United States Patent

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[72] Inventor **Charles R. Goodman**
206 Minnesota Ave., Lynn Haven, Fla. 32444

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[54] **CHEMICAL PROPORTIONATING APPARATUS**
4 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **222/57,** 222/145, 222/334, 222/383
[51] **Int. Cl.** **B67d 5/08**
[50] **Field of Search** 222/57, 334, 385, 145, 333, 383, 129.2; 103/57, 59; 137/99

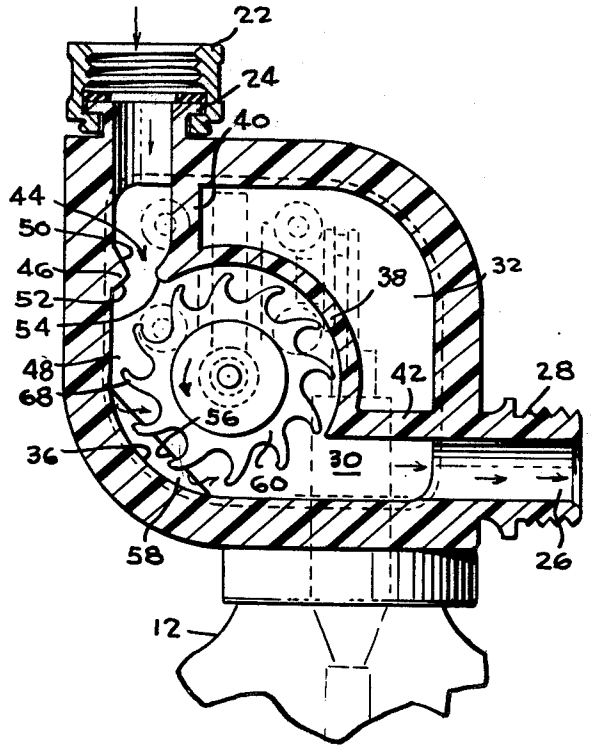
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Primary Examiner—Robert B. Reeves
Assistant Examiner—H. S. Lane
Attorney—Mason, Fenwick & Lawrence

ABSTRACT: A fluid pressure operated chemical proportionating apparatus comprising a housing, a mixing chamber formed within said housing, fluid inlet means and a fluid outlet means connected to said chamber, a chemical supply reservoir in communication with said chamber, a rotatable impeller having a plurality of radially extending blades, a baffle plate across said mixing chamber forming in part an impeller passage, said baffle plate being provided with a suction opening communicating with said chamber, said passage including a curved partition concentric to said impeller and forming a boundary for said impeller passage, said passage being in alignment and fluid communication with said inlet means and outlet means, constriction means positioned below said inlet means and within said impeller passage adjacent to said impeller, to increase the velocity and control the direction of the incoming fluid upon said impeller, an impeller shaft mounted for rotation within said chamber and carrying said impeller, a pump assembly operably connected to said impeller, and positioned for communication between said chamber and said reservoir, said pump assembly comprising a cylinder mounted in said housing and extending into said reservoir, a siphon tube secured to the base of said cylinder and extending to the bottom of said reservoir, a cylinder passageway through said cylinder communicating with said siphon tube, the construction and arrangement being such that fluid entering said inlet passes through said constriction means at high velocity upon said impeller to draw through said opening fluid from said mixing chamber and simultaneously operate said pump to raise fluid from said reservoir and into said mixing chamber for dispensing through said outlet.



