Table 2.—Results of Sewage Aeration in the Presence Activated Sludge on the Fill and Draw Plan.
(Parts per million.)

Month	Crude Sewage	Hours after refill. 0	2	5	20
Suspended solids—					
June	180	35	24	20	14
July	147	21	12	8	14
August	154	24	12	9	6
Dissolved oxygen—					
June	1.0	0.0	0.1	0.4	2.5
July	0.7	0.0	0.0	0.2	1.7
August	0.5	0.0	0.0	0.1	0.9
Relative stability—					
June	...	14.	31.	76.	100.
July	...	11.	34.	84.	100.
August	...	12.	28.	63.	88.
Oxygen demand—					
June	230.	53.	38.	...	7.
July	173.	63.	38.	...	4.
August	211.	53.	34.	...	11.
Nitrite—					
June	...	0.08	0.11	0.49	1.50
July	...	0.01	0.07	0.25	0.53
August	...	0.00	0.07	0.12	0.66
Nitrate—					
June	...	0.10	0.60	1.20	7.30
July	...	0.00	0.10	0.55	2.80
August	...	0.00	0.10	0.55	2.80
Volume of air per volume of sewage		1.17	3.50	7.00	24.55

At Champaign, Ill., a very interesting plant is operating. This plant is under the direction of Prof. Edward Bartow, of Illinois Water Survey.

It will be recalled that Prof. Bartow was the first American to start experiments with activated sludge after the English experiments were published, which he did in November, 1914. The results obtained by him in treating sewage by this method have been very gratifying. The present plant has not been very long in operation—about three months. The dissolved oxygen determinations show from 1 to 9 parts per million, and stability with methylene blue lasting from 5 to 15 days and longer. From 1.5 to 3 cu. ft. of air per gallon has been applied by means of porous plate distributors. The former figure is found to be sufficient. Sludge-drying on Imhoff drying beds has not been a success.

There are two activated sludge plants in Chicago. The first, which is the larger, was installed by the Sanitary District in January of this year. So far, the results have been negative, owing mainly to trouble caused by the porous plates used to diffuse the air. Mr. Langdon Pearce thinks that we should go slow in the adoption of this method. It is not a simple process to operate, but one whose entire limitations are not yet developed. The cost problem is still uncertain, particularly the cost of handling the sludge.

The other Chicago plant is that of Armour and Company, soon to be demolished, as its work is about completed, and a permanent plant of large size is to be installed for the stock yards. This is an experimental plant, having, with an 8-hour retention period, a capacity of 30,000 gallons per day. The sewage treated, derived from the stock yards, carries at different times from 58 to 3,000 parts per million of suspended matter. For air distribution, porous plates were used at first, but gave trouble and were soon abandoned, pipe grids being substituted, which could easily be removed and cleaned, and these have given full satisfaction. The pipes are one-inch galvanized pipe and are perforated with 1/25-inch holes, staggered, two inches apart. Mr. G. L. Noble writes of this plant:—

"We have been operating constantly since last February and feel more surely than ever that activated sludge will probably be the cheapest and most efficient method of sewage disposal for our particular needs. . . . We are now installing an experimental plant at Fort Worth, Texas, to use on our sewage down there. We are still experimenting with dewatering the sludge, concerning which our conclusions are not yet final."

At Chicago, about 25,000 gallons of sludge, 99% water, is produced per million gallons of sewage. This gives about 1¼ tons of dried material containing 4½ to 5 units of ammonia, the value of which gives the sludge a value of $9 to $10 per ton in the dry state.

Perhaps the most interesting as well as the largest activated sludge plant in this country is that located at Milwaukee, Wis. After extensive experiments, in which Dr. Gilbert Fowler, of Manchester, England, co-operated, this plant was constructed and put into service in January of this year. Its nominal capacity is 1,620,000 gallons per day; but owing to the settling basin having proved insufficient in capacity, not more than 1,200,000 gallons can be properly treated. Additional settling capacity is being, or already has been, provided, which will bring the plant up to its designed capacity.

Much trouble has been experienced with the porous plate air distributors, and the soundness of the material, of which they are formed. The porosity runs from 1.85 to 4.50 cu. ft. of air per minute per square foot of surface, under 2 inches of water pressure. The air filter is not yet entirely satisfactory, and permits some oil and dust to enter the plates, which results in some plates working more freely than others, and the uneconomical use of air. There seems good reason to believe that these difficulties will soon be overcome, as they are only questions of experiment and design.

Cold weather has been found to increase the amount of air necessary and to decrease the nitrates in the effluent; but in February, March and April, 98 per cent. of suspended matter and 95 per cent. of bacteria were removed, and a stability secured of 108 hours without dilution.

The dewatering of sludge has been successfully done with either of two kinds of presses. The sludge which contains 99 per cent. water is reduced to 75 per cent. water without difficulty, and further dried by a direct or indirect heat drier to 10 per cent. moisture.

As to the value of the sludge recovered, this is stated to be about $12.50 a ton of dry material, on the basis of 5 per cent. of available ammoniacal nitrogen, which is worth about $2.50 per unit, each per cent. being taken as a unit. This does not include phosphoric acid or potash, of which the combined value may be from $1 to $2 in each ton.

Milwaukee is so situated and the cost of electric power, stated to be about 6/10 of a cent per kw.h., is so low, that the activated sludge method seems particularly well adapted to the place, and problems of design now seem to be the principal problems to be met.

At Baltimore, Md., activated sludge experimental work has been progressing with many difficulties, caused mainly by the form of air compressor at first installed. The oil used to lubricate this got into the porous diffusers, which gave considerable trouble and was not prevented by the interposition of a gravel strainer in the air line.