of reciprocal valves 27, 28 and a suitable linkage generally indicated at 29 adapted to relatively reciprocate the valves in proper relation.

Valve 27, which closes the ingress opening of the tubular outlet 19 attached to the cup 17, comprises a circular valve element 30 press fitted on the valve stem 35 and having a lower inwardly inclined surface 31 corresponding substantially with the slope of bottom 18 of the measuring cup and a plurality of circumferentially spaced depending clearing fingers 32 disposed coaxially of the element 30 on a radius adapting them to snugly fit within the tubular outlet member 19. The junction of the outer surfaces of fingers 32 with the surface 31 of the valve element is undercut to form an annular groove 33 adapted to receive a gasket 34 of any suitable character and a valve stem or actuating rod 35 is coaxially

secured to the upper face of the valve element 30 extending upwardly to a suitable position without the reservoir where it is terminated in a portion of reduced section 36 forming the shoulder 37 and having a transverse opening 38 there-through in proximity of its upper end.

The valve 28 closes the ingress opening of the measuring cup 17 leading from the reservoir chamber 25 and comprises an annular valve element 39 provided with a lower spherical surface 40 adapted in the seated position of the element to slightly protrude into the chamber 26 to compact the material therein and force occluded gases in the material through a vent as herein-after more particularly described. Valve element 39 is slidably fitted over the valve rod 35 in snug relation and has its spherical face 40 undercut at 41 to receive an annular gasket 42 of any suitable character adapted to seat upon the inner edge of the annular bottom forming member 16 in fluid sealed relation. A valve actuating stem 43 of tubular section is secured to the upper face of valve element 39 and extends upwardly to a position without the reservoir in concentric relation to the valve stem or rod 35 where it is terminated adjacent the shoulder 37 on the latter rod. The valve stem 35 is also formed to provide a stop 44 so that when the valve 28 assumes the position shown in Fig. 2 it will engage the stop 44 and prevent further relative movement of the valves 27 and 28 upon exertion of an upward force on the valve stem 43 urging the valve 28 to a position above which it occupies in Fig. 2. Valve 28 and the cooperating portion of valve stem 35 form a snug sliding fit to prevent flow of material in the reservoir chamber into the tubular valve stem 43 when the valve 28 is in the raised position shown. Intermediate the valves 27 and 28 the valve rod 35 is grooved as at 45 in such manner that the groove will establish intercommunication between the chamber 26 and interior of valve stem 43 when the valve 28 is in its seated position and the valve 27 is in its raised position whereby chamber 26 will be in unobstructed communication with atmosphere through the tubular valve stem 43.

The linkage system 29 for actuating the valves comprises a pair of opposed plates secured to opposed side portions of the valve stem 43 in upwardly extending relation with their upper end portions inwardly converged and terminating in spaced parallel portions. If desired the plates 46 may be reinforced by the transverse strut 47 as shown in Fig. 2 and intermediate its ends an apertured spring abutment 48 is secured in such manner as to slidably receive the reduced portion 36 of the valve stem 35 below the opening 38 therein when the valves are disposed as shown in Fig. 2. A spring 49 is interposed between the shoulder 37 on rod 35 and spring abutment 48 attached to the plates 46 under sufficient initial compression to normally retain the valves in the position shown in Fig. 2 with valve element 39 engaging the stop 44. A lever supporting bracket 50 of any suitable construction, such as, a pair of upwardly and outwardly converging legs 51 secured to the wall member 12 and having their outer end portions disposed in spaced parallelism and terminating just slightly below the level of the normal uppermost position of the plates 46 is provided to support one end of a generally horizontal disposed lever 52 pivoted as at 53 to the bracket 50. The lever 52 is pivoted intermediate its ends at 54 to the upper end portions of the plates and projects a slight distance beyond the

wall member 12. A standard 55 is secured to the wall member 12 in upstanding relation and is slotted as at 56 to receive the projecting end of the lever 52 in such manner that the lever will engage the upper surface of the slot under the action of spring 49 when the valves are as shown in Fig. 2. An actuating lever 57 is pivoted at one of its ends 58 to the valve stem 35 within opening 38 and extends outwardly through the slot in standard 55 to provide a substantial hand grasp portion 59. The end of lever 52 projecting without the standard 55 is connected by the link 60 to an intermediate portion of lever 57.