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SHEET 1 OF 2

Fig-1

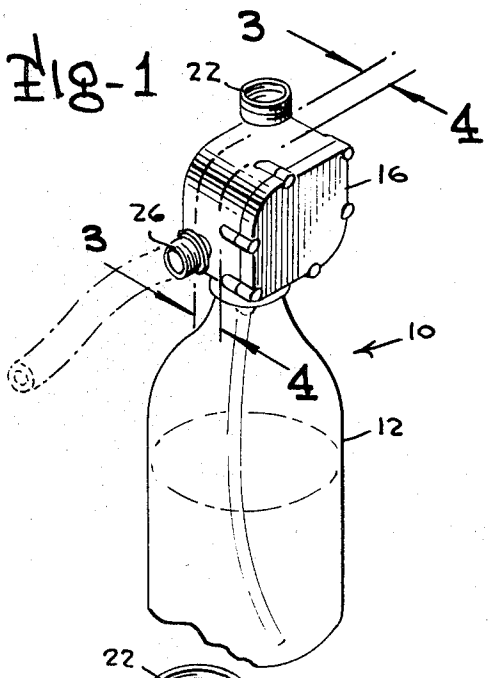
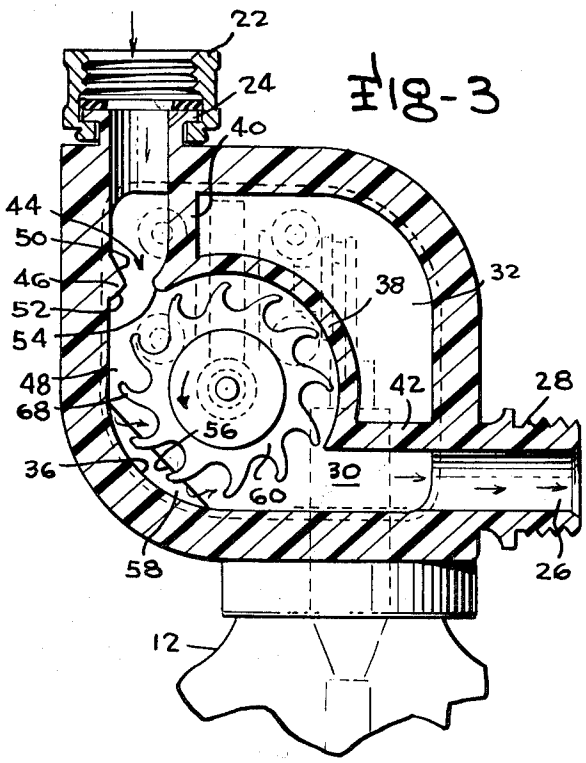


