

450° and 482° Fah., naphthaline, crystalline when cold).....	24.00 per cent.
Oils (heavier than water, distilling over between 482° and 540° Fah., naphthaline, crystalline when cold).....	28.50 "
Higher phenoloid bodies, distilling over between 540° and 610° Fah.....	10.25 "
Heavy crystalline substance and a little red oil, distilling over between 610° and 680° Fah....	12.00 "
Soft pitch, non-volatile at 680° Fah....	15.50 "
	100.00 "

No two lots of oil will give precisely the same analysis, so that only general qualities should be called for in specifications. The phenols, which include crude carbolic acid, cresylic acid, and other tar-acids, are the germ-destroyers, and some of the heavier constituents, principally naphthaline and acridine, which crystallize in the cells and render the wood water and air-proof, are the germ-excluders.

About 10 lbs. per cubic foot is sufficient to prevent decay above water, and 15 or 16 lbs. per cubic foot to protect the piles against the ravages of marine insects for at least thirty and perhaps fifty years, in Canadian waters. Creosoted piles at Sydney, Cape Breton, in use 24 years, are still in perfect condition.

The following quantities of creosote per cubic foot are considered a sufficient protection against sea-worms at the places mentioned below :

In English harbors.....	10 to 12 lbs. per cubic foot.
Northern harbors in the United States.....	10 to 12 "
Holland and Belgium.....	10 to 12 "
France.....	19 "
Gulf of Mexico.....	20 "
Canada.....	15 to 16 "

The square timber should be handled carefully after creosoting, to avoid chafing or brooming the edges and thus spoiling its appearance.

Economy in creosoting.—Piles can be treated most economically at a shipping port near the forest in which they grow, because the following items of loss are thereby avoided :

1. The handling and the freight on the bark, which is about 10 per cent. or 15 per cent. of the total cubic contents.
2. The cost, handling, freight and duty on the small and crooked ends which will be cut off before creosoting.
3. The cost, handling, freight and duty on the waste pieces occasioned by cutting piles to special lengths.
4. The cost, handling, freight and duty on piles which may be condemned by the Inspector as being unsound, small, or crooked.
5. One extra loading into the vessel, and one extra unloading from the vessel.

Purpose of creosoting.—The purpose of creosoting is to so fill up the cells of the wood that neither air, moisture, nor life can get inside. In order that this may obtain to the fullest possible extent, it is necessary that as little cutting as possible be done, and all cuts or broken surfaces be covered over with three or four coats of thick hot creosote, and where such surfaces are exposed above water they should be coated over once a year.

If two or three months elapse between the time of treatment and the using of the timber in actual construction, inject 1 to 1½ lbs. of creosote extra per cubic foot of timber, to allow for evaporation.

Inspection.—Close inspection during the treatment by a reliable engineer, experienced in the work, is an

absolute necessity, and honest contractors always prefer to have such a man at their works.

Economy in Construction.—The saving of labor for renewals and maintenance, and not the first cost, should be the ruling factor, and in a calculation for ultimate economy, it will be found a decided waste of money to expose untreated timber to the insatiable sea-worm. Public works and railroads exposing untreated timber to quick destruction by sea-worms, instead of defying them by using creosoted material, are neglecting an important economy ; in the case of Public Works spending the people's money for maintenance and renewals, and in the case of railroads spending money for maintenance which should be paid in dividends to the stockholders. To secure good results, pay a sufficient price, contract with none but reliable persons, and keep an experienced person at the works during the preparation and treatment of the timber.

Price.—Creosoted piles, from 30 to 65 feet long, can be delivered in dock in almost any port in Canada, freight and duty paid, for from 30 to 40c. per lineal foot, according to lengths and sizes of butts and points ; square timber for from \$35 to \$45 per B.M., according to sizes, lengths and quantity of oil. Duty is 20 per cent.

The following is a skeleton specification for the supply and creosoting of piles (short-leaf or Loblolly pine) with dead oil of coal-tar, which may prove useful as a general guide :

SPECIFICATION.

For piles of Virginia or North Carolina short-leaf or Loblolly pine, to be delivered, freight and duty (20 per cent.) paid, at , on or before the day of, 189..., as per accompanying bill.

The piles to be of the Virginia or North Carolina short-leaf pine, *Pinus mitis*, or Loblolly pine, *Pinus toedas*, sound, free from shakes, bad knots, or other imperfections that would reduce their strength. To be completed, barked and saw-butt, and so nearly straight that when the tape is stretched from the centres at the ends, it will not overhang the most crooked places more than one inch. They shall be not less than nine inches diameter at the small end, and not less than 16 inches diameter at the butt ; all measurements after barking. To be of even taper and not button-headed, thus : a pile 16 inches at butt to be not less than 14 inches three feet down. The cubical contents of the round piles shall be determined by the rule used by the United States Government, as follows : Multiply the square of mean circumference by the length and divide by 12.5 ; if in inches divide again by 144.

Dead Oil of Coal-tar.—The creosote shall consist of dead oil of coal-tar heavier than water—not thin oil, lighter than water, thickened and weighted with coal-tar. The composition shall be as follows : At least two-thirds shall be obtained by distillation at a temperature exceeding 482° Fah., and the remainder at a temperature exceeding 392° Fah. Specific gravity at 60° Fah, between 1.035 and 1.065. Completely liquid at 100° Fah. To solidify between 40° and 45° Fah. Phenols between 5 per cent. and 10 per cent. Naphthaline not less than 50 per cent. Boiling point not below 410° Fah. The storage tank shall have no water on top of the creosote, nor no muddy nor objectionable matter at the bottom. When a sample for analysis is required, it shall be composed of one-half from the upper 12-inch layer and one-half from the lower 12-inch layer of the storage tank.