to convert the readings taken in the lines opposite the notches to corresponding intermediate values. In the case of the four-lobed nozzle, depths at points 1.414 feet, 2.828 feet, 4.242 feet, and so on out from the nozzle in the lines opposite the notches were picked from curves plotted from the actual measurements made at the foot points. From this it is evident that the work would have been facilitated and the accuracy increased somewhat by arranging the pans at the desired distances from the nozzle when the run was being made, and also to have had actual readings taken in lines intermediate between the lobes and notches. The reasons for this arrangement of the points at which depths of discharge are desired is shown in the explanation of the method of computation.

As would be readily inferred, the factor of wind has considerable effect on the spray from the nozzle. Such conditions, however, are not at all uncommon in actual practice. If readings are taken at different compass directions from the nozzle, the effect of the wind may be seen and also a fair average depth of discharge obtained. This method was therefore adopted.

Owing to the fact that sewage is not always available for use, experiments may be carried out with water, the results being fairly comparable for all practical purposes.

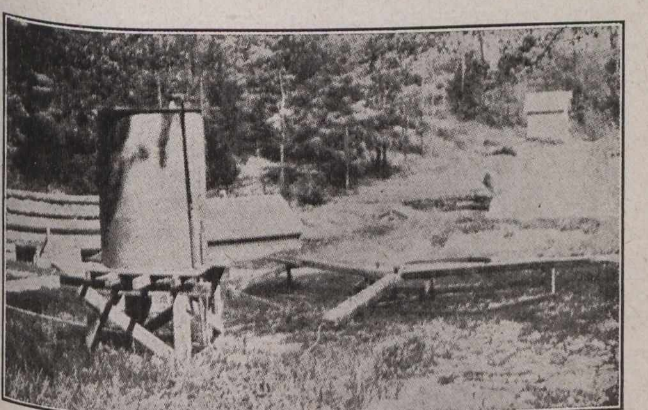

Fig. 3.—Arrangement of Apparatus Used in the Experiment.

In any preliminary investigation it is best to make all runs with constant heads. If thought desirable in order to obtain a better average more than one run may be made at each head. In the tests made constant heads were used, one run being made at each head.

The method of making a run was as follows: The collecting pans being empty and placed in their correct positions and the water in the equalizing reservoir at a certain head, the discharge valve was suddenly opened. The time of opening the valve was noted on a stop watch. By opening the supply valve at the same time, the head in the tank was kept constant. The total head at the tank and the effective head at the base of the nozzle were then noted. At the end of two or three minutes, depending on the depth of water in the pans, the control valve was closed and the depth of water in each pan measured and recorded.

Since the distribution was measured in actual depths at different distances from the nozzle, the measured depths were taken in the convenient unit of thousands of a foot. As it is not always convenient or economical to obtain pans whose sides are vertical, those with slanting sides may be used by making the necessary corrections. The latter type were used in this experiment and the corrections made by means of conversion curves. The pans used, however, should be of a uniform size and shape.

The rate of discharge of the nozzle at any head was obtained by noting the period of time necessary for the water surface in the tank to drop one-tenth of a foot, the supply valve being closed.

The results obtained in the experimental work were arranged according to the following form:

Original Data for Taylor Four-lobed Nozzle.

* Nozzle Setting, H = 0.177 Feet.

Time of Run	Position	Gage Readings Tank	Gage Readings Nozzle	Depth in Pans in 0.001 Feet 1	2	3	4	5	6	7	8	Direction	Rate of Flow
3′	Lobe	5.98′	4.15′	0	6	170	232	51	2	0		West	0.1′ in 37″

At the start of the computation work the readings giving the depths of discharge in the various parts of the bed were converted to corresponding average values for one minute of time. As the numbers became rather small, the unit depth was decreased to ten-thousands of a foot. These values were then arranged according to the following form:

Average of Three Directions for One Minute Flow for Four-lobed Nozzle.

Nozzle Setting, H = 0.177 Feet.

Position	Velocity in Riser Ft./Sec.	Effective Head At Nozzle Feet	Depths in Pans in 0.0001 Feet 1	2	3	4	5	6	7	8
Lobe	2.72	4.275	1	32	404	631	218	9	0	

In testing the efficiency of the nozzles, and as a means of comparison of the distribution under varying conditions, some method by which the relative efficiency of distribution can be measured is necessary. The best method so far devised seems to be that of Phelps, who makes use of a "coefficient of distribution." As originally developed, this idea of a numerical expression of efficiency was applied to tests on circular nozzles only. This was not applicable to the case of four-lobed or six-lobed nozzles, designed to cover respectively square and hexagonal areas. For this reason some new means of expressing the evenness of distribution which would apply to these cases seemed necessary.

To meet this need and also to make it possible to take into account the factor of overlap, which is not considered in the method aforementioned, a modification of the Phelps' method was devised. This modified method, while following the same general theory as the other with respect to the manner of stating the evenness of distribution, differs in that it allows the shape of the area served to be taken into account. The method as devised is given below. In order to make the explanation perfectly clear, a sample computation is given for a four-lobed nozzle.

Calculation of Coefficient of Distribution for Taylor Four-lobed Nozzle by Modified Phelps' Method.—For the purpose of description a 12-foot spacing of nozzles will be assumed, although in the actual computation this does not enter into the work until later and may be varied at will according to the conditions of the case in hand.

The diagram in Fig. 4 shows two nozzles spaced 12 feet apart and placed with the lobes opposite and in line. lines drawn parallel to the common side of the areas served, and midway between the foot points divide the triangular area, forming one-fourth of the total area served by one nozzle, into trapezoidal strips one foot wide with the exception of the outer one which is one-half foot wide and the inner one which contains only one-fourth square foot and may be neglected. The letters *a*, *b*, *c*, *d*, etc., indicate the depths of liquid at points 1, 2, 3 and 4 feet from the nozzle. Letters *a′*, *b′*, *c′*, *d′*, etc., indicate the depths at points 1.414, 2.828, 4.242 and 5.656 feet

*See Fig. 1 for explanation of "H."