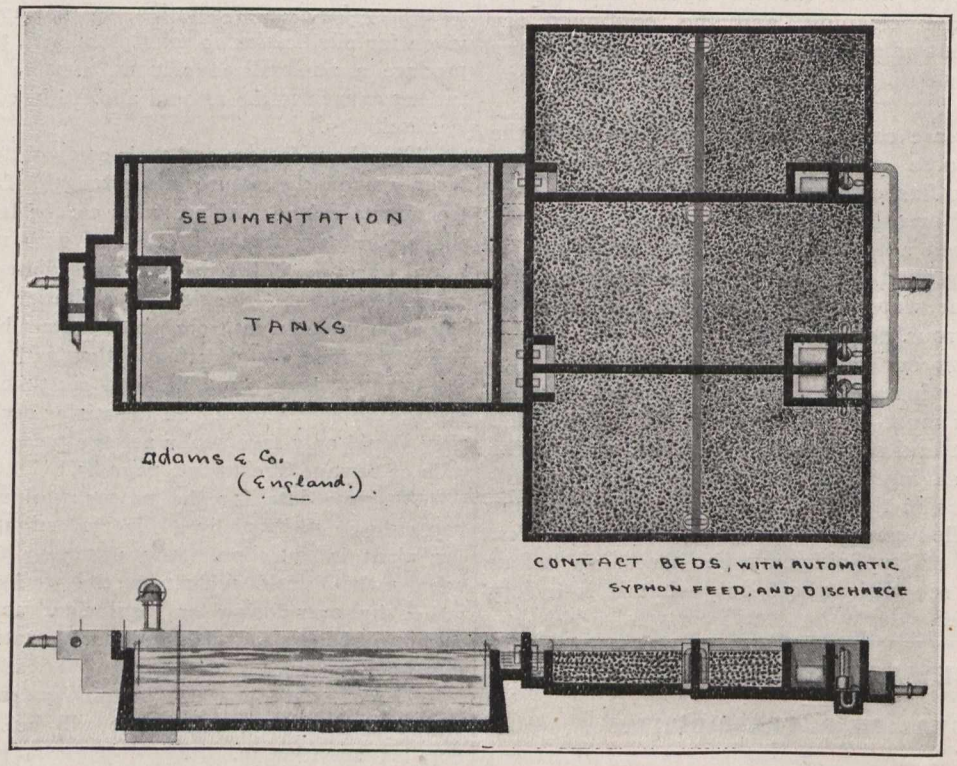
quantity of water is held up in a bed, and the quantity of draining increases, till with a bed in long use a very short contact, say, a quarter of an hour is all that is required. With increase in dilution of the tank effluent, due, e. g., to storm water, the period of contact may be reduced to a minimum. In general, after the bed is once mature, the period of rest is more important than the period of contact, and the total time occupied in twenty-four hours in filling, standing full, and emptying should not exceed the total of the period of rest. Thus, with ferquent fillings, the time of contact should be shortened. If the bed takes long to fill, the extra time in filling should be taken from the time of contact."

The above is quoted as it represents fairly accurately English practice, which has given great attention to the practical working of this system. Dunbar in his Hamburg experiments practically substantiates English practice in this



direction. In order to test the amount of purification effected and absorption at various periods of contact, six filters were constructed of exactly similar size and of the same material, and they were charged simultaneously every day with the same sewage. The first filter was discharged after standing full for half an hour, the second after an hour, and so on. The results are shown in the following table:—

Reduction in oxygen absorbed effected by Contact Bed.*

	Time Bed Standing full (hours)	Oxygen absorbed (parts per 100,000) Day. 1st.	2nd.	4th.	6th.	Percentage Reduction in Oxygen abs'bed on 6th dy.
Crude sewage, str'ned	....	9.07	12.30	9.30	11.42	.....
Effluent from Bed	1	0.5	5.85	4.10	4.37	3.57	68.73
" " "	2	1.0	3.52	3.67	4.07	3.15	72.43
" " "	3	2.0	3.22	3.07	2.62	2.27	80.09
" " "	4	4.0	2.87	2.77	2.47	2.00	82.49
" " "	5	6.0	....	2.92	2.32	1.85	83.81
" " "	6	12.0	2.77	1.75	1.75	1.57	86.21

The table shows clearly that the reduction on the oxygen absorbed, which may be taken as a measure of the changes which have occurred is not so great on the first as on the following day. On the sixth day the filters were so far matured that they effected a considerable reduction in the oxygen absorbed. Even with only half an hour's contact the oxygen was reduced from 11.42 to 3.57, i. e., by 68.73 per cent., and the effluent was non-putrescible. By a longer contact the oxygen absorbed was further reduced, but not by any means at the same rate. The main portion of the purification had taken place, therefore, during the first half hour. The experiment was repeated, allowing the first filter to stand full of sewage for five minutes, the second for thirty minutes, and so on. The filters were now more mature, and within the first five minutes the oxygen absorbed was reduced from 13.87 to 2.34, i. e., by 83.2 per cent. The main portion of the purification had thus been achieved during the first five minutes. Dunbar, therefore, points out what must be apparent, that the separation of the putrescible matters in solution does not occur gradually, requiring prolonged periods of contact, as would be the case if it were due to the direct decomposing action of bacteria during the time of contact.

We must conclude that the time of contact or period when the beds stand full is useful only as far as the question of absorption is concerned, and that as the absorbing power of the filter increases, the time of contact may be cut down to minutes, and that no benefit in extra nitrification is obtained by allowing longer periods of contact than are necessary for the process of absorption.

Referring to the period of rest or aeration, which is generally now acknowledged as the most important phase in the contact cycle process. During this period, when the liquid sewage is drawn off, the bed uses up not only the oxygen which is immediately drawn into the pores of the filter taking the place of the space volume lately occupied by the liquid, but continues with great energy to attract oxygen from the surrounding atmosphere. This has led to many experiments with a view to forcing atmosphere into the filter beds under pressure, such, however, have not been successful in practice. It is agreed that a well constructed bed supplied with aerating pipes, the filtering material being of a size allowing ample air space, can obtain by ordinary methods all the oxygen it requires. It is a question, however, whether in the case of using very fine material, or where beds have to be protected from the frost, a greater efficiency can not be obtained by introducing warmed air into the base of the filter during winter months especially.

In the case of a very fine material especially when the beds are fairly deep, such as 6 feet for instance, the air containing space being proportionately small, the oxygen may be used up at a higher rate than it can be supplied. We have several examples of such beds on record, where undesirable septic decomposition has been set up, the effluents showing discoloration, caused by sulphide of iron, as well as giving off strong odors of sulphuretted hydrogen.

The main reason why a contact bed will deal with such large quantities of sewage, remains in the fact that the gen-

*Principals of Sewage Treatment, page 159 (English Edition.)