Fig-3



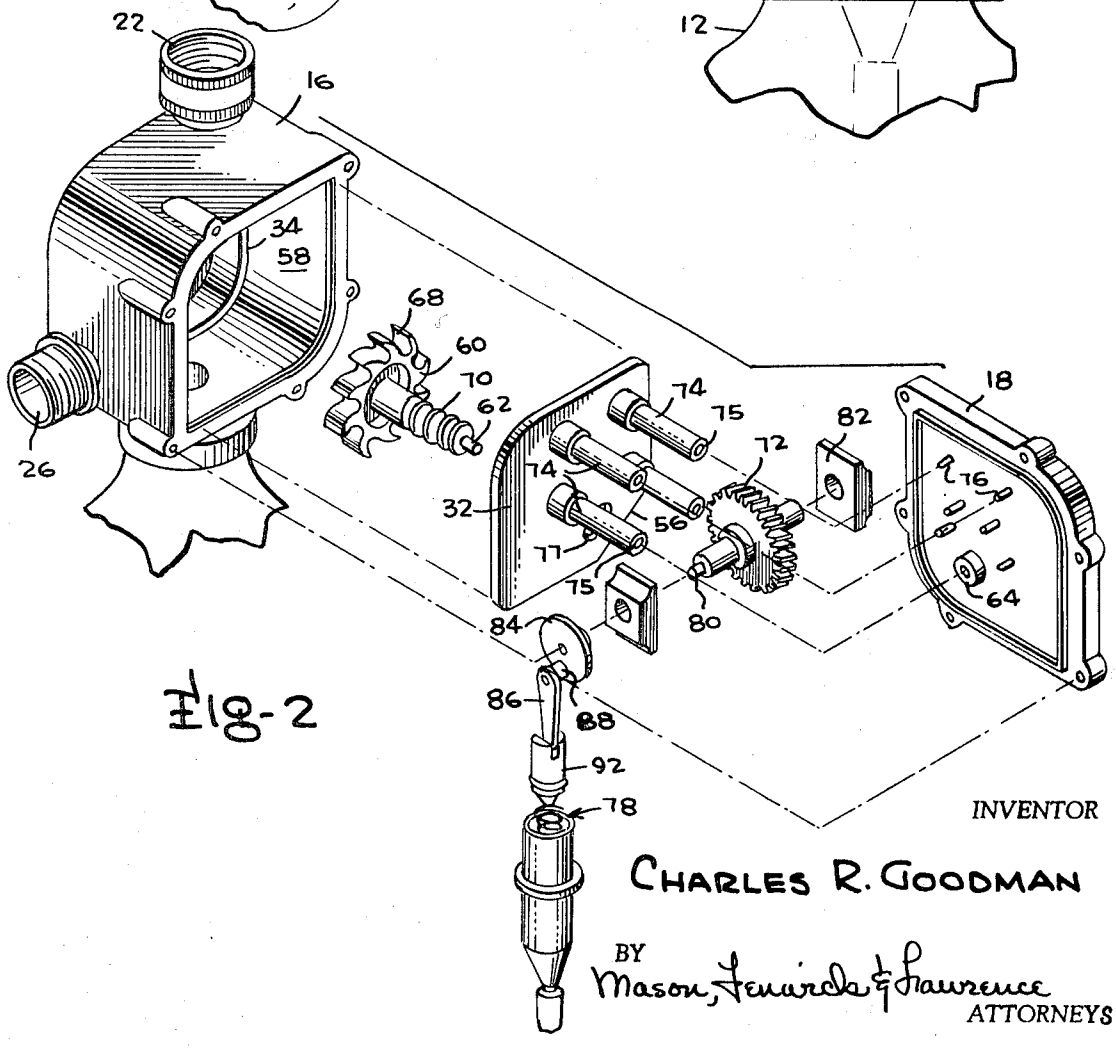


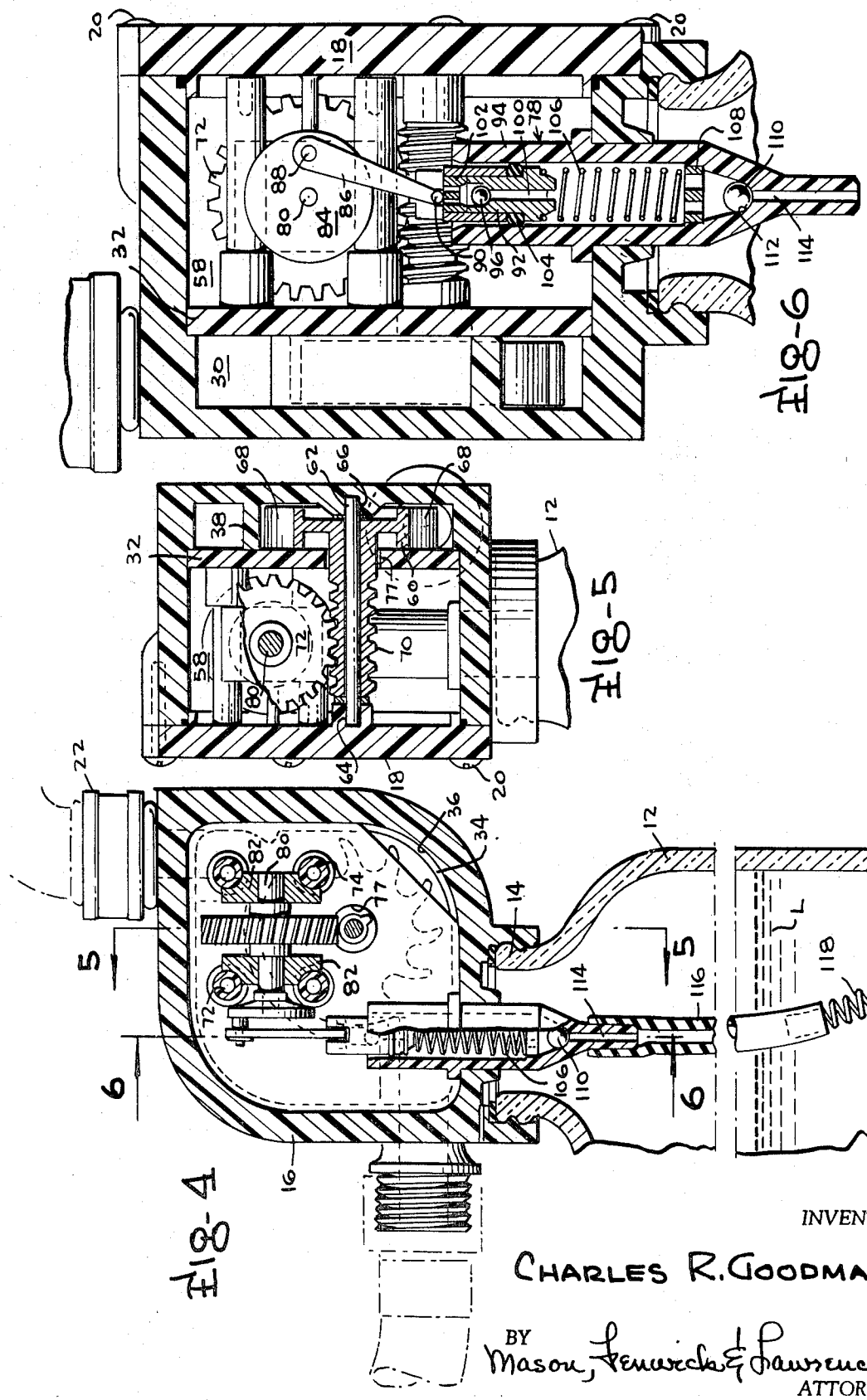
Fig-2

INVENTOR

CHARLES R. GOODMAN

BY Mason, Fenwick & Lawrence

ATTORNEYS



INVENTOR

CHARLES R. GOODMAN

BY Mason, Fenwick & Lawrence

ATTORNEYS

CHEMICAL PROPORTIONATING APPARATUS

This invention relates generally to a dispensing apparatus. More particularly, the present invention relates to a chemical dispensing or proportionating apparatus under fluid pressure without a loss in effectiveness due to back pressure at the final dispensing outlet. The present invention is even more closely related to the mixing and dispensing of insecticides, herbicides and fertilizers by the average home owner.

Chemical dispensing apparatus are well known in the art and have been used for a number of years to achieve proportionate dispensing of liquid or solid materials into a fluid stream of either liquid or gas. While a number of these apparatus have enjoyed varying degrees of commercial success, effective and economical chemical dispensers to proportionate the chemical into a fluid stream have not been found to be particularly effective for consumer use when the ultimate outlet nozzle may produce a backup pressure. Such a backup pressure is frequently found to occur when automatic lawn sprinkling systems are incorporated in the dispensing system. This backup pressure frequently has been found to completely inhibit dispensing and the operation of the dispenser or else so lessen the effectiveness of the dispensing operation that the proportions of the chemical in the fluid stream have been substantially changed beyond the desired rate.

It is one of the principal objects of the present invention therefore to provide a dispensing apparatus for chemicals into a fluid stream which is not adversely affected to an undesirable degree by backup pressure from the final dispensing nozzle.

This invention also has as an object the provision of a dispensing apparatus including a novel constriction means to direct an impinging inlet flow upon an impeller for operation of a pump assembly to supply the chemical to be dispensed.

The present invention also has as an object the provision of a novel impeller passage with fluid communication to the mixing chamber for drawing the fluid in the mixing chamber into the impeller passage.

