(1), the clinker concrete is better than the ordinary gravel concrete; (2), it is almost if not quite as good as the best gravel concrete; (3), it is far superior to cinder concrete; (4), if properly mixed it will give uniform results under test; (5), it can be used to advantage in mass concrete; (6), the tests have not been carried far enough to warrant its use in reinforced concrete; (7), that the city of Milwaukee can use this material for any of its concrete work and provide an income for the running of the garbage disposal plant. Further tests are necessary to determine the mixture of cement, sand and clinker which will give the maximum strength for the same cost of materials.

CROSS-TIES.

The Forestry Branch of the Department of the Interior has collected statistics with regard to the cross tie consumption in Canada for 1910.

There were 9,213,962 cross ties purchased in 1910 by the steam and electric roads of Canada at a cost of $3,535,228. This is a decrease of 35 per cent. from the number purchased in 1909. The average cost of these ties at the point of purchase was 38 cents per tie. Three kinds of wood, cedar, jack pine and hemlock furnished 77 per cent. of all the ties purchased. Cedar itself supplied 40 per cent. of the total consumption and its use is increasing yearly in proportion to other species. Oak, which makes an expensive tie, costing 74 cents each, was used principally by an United States company having mileage in Canada. Of the total number of ties purchased, 70 per cent. were hewn ties. The only important species which has a majority of sawn ties, was oak. Sawn ties cost on the average 36 cents per tie and hewn ties cost three cents more. The steam railways used 95 per cent. of all the ties and these ties cost them on an average of 38 cents. The electric railways used 302,540 ties—an increase of 183 per cent. over 1909. They paid for their ties 41 cents each. Although on the average they use smaller ties, this excess of 3 cents in the cost is due not only to the disadvantages incident to contracts for smaller quantities of material but also to the fact that the electric roads are more likely to purchase ties at points where the price includes transportation charges.

WASTE IN SPARE AUTOMOBILE TIRES.

Spare tires, which are not included in the equipment of Franklin cars, the manufacturers claiming they are unnecessary to their form of construction, are the basis for a few interesting figures submitted by an engineer of that company as follows:

"Assuming that there are in round numbers 500,000 automobiles in the United States and that each one carries a spare tire and that the cost of the average spare tire is $47, the motoring public of this country has $23,500,000 tied up in this form.

"And, assuming that the value of a spare tire depreciates about one-half before it is placed in use, there is a dead loss of $11,750,000.

"Again, if the average spare tire weighs 25 pounds, the cars are carrying an unnecessary weight of 12,500,000 pounds.

"Further, if the average owner drive 500 hours a year at 20 miles an hour there is a total yearly waste of 4,337,000 horse power in carrying the spare tires."

SIXTY-TON TEST ON CONCRETE PILE.

The following test on a concrete pile was made during the course of last year by Lockwood, Greene & Co., of Boston, on a Simplex concrete pile driven at the New Print Works of the Pacific Mills by the New England Foundation Co., the contractors. Although the duration of the test was two months, and the local 60 tons for more than one month, the settlement recorded was practically negligible. It should be noted that the pile was driven in the spring of the year when the ground was moist and cold, causing the concrete to set comparatively slowly.

The figures have added value, as data on this subject is extremely scarce, principally due to the fact that there is not usually an opportunity for testing a pile which will see actual service. However, conditions at the Pacific Mills are such that a complete test was possible. Since the methods employed in the tests were carefully arranged and all readings made and checked by two engineers of an unprejudiced firm, the data is absolutely reliable. The conditions of the tests were worse than would be set in general practice and it should be remarked here that the pile selected for the test was one that did not look as fit as the others.

The general method used in the simplex system consists in driving to a suitable bearing, under a drop hammer, operated in a substantially rigged pile driver frame, a 16 in. diameter, ¾ in. thick hollow cylindrical steel tube or form to the lower end of which is fitted loosely with a conical cast iron point. As practically the entire energy of the hammer is delivered to the point full value is given to the penetration, equal compression to the soil all the way down, and developing the full bearing value of the soil, from top to point. Upon reaching the required depth the form is filled with soft concrete, by means of drop bottom buckets, to a sufficient height and quantity to fill the pile hole to proper level. The form is then pulled out, leaving the point in the ground, the concrete being forced down and out by its own weight, thereby completely filling the hole to its compacted wall. The concrete is always placed before the removal of the form, no shell being left in the ground.

The pile under test was driven on the banks of the Merrimac River through a stratum of gravel which is filled with water. In order to keep the water out of the tube while it was being filled with concrete, a coil of oiled jute was placed between the cast iron point of the pile and the steel tube.

To obtain an even bearing area for the load, the pile was cut off, capped and then surmounted by an iron plate upon which were balanced 8 in. x 16 in. timbers over which were placed similar timbers at right angles. The platform was then erected to support the brick wall.

By counting three different piles of one hundred bricks each the average weight per brick was found to be 5.18 lbs. Every part of the platform and all materials supporting the brick load were carefully weighed previously and found to weigh 3456 lbs.

Readings were obtained by means of a piece of 1¼ in. gas pipe 17 ft. long placed upon the iron plate between the timbers and by referring to a nail head placed in the river wall nearer the pile and assumed as zero. Readings were taken daily at nearly the same hour, corrections of temperature for above gas pipe being made after June 2nd. Observations were recorded by one engineer of Lockwood, Greene & Company and checked by another of the same firm, both readings being kept.

The test begun on May 13th which was ten days after the pile was driven. A load of 30 tons was applied on the 14th and this was not changed until May 19th, the difference of readings being .006. On the later date 15 more tons were applied, making the load 45 tons. On the 8th of June the