How to Make Proportioner for Fertilizer Use

By PROF. C. I. GUNNESS
(Massachusetts Agricultural College)

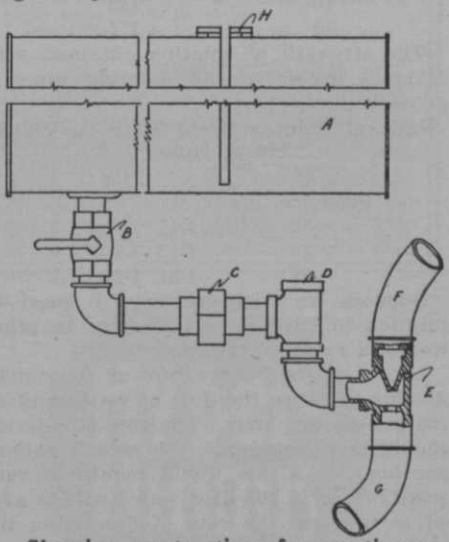
DURING the last few years there has been a great deal of interest in the application of liquid fertilizers to greens. Various methods have been used for applying these fertilizers. One method is to use a fairly strong solution and apply by means of a hose from a barrel or tank. After the solution has been applied the green is given a liberal watering. This method is rather clumsy and slow, and requires the transportation of a barrel and other equipment. Another method involves the use of a power spraying outfit. This method is very effective although it requires heavy and expensive equipment. Still another type of equipment which has been used is known as a proportioner.

The standard type of proportioner utilizes the energy of water flowing through a hose to suck a solution from a barrel and mix the solution with the water flowing through the hose. A proportioner is a type of ejector and looks somewhat like a pipe tee. Water from a hose enters the tee through a nozzle and leaves through a larger orifice at the opposite end of the tee and discharges into a hose. Water rushing through these orifices creates a suction effect in the body of the tee, and the solution is sucked in at the side outlet of the tee, a pipe from this connection being run into a barrel containing the solution. The chief difficulty with the ordinary proportioner lies in the fact that it is difficult to control the rate of flow of solution. The rate of flow varies with a change in water pressure, and a change in the height of the liquid in the barrel.

Describes Construction.

An improved type of proportioner is shown in the diagram. It consists of a 10-gallon tank (A) for holding the solution. A Model T Ford gasoline tank serves the purpose very well. A stop cock (B) serves to turn on and off the solution but is not used for regulating the rate of flow. The union (C) is a packed ½ in. union. In it is placed a metal disc with a small orifice. A rubber gasket is placed

on either side of the disc. The disc is used to regulate the rate of flow from the tank, and discs having different sized openings are provided to obtain different rates



Showing construction of proportioner.

of flow from the tank. As the solution leaves the disc, it flows into a ½ in. tee, giving a vent at (D) From there the solution flows to the ejector (E), shown in section, where it mixes with the water from the hose (F), and flows out through the hose (G) leading to the sprinkler.

A gasket is placed between the filling cap (H) and the tank. A vent pipe extends from the filling cap to a point within ½ inch from the bottom of the tank. The purpose of this special vent pipe is to obtain the same rate of flow from the tank when it is nearly empty as when it is full. If the tank were vented at the top, the rate of flow would vary with the amount of solution in the tank. The purpose of the vent (D) is to make the rate of flow independent of the suction created in the proportioner. In the proportioner, the suction varies with the water pressure, and if the vent (D) were not provided, the rate of flow from the tank would vary with the water pressure. The proportioner is placed below the level of the union (C) and disc, in order that the solution may run away freely and the rate of flow not be influenced by water standing in the pipe leading to the proportioner. The proportioner has an inlet nozzle ⅛ inch in diameter and an outlet orifice 9/32 inch in diameter. The space between the two openings is 7/16 of an inch.

Operates on Low Pressure.

This proportioner will operate on a water pressure as low as 10 pounds and with increasing efficiency at higher pressures. With an inlet pressure of 40 pounds, it can operate against a discharge pressure of 10 pounds. For best service, however, a ¾ inch hose with a relatively large nozzle should be used from the proportioner to the sprinkler. Any attempt to obtain fine sprinkling will cause the proportioner to back up through the vent (D) and overflow. With 50 feet of ¾ inch hose, the nozzle can be restricted so as to give fairly fine sprinkling but if 100 feet are used, the nozzle will have to be quite large.

Using the Proportioner.

In using this device for fertilizing a green, the operator may use a rotating sprinkler or a hand nozzle. For most purposes the latter will be found more practical. It is first necessary to decide on the length of time which is to be allowed for covering the green. The proper amount of solution for the green is then put in the tank and a disc selected which will discharge the solution in the proper time. As an example, let us assume that we wish to apply 4 pounds of sulphate of ammonia per 1000 sq. feet of green. We would then proceed as follows:

1. Prepare a stock solution, using 4 pounds of sulphate of ammonia to one gallon of water.

2. Use a disc which will flow one gallon of solution per hour.

3. Put as many gallons of stock solution in the tank as there are 1000 sq. ft. in the green. Add enough water to fill the tank.

4. Divide the green into quarters and sprinkle for 15 minutes on each quarter.

Obviously, if we wish to cover the green in less than one hour, we will use a larger disc.

In order to give some idea as to the rate of flow from the tank, the following table is given. The rates of flow are for water. Solutions of different viscosities will flow at different rates. Ordinary solutions of sulphate of ammonia will flow at the same rate as water. Where other solutions are used it will be necessary to determine the actual rate of flow.

Rate of Flow from Tank.

Disc	Size	Gals. hour	Time required to empty tank
1	⅛	8.2	1 hr. 13 min.
2	3/16	15.4	39 min.
3	¼	25.5	23½ min.
10	9/64	10.0	1 hr.
20	7/32	20.0	30 min.

In some cases the greenkeeper may wish to apply a solution of given strength. In this case it is merely necessary to know the rate at which water is supplied by the hose from the hydrant, and then use a disc which will supply the proper amount of solution. The rate of flow through the hose is as given below, with a ⅛ inch nozzle in the proportioner. The pressure is taken at the proportioner. It will be noticed that a change in pressure from 30 to 50 pounds makes only a small change in rate of flow.

Quantity of Water Supplied by Hose.

Pressure, lbs.	Gals. per hour
30	140
40	155
50	175

The strength of solution obtained with different pressures and different discs is given below.

Ratio of Solution from Tank to Water from Hose.

	Disc		
Pressure, lbs.	1	2	3
30	1-17	1- 9	1-5
40	1-19	1-10	1-6
50	1-21	1-11	1-7

Suppose we wish to apply 1 quart of solution to 50 gallons of water; in other words, a ratio of 1 to 200.

Let us assume a pressure of 40 pounds. At this pressure the flow of water will be 155 gallons per hour. The flow of solution should then equal 155÷200 or .77 gallons per hour. As this would require a very small orifice in the disc, water will be added to increase the rate of flow from the tank. Let us assume that we wish to sprinkle for 30 minutes. We would then put one-half of .77 gallons or 3 pints of solution in the tank and add enough water to fill the tank. Then use disc No. 20 which will empty the tank in 30 minutes.

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