This invention also has as an object the provision of a simple, economical, and yet efficient, chemical proportionator and dispenser for use by the average person in dispensing insecticides, herbicides, fertilizers, or other chemicals with commonly available equipment such as the garden hose.

These and other objects will be readily apparent from a careful study of the following specification, claims, and drawings wherein:

FIG. 1 is a perspective view of the assembled chemical proportionator;

FIG. 2 is an exploded view in perspective of the elements forming the proportionator;

FIG. 3 is a side elevational view partly broken away taken along the lines 3–3 of FIG. 1, and illustrating the constriction in the impeller passageway and the impeller, along with the opening in the baffle plate into the impeller passage;

FIG. 4 is a side elevational view partly broken away, and taken along the lines 4–4 of FIG. 1;

FIG. 5 is a side elevational view partly broken away of the worm mechanism and the shape of the impeller passage; and

FIG. 6 is an enlarged elevational view partly broken away taken along the lines 6–6 of FIG. 4, and illustrating in detail the pump assembly.

Referring to the drawings, numeral 10 generally depicts the chemical proportionating apparatus to of the present invention. This apparatus of the present invention includes a chemical supply reservoir 12 in the form of a large bottle which may be made of any suitable material such as a polyethylene. Secured to the top of the reservoir 12 as by screwthreads 14 is the proportionating housing 16 best shown in FIG. 2. The housing includes a cover 18 which is secured to the side in any suitable manner as by screws 20. The housing is closed on all sides except for the inlet 22 which may be a female hose coupling secured in any conventional manner to lip 24 (see FIG. 3) forming the inlet of the housing 16. In the same plane as the inlet, the outlet 26 is provided which has screwthreads

at 28 for attachment of other conduits such as a garden hose for a lawn sprinkler system or the like. The inlet 22 may be connected to any suitable water inlet either directly to the valve faucet fitting or through a hose attachment shown in phantom lines in FIG. 1.

