should be laid a 6-inch foundation of clean coarse gravel, to conform with the cross section and finished grade of the street. Upon this foundation of gravel when thoroughly rolled was then placed 3 inches of tarred stone capable of passing through a 2½-inch ring, 20 per cent. of which being fine crushed and capable of passing through a 1½-inch ring. This crushed stone was heated on a steel platform or pans to 120 degrees, and tar composition then poured until the stone was thoroughly covered. Tar was heated to boiling point (212 F.) and pitch to about 240 degrees, and the whole thoroughly mixed. After mixing it was placed on the street and graded evenly to the required depth, then rolled with a horse roller, after which it was rolled with a steam roller. A second course 2 inches in depth of crushed stone passing through a 1½-inch and 1-inch ring respectively, mixed in the same manner, was placed and rolled with a horse roller. On this second course was then spread the finishing coat 1 inch in thickness, composed of a thorough mixture of sand, pitch and tar. The sand was thoroughly dry and heated to at least 120 degrees Fahrenheit. This coat was applied while hot, spread evenly to the proper thickness, and rolled with horse roller, after which the whole pavement was rolled with the steam roller and sanded with dry sand ½-inch in depth. Traffic was to be kept off for a period of at least one week. Tar was to be heated to 212 Fahrenheit and pitch to 240 Fahrenheit, and properly mixed in the ratio of ten gallons of tar to one gallon of pitch per cubic yard of crushed stone, and eleven gallons of tar to one of pitch per cubic yard for the top coat. Tar was required to be clear coal gas tar containing no water gas tar; the pitch also to be the best of its kind manufactured from pure coal gas tar.

Guelph.—The City of Guelph in 1908 laid one block of tar macadam. This consists of a foundation of rough stone, 8 inches in depth. On this was laid a 3-inch layer of 3-inch stone. Then followed a 3-inch layer of 2½-inch tarred stone; then a 1-inch coat of ½-inch stone tarred. Both stone and tar were heated, the hot tar being poured over the dried stone. Several other streets, aggregating 27,016 square yards have since been similarly paved. The tar is produced at the municipally-owned gas works. For both coats of stone, the amount of tar used averaged 2½ gallons per square yard.

These roadways are giving satisfaction, and show very little sign of wear. In the years 1910 and 1911 concrete foundations on tar macadam roadways were found to be cheaper than stone. In laying the surface the concrete base was flushed with hot tar. The 2-inch broken stone was then spread to a thickness of three inches, and rolled once or twice with a 15-ton roller. The stone was then sprinkled with hot tar sufficient to coat most of the stone, but not enough to fill the voids. For the surface, half-inch stone free from dust, was dried on plates and mixed on a mixing board with hot tar, then spread and rolled until well compacted.

In laying the earlier roadways the tar was boiled in ordinary tar kettles, but this method was too slow. The city now uses an old steam boiler set in brick work in the ordinary manner. The tar is emptied into the boiler from an elevated platform, and after being boiled is drawn off by a pipe from the bottom into a tank wagon, and immediately taken to the street. The only refining is by boiling. A slow fire is necessary and constant stirring to prevent boiling over. The tar is frequently tested by cooling a little in water, and the boiling is continued until the tar becomes of the desired consistency.

Ottawa.—Tar-concrete pavements were first laid in Ottawa in the year 1902, and the total length laid has been 5.15 miles. In construction, the roadway was excavated to the required sub-grade, which was then rolled with the 15-ton roller if soft or loose, until thoroughly compacted. Upon this the spalls were placed to a depth of from 8 to 10 inches, and the top spalls broken up by hammers and made to conform to the shape of the roadway. On the spalls was placed a layer of 2-inch stone, 3 inches thick and well rolled. The next layer consisted of 2-inch tarred limestone, 3 inches thick, and put down while hot and rolled at once until cool. Great care was taken with this layer to see that it conformed to camber and grade in crown and gutter. The last coat or wearing surface consisted of a 1-inch layer of ⅝-inch tarred limestone, laid down while hot and rolled until it presented a hard, smooth surface. This surface was then dusted over with limestone dust to fill up any interstices and render it water-tight. The amount of crown on these pavements varied according to the width from 7½ inches to 8½ inches, being reduced in amount as the longitudinal grade increased.

Chatham.—One block of tar macadam was laid in 1898, but this has not been satisfactory, owing, apparently, to the surface of the tar macadam being destroyed by a coating of clay brought by the wheels of vehicles from unimproved streets. In 1910 it was sufficiently intact, however, to be used as the foundation for a bitulithic pavement.

The specifications for the tar macadam required:—An excavation 12 inches below the finished grade of the pavement; an 8-inch layer of broken stone; a 4-inch layer of tarred stone; a ¾-inch layer of fine tarred surface coating.

The stone to be tarred was spread on an iron floor, under which were flues from a fire, and heated until the moisture was driven off. The stone in its heated state was then mixed thoroughly with tar. The tar was previously boiled in an iron kettle holding 50 imperial gallons, to which was added a bucketful of pitch. Eight imperial gallons were added to each cubic yard of coarse stone, and from ten to twelve gallons to the fine stone. The cost of the tar macadam was $1.23 per square yard.

Results.—The tar-concrete roadways described, have been made from commercial tars. The work was principally by day labor under corporation foremen and engineers. Reference to proprietary tar products has been purposely avoided. The writer is not personally familiar with the first tar pavements laid, but has observed construction and results in numerous cases since the year 1900. The general history of these pavements has shown much similarity. For the first three years the surface has been all that could be desired, but about the end of that period a disintegration of the top coat has commenced. At the end of five years a mottled condition has become general, where the seal coat has chipped away, exposing the coarser bed of tarred stone. At the end of ten years the surface has become generally disintegrated, but the foundation has rarely, if ever, broken through, and a portion of the tarred surface course remains in place. Sections of the Mulberry Street pavement in Hamilton, laid in 1880, can still be seen. In no case has it been found that adequate attention has been given to the repair of these pavements by tar painting, or patching with tarred stone.

In the cities of Hamilton and Toronto, both of which have municipal asphalt plants, the tar pavements have been restored by giving a complete surface of sheet asphalt. The greater part of the tar-concrete roadways in Hamilton laid since 1899, have been treated in this way at the end of ten years, and results have been very gratifying. James Street south, in Hamilton, with central lines of car tracks, has been treated in this way, and is indicative of results under heavy traffic. Dupont Street in Toronto, constructed as a tar macadam in 1903, was surfaced with a coat of sheet asphalt one inch in thickness in 1908, and the pavement is to-day (1912)