experiments and practical tests, it is yet to be proven that paints, coverings, fabric and otherwise (except possibly asphaltum of one or two inches in thickness), are of much, if any, value. Tests made have only served to emphasize the fact that many of these coverings, such as pitch and burlap wrappings, increase rather than decrease the action of electrolysis.

Certain rather satisfactory results have been obtained by introducing insulating joints in pipe lines at proper intervals. Further developments along this line promise good results, provided experiments prove that the insulating joints can be inserted economically. Some cities have spent quite a little time and money in drainage experiments, their purpose, of course, being to remove as much as possible of the water from the soil and thus reduce the likelihood of electrolytic conduction. So far these experiments have not been productive of very good results and the opinion seems to be growing that the cost is excessive in comparison with results obtained. To sum up, so far the only method yet developed of securing absolute immunity from electrolysis is to perfectly insulate the return circuit. Several cities, notably, Havana, Cuba, and Cincinnati, Ohio, have accomplished this by providing an overhead return wire. Others have their return circuit through insulated underground conduits. At present a committee composed of leading men from engineering societies and kindred associations organized into what is known as the "American Committee on Electrolysis," are giving the subject of electrolysis mitigation very close study, and it is to be hoped that their findings, when made public, will go far towards settling this rather distressing problem.

Conclusions.

From the foregoing statements, and investigations made by the writer in the preparation of this paper, the following conclusions are drawn:—

(1) The possibility of electrolysis trouble increases as electric railways become more numerous and the loading becomes heavier.

(2) Stray currents are the principal and most troublesome source of damage. This damage is confined entirely to points where currents leave pipes.

(3) Anodic corrosion in underground pipe lines is directly traceable to currents that have leaked from imperfectly insulated return circuits of electric railways.

(4) The really serious damage to supply lines and distribution systems proper is confined in the main to the neighborhood of the power house, except under certain peculiar local conditions such as unusually wet soil, cinder beds, etc.

(5) Service pipes furnish the greater number of failures in a short period of time, and for this reason are generally regarded as the seat of probably seventy-five per cent. of the total trouble. Lead, steel or wrought iron all being readily attacked.

(6) The higher electrical resistivity of cast iron and the extra thickness of metal presented, greatly reduces the possibility of ultimate destruction in this class of material as compared with ordinary steel or wrought iron pipes.

(7) Self corrosion, except under extremely trying conditions, is seldom, if ever, sufficiently serious to cause complete failure of cast iron, though it might destroy iron of thinner structure.

(8) Paints, dips, fabric coatings, etc., are of little or no value in mitigating electrolysis. Fabric coatings especially rather tending to increase than decrease the damage.

(9) Better bonding of rails, introduction of insulating joints and like remedial measures have so far proven the most helpful in electrolysis mitigation.

(10) Only perfectly insulated return circuits offer absolute immunity from stray current damage.

(11) The Bureau of Standards, Washington, D.C., is glad to aid cities in the investigation and alleviation of their electrolysis troubles.

MR. LEA SAYS AQUEDUCT IS O.K.

The following letter was written by R. S. Lea, consulting engineer, Montreal, under date of June 26th, 1917, to R. D. Waugh, chairman of the Board of Commissioners of the Greater Winnipeg Water District:—

"Early in 1916, as you are aware, I was appointed a member of a Special Board of Consulting Engineers to examine and report upon the general question of the design and construction of the Shoal Lake Aqueduct. This was in consequence of certain defects which had developed in the previous (the first) season's work.

"In this matter I was associated with Brigadier-General H. N. Ruttan, late city engineer of Winnipeg, and Mr. J. G. Sullivan, chief engineer of the Canadian Pacific Railway.

"As a result of our investigation, covering a period of about six months, we reported that the materials and workmanship employed in the construction of the concrete aqueduct were of the highest quality, that the works, if carried out along lines indicated in the report, would, when completed, satisfactorily fulfil the purpose for which they were designed, would be of a substantial and permanent character, and would cost a sum which would compare advantageously with that of similar works elsewhere.

"The experience gained in connection with the 1916 and the present season's work, together with the lapse of a winter season, has served to confirm these conclusions, and to indicate that the defects referred to in the first year's work can be effectively repaired at a comparatively small cost.

"So far as my personal opinion is concerned, I can say that I have never seen a better example of concrete construction, both as regards workmanship and materials."

The scheme for the construction of a harbor at Vizagapatam has received the general sanction of the Secretary of State for India and the Bengal-Nagpur Railway Company is at present engaged in a detailed survey of the harbor.

The largest highway bridge in Nova Scotia is a six-span steel structure connecting the mainland of Cape Breton Island with Isle Madame. It is 2,500 ft. long overall, of which 1,400 ft. is earth embankment. There are three fixed spans of 200 ft. each and a swing span of 205 ft.

The Bureau of Standards, Washington, D.C., has undertaken to record the present state of knowledge and practice concerning the data on the properties of metals and alloys used by engineers and others, with the view of making generally available the most acceptable values of the constants. Forms are being sent out requesting the names of metals and alloys, conditions, chemical composition, etc. Some of the alloys for which data are particularly desired are aluminium and its light alloys with zinc, copper, etc.; nickel, monel metal, copper and nickel alloys, bearing metals, etc. The collection of the data should result in securing information which will be of value to manufacturers, metallurgists and all concerned with the making and use of alloys.