The housing 16 and the cover 18 may both be formed of a molded plastic such as the common ABS material frequently used for its wearing and stability characteristics. The interior of the housing 16 is provided with an impeller passage 30 as shown in FIG. 3. This impeller passage is formed in part by a baffle plate 32 which blocks off a portion of the interior of the housing and fits snugly up against the lip 34 in the housing which is in intimate contact with a rim portion of the baffle against which it rests. The impeller passage 30 is also formed from the side and bottom of the housing 16 which is curved at 36 to reduce turbulence in the passage as the fluid flows through the passage. On the upper side of the impeller passage is a curved partition 38 which is substantially concentric with the curvature of the housing at 36. Inlet and outlet partitions 40 and 42 integral with the curved portion 38 are provided to direct the fluid through the proportionating apparatus.

One of the unique aspects of the present invention is the inclusion of a constriction means 44, best shown in FIG. 3. This constriction is formed in part from an enlargement 46 of the housing wall 16 to extend part way into the impeller passage. The enlargement is further unique in that its upper surface upstream and remote from the impeller chamber 48 has a flat surface 50, while the under surface downstream which forms a boundary for the impeller chamber 48 is provided with a rounded or curved portion 52. In effective opposed relationship to the enlargement 46 is an extension of the curved partition 38 beyond the inlet partition 40 forming a bulbous extension 54 which has both curved upper and lower surfaces.

The baffle plate 32 is provided with an opening 56 which establishes fluid communication between the impeller chamber 48 in the impeller passage and the chamber 58.

Rotatively positioned within the impeller passage 30 and the impeller chamber 48 is an impeller 60 mounted for rotation on a shaft 62 suitably journaled in bearings 64 and 66 in the cover and housing, respectively. The impeller is conventionally constructed with suitably curved blades 68 radially extending from the body of the impeller. The body of the impeller is elongated along the shaft to form an integral worm gear 70 which is operatively connected to a worm wheel 72.

As can be seen from the exploded illustration in FIG. 2, the baffle plate 32 is secured in place by a plurality of baffle supporting or positioning tubes 74 which provide a tight fit in openings 75 for projecting pins 76 located on the cover 18. As best shown in FIG. 5, the worm gear passes through the baffle plate 32 at the aperture 77.

The worm wheel 72 and the worm gear 70 operate within the chamber 58 and serve to operate the pump assembly 78.

The worm wheel 72 is secured to a rotatable shaft 80 suitably journaled in bearing blocks 82 held in place between the cover 18 and the baffle plate 32 by the tubes 74. Also, rotating with the worm wheel 72 is the flywheel 84 having a connecting arm 86 eccentrically pivoted on pivot pin 88. The opposite end of the connecting arm 86 is pivotally connected at 90 to the piston 92 which reciprocates within the pump cylinder 94. The piston 92 is of the pass-through type having a ball check valve 96 adapted to fit in valve seat 98 and close piston passageway 100. The ball is prevented from being removed from the piston by ball retainer 102 having suitable passageways therethrough to permit the flow of fluid. O-ring 104 provides the sealing means between the piston and the cylinder 94. Resilient means in the form of helical spring 106 urges the piston in an upward position and is bottomed on ball retainer 108 which contains ball check valve. 110. Ball valve seat 112 cooperates with the ball valve to block passageway 114 to prevent backflow.

As best shown in FIG. 6, the pump cylinder 94 is extended to form passageway 114 which depends substantially into the supply reservoir 12. A flexible tube of conventional type such

as may be made of polyethelene is shown at **116** in FIG. **4** to extend near the bottom of the reservoir **12**. A filter **118** is recommended to be positioned in the bottom of the tube in a conventional manner.

