

very different fashion, their workshops being variously known as "bacteria beds," "contact beds," and "filters." The last of these terms, though not wholly appropriate from a scientific point of view, is so convenient and so well known that it is most generally adopted. A plentiful supply of oxygen is essential to the purification of the effluent, and the chief function of a filter is to secure a thorough admixture of this with the atmospheric air. Many devices more or less ingenious have been employed for the purpose; but in point of simplicity and efficiency the following method is the best. It consists in charging a filter with some granular material such as coke, burnt ballast, or broken clinker, filling the interstices of the material with the liquid to be purified, keeping the filter full for a certain period, and finally drawing off its contents. The liquid descending through the filter is brought into close contact with the air which the latter contains, and is purified by the agency of the aerobic bacteria therein. In addition to promoting the admixture of liquid and air, the filtering material serves the further important purpose of affording a resting place for the bacteria, which would otherwise be washed out at every discharge. To secure the utmost efficiency, these organisms must be brought as near their mark as possible; in other words, the interstices should be narrow, so that no portion of the liquid may be far from the filtering medium. The latter should be in small pieces, so as to afford the maximum superficial area; but, on the other hand, it should not be so fine as to prevent the liquid from passing away freely. In order to secure efficient working, and at the same time to maintain the filters in healthy condition, they must be worked in regular rotation. If the valves regulating the admission and discharge of the effluent are opened and closed by hand a man must be constantly present to watch the rate of filling, and open and close the valves at the proper times; and if the work is to be done regularly and efficiently, he must never fall asleep at his post, nor yet make a mistake. Now, the infallible man is not easily found, and in any case the wages of successive relays of men for the night and day shifts would bear very hardly on a small community. It was therefore necessary to devise means whereby the filling and emptying of the filters might be effected without manual intervention. For this purpose automatic alternating gear was introduced, in which the various stages of filling, resting full, discharging, and aerating are brought about in turn by means of an

overflow from the filter last filled. The alternating gear at Belleisle has done its work with unflinching precision for the past three and three-quarter years, during which time it has effected something like ten thousand discharges. The whole installation is thus rendered completely automatic, the attention required being reduced to an occasional visit of inspection, oiling the bearings of the gear at long intervals, and throwing the spare filter into work in place of one of the others every second or third day. The filtered effluent varies somewhat in appearance, according to the period of the discharge and the strength of the sewage; but it never fails to excite the warm admiration of the deputations who come to inspect the works, and who often have to taste the filtrate to satisfy themselves that it is really as good as it looks. As regards the financial aspect, the first cost of an installation on the septic tank system is in general not more than that of works of the kind hitherto in vogue. Bearing in mind that works on this system for a given population are always capable of dealing with a large quantity of storm water in addition to the sewage proper, it is really cheaper than the older systems, even as regards first cost. The true criterion, however, is the annual cost of working, which, for precipitation works of a moderate size, would range from a shilling to eighteen pence

per head or even more. Works of the kind for a population of 47,000, which the works now being laid down at Belleisle will be capable of serving, would the fore cost from £2,500 to £3,500 per annum for working expenses alone. The septic tank installation will probably cost one-twentieth part of the smaller sum

FINISHING WHITE AND YELLOW PINE.

One of the best, though perhaps not the cheapest way to finish white pine is to see that the work is well sandpapered to the grain, then thoroughly dusted. Give it at least one coat of white shellac varnish and one coat of inside varnish. Should this prove to be too expensive, substitute liquid filler for the shellac. For hard yellow pine finish apply one coat of orange shellac varnish and one or two coats of hard oil finish, or omit the shellac and apply hard finish instead. A filler is required for this wood. In every instance, however, whether shellac, varnish, liquid filler or hard oil finish is used, care must be taken that the first coat is thoroughly dry and hard before applying the succeeding coat, or the latter is liable to sink, causing lack of lustre.

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