In the operation of the form of the invention thus far disclosed, assuming that the valves 27 and 28 occupy their normal positions as disclosed in Fig. 2 with lever 52 engaging the upper surface of slot 56 the reservoir will be filled with any desirable fluent material and a suitable heat transfer medium will be circulated between the walls of the reservoir to keep the material in the reservoir in the proper state of fluidity, if necessary. When the reservoir is filled the sump or measuring cup chamber 26 will be filled through the opening past the raised valve 28 and the device is now conditioned to dispense measured volumes of the material. The lever 57 is depressed by the portion 59 which causes the lever 52, through the link 60, to fulcrum about its pivot 53 and therethrough depress the plates 46, valve stem 43 and valve 28 against the action of spring 49 resting on the valve stem 35 which at this moment is immovable downwardly because of the interengagement between the valve 27 and its seat upon the bottom 18 of the measuring well 17. When the valve 28 is depressed sufficiently to engage its seat on the bottom member 16 communication between the chambers 25 and 26 will be obstructed and valve stem 43 will be immobilized against further movement of depression. Continued depression of the lever handle 59, after engagement of the valve 28 with its seat will cause the lever 57 to fulcrum about its connection with link 60 and raise the valve rod 35 thereby unseating the valve 27 and providing for the discharge of the contents of the measuring cup chamber 26 through the tubular outlet 19. When the valve 28 is held in its seated position by retaining the lever handle 59 depressed and the valve 27 correspondingly held in its raised position the vent 45 will straddle valve 28 to establish communication with atmosphere past the valve 28 and facilitate discharge of the contents of the chamber 26. In the seated position of valve 28 the spherical face 40 will act to ensure that the well 17 will be filled with the same volume each time it is filled by positively engaging the upper surface of the contents in the cup; and the clearing fingers 32 on valve 27 will keep the tubular member 19 cleared of obstruction as well as serve to guide the valve.

When the measuring chamber 26 is exhausted of its contents the lever handle 59 is simply released and the valves will be returned to their normal position of Fig. 2 by the spring 49.

In the modified form of valve actuating linkage shown in Fig. 5 the bracket 60 is perforated to receive the upper end portion of valve stem 35 and is suitably secured to any stationary support, which may be the reservoir. A spring 61 is interposed between the valve stems 35 and 43 as shown and acts in the same manner as spring 49 to keep the valves 27 and 28 in the normal relative position of Fig. 2. A lever 62 is pivoted at one end to the upper end of valve stem 35 and

pivoted intermediate its ends by a link 63 to a lever rigidly connected to the valve stem 43. Upon depression of the free end of lever 62 the same relative movements of valves 28 and 27 will take place in the same sequence as in the form hereinbefore described, except in this form a spring 65 interposed between a relative stationary support 66 and the valve stem 35 is substituted for the standard 55 and acts to normally seat the valve 27 while spring 61 acts to normally unseat valve 28 when valve 27 is seated.

In the gang measuring and loading device shown in Figs. 6 to 9 there is provided a reservoir 67 of generally rectangular shape in horizontal section formed by spaced inner and outer side walls 68 and 69, joined in fluid sealed relation to spaced inner and outer bottom walls 70 and 71, respectively. The bottom walls 70 and 71 extend inwardly from opposed side walls in downwardly converging relation and are secured in any convenient manner in fluid sealed relation to a bottom plate 72 disposed medially of the reservoir. The bottom plate 72 is formed with a plurality of aligned bores 73 corresponding to the number of measuring cups or chambers with which the device is to be equipped and chamber forming members or cups 74 of similar construction are secured to the plate 72 in axial alignment with each of the bores 73. Conveniently the cups 74 are of the same general construction as the cup 17 and are secured to a plate member 75 so bored as to receive the upper end portions thereof in fluid sealed relation as indicated in Fig. 8.

In order to circulate a heat exchange medium about the cups 74 they are enclosed by a casing 76 having parallel side and end walls secured to the plate 75 in sealed relation and an arcuate bottom wall through which the tubular outlets 77 of the cups 74 project in sealed relation. A suitable heating or cooling medium may be circulated about the cups 74 within casing 76 through the inlet and outlet therein as indicated at 78 and 79, respectively.

The plate 75 with its assembled cups and casing is detachably secured to plate 72 in any desirable manner, as by the stud fastenings 80, with the cups 74 in axial alignment with the cooperating bores 73 in plate 72, and a suitable gasket 81 interposed between the plates 72 and 75 to form a sealed connection.

Each cup 74 is controlled by a pair of cooperating valves 82 and 83 similar in construction to the valves 27 and 28, respectively, of Fig. 2. The valves 82 are each provided with a valve stem 84 slotted intermediate its ends as shown at 85 and adjacent its upper end at 86 for purposes hereinafter made more apparent. The valves 83 are axially bored to receive the valve stems 84 in snug sliding relation and are counterbored to receive tubular valve stems 87 disposed concentrically of the valve stems 84 as clearly shown in Fig. 8. The upper end portions of the valve stems 87 have secured thereto bushings 88 which receive the valve stems 84 in snug sliding relation and are provided with opposed pins 89 for a purpose made clear subsequently.

