through the plant will increase. If the rate of aeration is kept constant the increasing sewage flow will meet a decreasing proportion of air. Such procedure might overload the activated sludge with organic matter. In our new plant arrangements have been made to store such sludge in tanks with continuous aeration during the period of weak night flow for the purpose of oxidizing the undigested materials. This purified sludge will then be in extra good condition to attack the strong sewage of mid-day.

Mr. Copeland compares the results obtained on Sundays and Mondays and the table below gives the average of four such comparisons.

Relative Purification of Weak and Strong Sewage by Activated Sludge (Fill and Draw.)

Analysis of Treated Sewage.

Day of Collection	Gallons Treated	Average Number of Cu. Ft. of Air Per Gal.	Mil. of Bacteria per c. c. 20° c.	Parts Per Million Suspended Matter	Oxygen Consumed	Nitrogen as Organic Nitrogen	Nitrogen as Free Ammonia	Data Regarding Effluent Stability in Hours	Nitrates P.P.M.
Sunday ...	74,190	2.03	3.11	136	68	27	14.9	..	..
% Removed	..	..	96	99	71	65	60	..	..
Monday....	74,100	2.26	3.37	343	111	28	13.9	120	5.9
% Removed	..	..	96	96	83	75	64	..	..

"Estimating the comparative strengths of these sewages by the amount of suspended matter contained, we see that the Monday sewage was about twice as strong as the Sunday sewage. By increasing the air from 2.03 to 2.26 cu. ft. per U.S. gallon, or 10 per cent., the stronger sewage was treated satisfactorily." On one Monday the suspended matter was six times as much as on the preceding Sunday, and yet 1.8 cu. ft. of air per gallon took care of this strong sewage as 1.9 cu. ft. per gallon took care of the Sunday liquor. Liquor containing as much as 600 parts of suspended matter per million have been successfully treated with less than 2 cu. ft. of air per U.S. gallon. Assuming the quantity of air at 2 cu. ft. per U.S. gallon, which is equal to 2.4 cu. ft. per Imperial gallon, and basing a calculation on four hours' aeration, then, $\frac{22{,}200 \text{ gallons} \times 2 \text{ cu. ft.}}{4 \text{ hours} \times 336 \text{ sq. ft.}} = 33$ cu. ft. per square foot of tank area per hour, which seems high compared with the results obtained by Messrs. Ardern and Lockett and Dr. Edward Bartow.

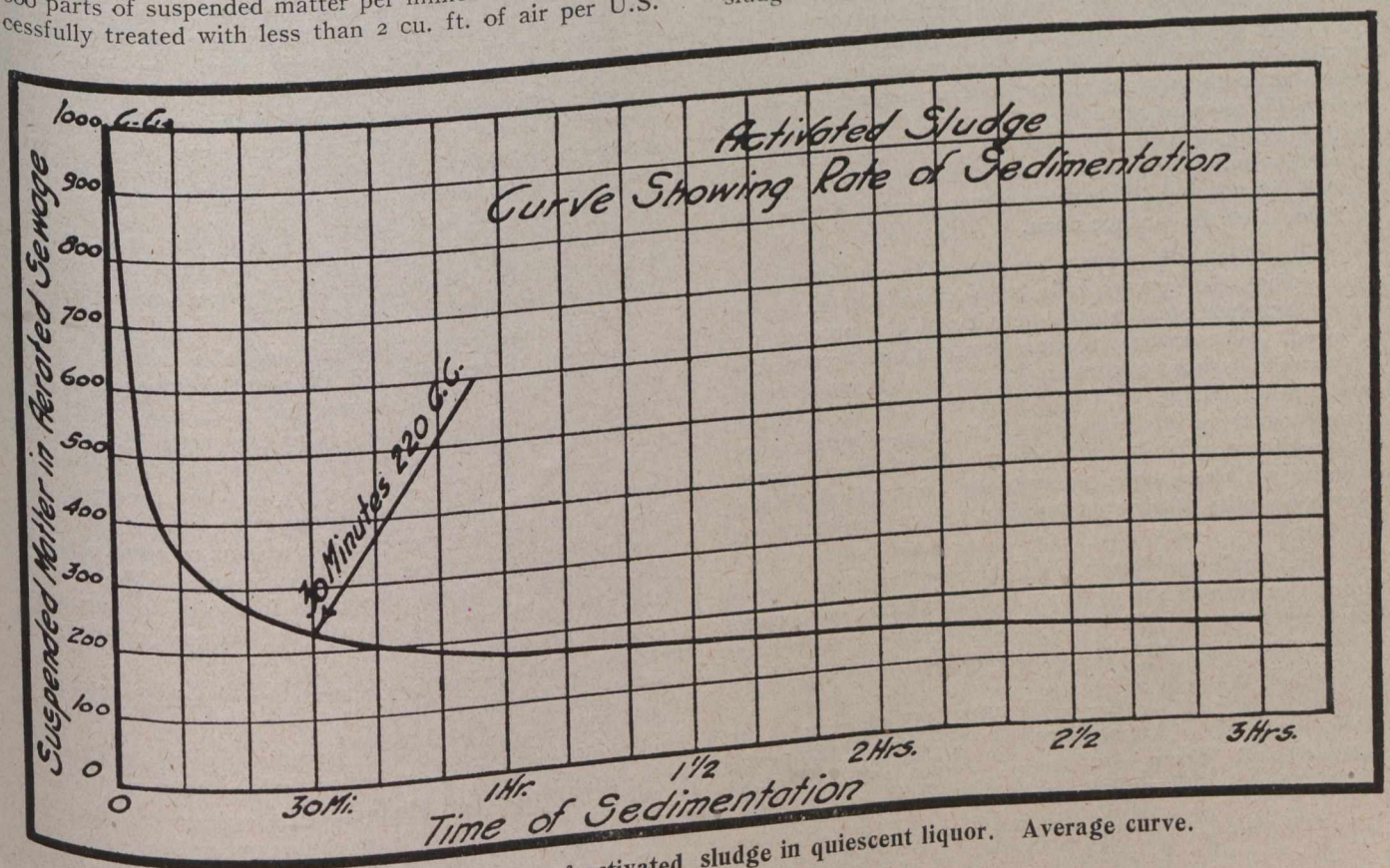
Mr. Copeland supplies a table showing the progressive steps of aeration.

Purification of Sewage Obtained Compared with Period of Aeration.

Period of aeration, in hours	0	1	2	3	4	5
No. of cu. ft. of air per min...	0	160	160	160	160	160
Cu. ft. of air per gallon	0	0.66	1.33	1.99	2.66	3.22
*Appearance of settled liquor.	Turbid.	Clear.	Clear.	Clear.	Clear.	Clear.
Stability in hrs..	0	2	33	120+	120+	120+
% bacteria removed	0	52	81	92+	95+	98+
Parts per million:						
Free ammonia.	22	17	15	11.	7	5
Nitrite	0.08	0.00	0.95	1.75	2.20	2.50
Nitrate	0.08	0.04	0.70	2.80	5.60	8.20
Dissolved oxygen	0.00	0.30	1.90	4.30	5.90	6.70
Cost per million gallons.....		$1.40	$2.82	$4.25	$5.64	$8.10

*NOTE:—The suspended matter carried by the sewage on this date ran 235 parts per million and the supernatant liquor after 1 hour aeration contained not more than 10 parts per million.

These data point clearly to the fact that well activated sludge coagulated the colloidal matter about as completely



Showing rate of settlement of activated sludge in quiescent liquor. Average curve.