This was a tile-pipe sewer with joints so imperfectly made that the air escaped into it in ever-increasing quantity until it was found impossible to contain enough pressure to hold back the water. It was then decided that the old sewer would have to be plugged and a new local was built along each boulevard. Every effort had been made to avoid doing this; the contractors even hauled earth from the south side of the tracks (about one-quarter mile) and deposited it on the street to a depth of two or three feet, also a new lock was built near the heading which would reduce the volume of air and, therefore, the area for possible escape. The compressors were also moved up and pipes driven from the surface through which the air was pumped into the tunnel. But all these efforts proved of no avail, and the new locals had to be built.

Advantage was taken of this delay to test the line of the sewer. This was considered advisable since the line had been carried around three curves from the shaft south of the tracks where it was first taken down. Two 6-inch pipes covered by caps were driven from the surface of the ground on the correct line ahead of the work. When these were driven to a sufficient depth plumb lines were dropped to the bottom, the top ends of which were placed exactly on the correct line of the sewer. Afterwards, when the tunnel reached these points, Mr. R. C. B. Tempest, the resident engineer, found to his satisfaction that his line was almost exactly true.

While the new locals were being built, a new shaft was sunk at a point on Mulock Avenue, north of Hirons Street. Another lock was also built and in this case a concrete collar was provided to prevent the air from escaping back over the lock and into the shaft. The shorter haul more than compensated for the cost of sinking the shaft. Work from here went on rather quickly and without any more accidents. Toward the end of this section the greatest progress was reached, from twelve to fifteen feet of sewer being completed each day.

The needle-beam method of supporting the timbers was used throughout. Several of these beams broke, owing to the various accidents which lessened the air pressure in the tunnel and thus necessarily increased the weight on the beams. After each accident the size of the needle-beam was increased until a 16-inch by 16-inch timber, reinforced on each side with steel plates, was used. Several times when the pressure was decreased the timbers in the crown of the tunnel settled so much that there was room only for one or two rings of brick. These places were built in temporarily, but when the rest of the sewer was complete they were opened up again, the timber raised and the brick work replaced correctly.

This large trunk sewer supplied a great need in the part of West Toronto which it served; besides providing a direct outlet for all the sanitary sewage and storm water of this the business and most thickly populated section, it also provided a direct and adequate outlet for all the sewage and waste water from the abattoirs. This had formerly all been carried in greatly over-charged tile pipe sewers winding through the principal streets and discharging into a 24-inch tile pipe outlet.

Considering the whole work, with the many difficulties overcome, the contractors, Messrs. Donnelly & Graham, deserve very great credit for their spirit and perseverance.

On the canals between London and Liverpool there are nearly 200 locks. On the waterway between Berlin and Hamburg there are only three locks. This is an extreme contrast, but taking the canals of England and Wales altogether, there are 2,377 locks for 3,800 miles of waterways.

LECTURES IN HIGHWAY ENGINEERING AT ONTARIO AGRICULTURAL COLLEGE

Arrangements have been made whereby during the fall term of the Ontario Agricultural College at Guelph, a course of ten lectures on highway economics, construction and maintenance will be included in the regular curriculum. The lectures will be given by the engineers of the staff of the Ontario Department of Highways, each dealing with the branches of the work of the department with which he is connected.

The following syllabus indicates the extent of the course which will be of value and of interest to those attending:—

1. History of Road Development, Growth of Traffic and Economic Value of Roads.—This lecture to briefly consider the origin of roads under Rome, and in ancient times, and to trace their early development in France and Great Britain, leading up to modern methods and to modern traffic and traffic requirements; economic value to develop from early military uses to present-day value of roads in general scheme of transportation.

2. Outline of Road Construction.—This lecture to discuss types of roads, suitability to traffic, steps in construction and the essential features of a good road. From this lecture, the remainder of the lectures should develop the details.

3. Road Drainage and Grading.—This lecture to deal with earth work, objects to be attained in grading, methods of handling earth, finished camber of the road, side ditches, under-drains, drain outlets, drainage laws, treatment of roadside.

4. Road Foundations and Subordinate Structures.—This lecture to include bridges, culverts, guard-rails, protective devices at railway crossings, etc. The depth of road crust would be fully discussed in relation to traffic and sub-soil.

5. Road Surfaces and Materials.—This lecture to discuss earth roads, broken stone roads, bituminous surfaces, concrete roads, the materials available for road surfaces, their qualities, tests and methods of treatment.

6. Road Maintenance and Dust Prevention.—This lecture to discuss effects of traffic, methods of road protection, methods of making small repairs, general methods of maintenance for each class of road.

7. Road Machinery and Its Operation.—This lecture to describe road graders, rock crushers, road rollers, implements for screening and handling stone and gravel road scrapers, the log drag, etc.

8. Road Laws and Organization.—This lecture to describe road laws in Ontario, their development, the responsibility of municipal authorities, compare Ontario laws with those of other countries, and lead to proper methods of road management under councils and road superintendents.

9. Financial Aspects.—This lecture to cover cost of roads, methods of finance, debenture issues and cost data in detail.

10. General Summary.—This lecture to review the entire course and more definitely co-ordinate the various parts of the subject.

The construction of merchant ships of a uniform type, of about 8,000 tons, has been commenced in the Italian shipyards.

The Society for Electrical Development, New York City, has issued a booklet giving a list of more than 3,000 applications of electricity, and it has been sent free to its members.