The actuating linkage for each pair of cooperating valves 82 and 83 is identical in construction and all of the linkages are simultaneously operable by common means, to which end a rock shaft 90 is journaled in any suitable manner to extensions 91 of the inner walls 68 of the reservoir 67 in parallel relation to the cups 74. The shaft 90 is provided with an actuating

handle 92 and may be freely oscillated about its axis.

As clearly shown in Figs. 7 and 8 the upper end portions of the valve stems 84 project through one leg of an angle iron support 93 carried by a wall member 94 secured to the rear edge portions of the wall projections 91 and are operable in timed relation to the valve stems 87 cooperating therewith by toggle linkages. The valve stems 84 are biased to occupy a normal position with the valves 82 in closing relation to the tubular outlets 77 of the cups 74 by means of resilient elements, such as helical springs 95 interposed between the angle support 93 and collars on the valve stems 84 under an initial loading as shown in Fig. 8. The linkage for actuating each pair of cooperating valve stems comprises a lever 96 secured intermediate its ends to the shaft 90, a lever 97 secured at one end through a suitable pin inserted in the slot 86 of the valve stem 84 and pivotally interconnected at its other end with lever 96 by means of a link 98, a lever 99 having a bifurcated end 100 pivotally receiving the pins 89 of the bushing 88 secured to valve stem 87 and pivotally interconnected at its other end with lever 96 by means of a link 101, and a link 102 pivotally interconnecting the levers 97 and 99 intermediate their ends. A spring 103 is secured between the levers 97 and 99 of each linkage to normally hold the valve 83 in its uppermost position relative to the valve 82. When valve 82 is raised and valve 83 lowered the slot 85 in valve stem 84 will establish intercommunication between the interior of valve stem 87 and the cup 74 thus permitting communication with atmosphere through ports 104 in the upper end portion of valve stem 87.

The top of the reservoir may be closed by a hinged closure 105, which can be raised to give access to the shaft 90 and associated valve actuating linkages, and a closure plate 106 hinged to the wall member 94 adapted to be raised to give access to the interior of the reservoir.

For the purpose of rendering the device capable of use for dispensing measured amounts of explosive or similar substance of different quantities, measuring cup units having measuring cups 74' of different volumes, as shown in Fig. 9 may be substituted for the cup unit shown in Fig. 8. The cups 74' of Fig. 9 are smaller than those shown in Fig. 8 but have their upper end portions enlarged to conform to the bores 73 in bottom plate 72 of the reservoir.

As well understood in the art a heat exchange medium may be circulated between the inner and outer walls defining the reservoir 67 in any suitable manner and a vent stack 107 and deluge connection 108 may be provided if desired.

The operation of this form of the invention is very similar to that of the form shown in Fig. 2. With the reservoir filled or partially filled with explosive or similar substance and the valves disposed as shown in Fig. 8 the cups 74 or 74' will be filled. Vessels, such as bombs or shells, are disposed one under each tubular outlet 77. The actuating handle 92 is depressed thereby tending to rotate shaft 90 and the lever 96 and links 98, 101 of each linkage counterclockwise as viewed in Fig. 8, which will result in lever 99 pivoting about its fulcrum on link 102 and the lever 97 pivoting about its fulcrum on valve stem 84 to depress valve stem 87 and seat valve 83 on bottom plate 72 in closing relation to bore 73. After valve 83 is seated upon the bottom plate 72 the lever 99 will pivot about the pins 89 on bushing

88 upon continued depression of handle 92 and the lever 97 will pivot about its fulcrum on link 102 raising the valve stem 84 to unseat valve 82 and permit discharge of the corresponding cup 74. In the raised position of valve 82 and lowered position of valve 83 the slot 85 in valve stem 84 will establish communication past valve 83 with atmosphere through the valve stem 87 and perforations 104 thus permitting free discharge of the contents of the cups 74 therefrom. After discharge of the cups 74, the valves may be restored to normal as shown in Fig. 8 by simply releasing the handle 92 so that the springs 95 and 103 will be free to move the valve stems 84 and 87 to their normally biased positions in a manner just the reverse of that above described.

Having now described the present preferred embodiments of the invention I claim:

1. In a fluent material measuring device in combination, means forming a measuring chamber having an inlet and outlet, independently movable valves for said inlet and outlet, a valve stem secured to the valve for said outlet and slidably receiving said inlet valve, means interposed between said outlet valve stem and inlet valve biased to seat one of said valves and unseat the other of said valves, and means including said biasing means for alternately seating and unseating said valves.

2. In a fluent material measuring device in combination, a reservoir comprising a storage chamber and communicating measuring chamber having an outlet, a valve in the measuring chamber adapted to be seated to close said outlet, a valve stem secured to the valve and projecting into the reservoir, a valve in the storage chamber slidably mounted upon said valve stem and adapted to be seated to obstruct communication between the storage and measuring chambers, a tubular valve stem secured to said second recited valve in concentric relation to the first recited valve stem, means interposed between said valve stems biased to urge separation thereof with said first recited valve in seated relation and said second recited valve in unseated relation and means for sequentially seating said second recited valve and unseating said first recited valve and vice-versa.