In operation, the chemical proportionating apparatus of the present invention is connected at its inlet **22** to a flow of water, and to a dispensing hose or lawn sprinkler system at its outlet **26**. The reservoir **12** is filled with a conventional liquid fertilizer or other chemical as desired. Many of these conventional liquid fertilizers are presently on the commercial market, and the present device will operate successfully with the known types. As the fluid flows through the inlet and reaches the constriction **44**, the shape and configuration of the constriction being unique substantially increases the velocity of the flow of water without undue turbulence and directs it upon the curved radial blades **68** of the impeller **60**. As the impeller rotates due to the force direction of the flow of water, the worm wheel and worm gear will rotate along with flywheel **84** to reciprocate the connector arm **86** which in turn reciprocates the piston **92** in the pump assembly **78**. Upon reciprocation, sufficient suction will be created in the cylinder **94** so that the liquid L in the reservoir will rise up through **116** and upon a sufficient number of reciprocations, the liquid will pass through the piston **92** and into the chamber **58**.

The liquid L will be sucked out through opening **56** in the baffle plate **32** and into the impeller passage **30** and be moved along with the rapid flow through the passageway out through outlet **26** in a uniform homogeneous mixture ready for application to the crops or grass.

It is one of the unique features of the present invention that because of the unique construction of the impeller passage and the constriction means that with backup pressure that may occur downstream of the outlet **26** will not prevent the operation of the chemical proportionating apparatus since the velocity and direction of the inlet flow through the constriction will impinge upon the impeller forcing the impeller to operate. As long as the impeller operates, the piston **92** will function and provide adequate flow of the chemical to the chamber **58**.

Another feature of the present invention is that the amount of liquid L dispensed into the mixing chamber and therefore mixed with the flow of water through the impeller passage depends upon the speed of rotation of the impeller which, in turn, is dependent upon the volume of flow through the inlet **22**. Therefore, there is an automatic dispensing of the liquid L which should be uniform whether the volume of flow through the inlet is great or small.

From the foregoing detailed description it will be evident that there are a number of changes, adaptations, and modifications of the present invention which come within the province of the those skilled in the art; however, it is intended that all such variations not departing from the spirit of the invention be considered as within the scope thereof.

I claim:

1. A fluid pressure operated chemical proportionating apparatus comprising a housing, a chamber formed within said housing, fluid inlet means and a fluid outlet means connected to said chamber, a chemical supply reservoir in communication with said chamber, a rotatable impeller having a plurality of radially extending blades, a baffle plate across said chamber forming in part an impeller passage, said baffle plate being provided with a suction opening communicating with said chamber, said passage including a curved partition concentric to said impeller and forming a boundary for said impeller passage, said passage being in alignment and fluid communication with said inlet means and outlet means, constriction means positioned below said inlet means and within said impeller passage adjacent to said impeller, said constriction means comprising an enlargement of the wall of said housing on one side of said impeller passage, and a bulbous extension of said curved partition on the opposite side of said impeller passage, said enlargement having a flat upstream surface remote from said impeller, and a curved downstream surface, said bulbous extension having both curved upstream and downstream surfaces to increase the velocity and control the direction of the incoming fluid upon said impeller, an impeller shaft mounted for rotation within said chamber and carrying said impeller, a pump assembly operably connected to said shaft and positioned for communication between said chamber and said reservoir, said pump assembly comprising a cylinder mounted in said housing and extending into said reservoir, a siphon tube secured to the base of said cylinder and extending to the bottom of said reservoir, a cylinder passageway through said cylinder communicating with said siphon tube, the construction and arrangement being such that fluid entering said inlet passes through said constriction means at high velocity upon said impeller to draw through said opening fluid from said chamber and simultaneously operate said pump to raise fluid from said reservoir and into said chamber for dispensing through said outlet.

2. The proportionating apparatus of claim **1** wherein said opening is at the base of the housing adjacent the lower path of travel of said blades and located between the inlet and outlet to said passage.

3. The proportionating apparatus of claim **1** wherein said shaft has a worm gear extending into the interior of said chamber, and a worm wheel engaging said worm gear, a worm wheel shaft mounted for rotation transverse to said impeller shaft, a flywheel secured to said worm wheel shaft and eccentrically positioned connector arm pivotally connected at one end to said flywheel.

4. The proportionating apparatus of claim **3** including a ball check valve positioned near the base of said cylinder, a lower ball retainer positioned above said ball valve, a piston mounted for reciprocal movement within said chamber, a piston passageway through said piston, a piston ball valve positioned in the throat of said piston passageway, said piston including a ball retainer at the top of said piston to retain said ball valve when unseated, resilient means between said piston and said lower ball retainer and pivot means secured to the top of said piston and operatively connected to said other end of said connector arm.