3. In a fluent material measuring device in combination, means forming a measuring chamber having an inlet and outlet, independently movable valves for said inlet and outlet, a valve stem secured to the valve for said outlet and slidably receiving said inlet valve, means interposed between said outlet valve stem and inlet valve biased to seat one of said valves and unseat the other of said valves, means including said biasing means for alternately seating and unseating said valves, and means in said valve stem adapted to establish communication between the chamber and atmosphere when said inlet valve is seated and the outlet valve is unseated.

4. In a fluent material measuring device in combination, means forming a measuring chamber having an inlet and outlet, a valve for said outlet, a valve stem secured to the valve and projecting without the chamber axially thereof, a valve for said inlet comprising a symmetrical surface adapted to protrude within the chamber in the seated position of the valve slidably mounted on said valve stem for independent movement, means interposed between said outlet valve stem and inlet valve biased to seat one of said valves and unseat the other of said valves, means includ-

ing said biasing means for alternately seating and unseating said valves, and means in said valve stem adapted to establish communication between the chamber and atmosphere when said inlet valve is seated and the outlet valve is unseated.

5. The structure of claim 4 wherein a stuffing box is provided on said valve operative to engage the inlet valve when the outlet valve is seated and the inlet valve is in a predetermined unseated position.

6. The structure of claim 1 wherein said outlet comprises a tubular member and the outlet valve is provided with circumferentially spaced clearing and guide fingers disposed within said tubular member.

7. In a fluent material measuring device in combination, a reservoir comprising a storage chamber and communicating measuring chamber having an outlet, an outlet valve in the measuring chamber adapted to be seated to close said outlet, a valve rod secured to the valve and projecting through the reservoir, an inlet valve in the storage chamber slidably mounted upon said valve rod and adapted to be seated to obstruct communication between the storage and measuring chambers, a tubular valve stem secured to the inlet valve in concentric relation to said valve rod, an upwardly extending bracket secured to the reservoir, a first lever pivotally secured at one end to the bracket, means pivotally connecting said tubular valve stem to an intermediate portion of said lever, a second lever pivotally connected at one end to said valve rod, a link interconnecting an intermediate part of said second lever and the end portion of said first lever remote from its connection with the bracket, means cooperating with said levers to limit oscillating movement thereof, and resilient means interposed between said valve rod and valve stem initially stressed to urge said levers into one of their limiting positions of oscillation.

8. In a fluent material measuring device in combination, a reservoir comprising a storage chamber and communicating measuring chamber having an outlet, an outlet valve in the measuring chamber adapted to be seated to close said outlet, a valve rod secured to the valve and projecting through the reservoir, an inlet valve in the storage chamber slidably mounted upon said valve rod and adapted to be seated to obstruct communication between the storage and measuring chambers, a tubular valve stem secured to the inlet valve in concentric relation to said valve rod, a bracket disposed in fixed relation to the reservoir slidably receiving said valve rod, a lever pivotally secured at one end to the valve rod, a linkage interconnecting an intermediate portion of said lever with the tubular valve stem, resilient means normally urging one of said valves to seated position, and additional resilient means interposed between said valve stem and rod initially stressed to urge the other of said valves to unseated position when its cooperating valve is seated by said first recited resilient means.

9. In a fluent material measuring device in combination, means forming a measuring chamber having an inlet and outlet, independently movable valves adapted to be seated to close said inlet and outlet, a valve stem secured to the valve for said outlet and slidably receiving said inlet valve, a valve stem secured to the inlet valve, a rock shaft journaled in a position adjacent the valve stems, a lever secured to the rock

shaft intermediate its ends, a lever pivotally connected at one end portion to the inlet valve stem, a link pivotally connecting the other end portion of said last recited lever with one end portion of the first recited lever, an additional lever connected at one end portion with said outlet valve stem, an additional link pivotally connecting the other end portion of said last recited lever with the other end portion of said first recited lever, a link pivotally interconnecting said levers connected to the valve stems intermediate their ends, means for rocking said rock bar, and means biasing said valves to a position with one valve seated and the other valve unseated.

10. In a measuring device, means defining a reservoir having a bottom portion provided with an outlet, a plate having an opening therein, means for detachably securing the plate to said bottom portion with its opening in registering relation to said outlet opening, a measuring cup secured to said plate with its upper portion in registering relation with the opening therein, a casing surrounding the sides and bottom of the measuring cup in spaced relation secured to said plate, and an outlet member secured to the bottom of the measuring cup projecting through the casing.

GEORGE D. ROGERS.