The cost cannot be accurately estimated till an experimental piece has been constructed. The burnt clay filler will cost no more than one dollar a cubic yard, where crushed stone costs $4.20 per cubic yard, and the filler constitutes five-sixths of the volume of asphalt pavement. To this great reduction in cost may be added that achieved by the omission of the base of cement concrete. On the other hand the preparation of the gumbo road bed will cost more than the graded surface on which the concrete sheet is laid, and to this must be added the cost of the underdrain which cannot be left out in the construction of a black road.

The future of the black road depends upon the answer which future experimental work may find for the question: "Will properly prepared gumbo form a reliable road base for heavy traffic if protected from moisture?" This we all know, that the naked gumbo in dry weather bears up in dry weather under the heaviest traffic. We should not expect it to prove weaker when waterproofed and protected by a sheet of heavily rolled asphalt.

## ELECTROLYSIS FROM STRAY ELECTRIC CURRENTS.

**By A. F. Ganz, M.E.**

(Continued from page 556 of last issue.)

**Damage and Danger Produced by Stray Electric Currents on Underground Piping.**—It has already been pointed out that damage from electrolysis to underground piping usually results in the neighborhood of the power station from current leaving the pipe to flow to the rails and to other return conductors, and that service pipes in the same locality are most frequently damaged where they cross under and are positive to trolley rails. The destruction of underground piping by electrolysis is, however, by no means confined to the so-called positive districts in the neighborhood of the railway power station, but will occur at any point in the pipe where current leaves the pipe to flow to the surrounding soil. In Fig. 10 is shown a water pipe and trolley line near a salt water bay, about 8 miles distant from the railway power station supplying this trolley road. The trolley rails at this point are about 25 volts positive to the water pipe; that is, the water pipe is in a highly negative district. The railway power station is located on the shore of a salt water bay, and its negative bus-bar is grounded through low resistance ground connections, so that large currents leak from the trolley rails at points shown in Fig. 10, and flow through the ground and the salt water of the bay to return to the negative bus-bar at the railway power station. These stray currents in their path encounter the water pipe and flow part of the way thereon. The values of current indicated on the pipe are average values obtained from 24-hour records. It is seen that in one section large currents leave this water pipe to flow to the surrounding soil and from there to the salt water. An examination of the pipe at this point also indicated that it had been badly corroded by electrolysis. This, therefore, affords an excellent example of destruction by electrolysis of a water pipe in a highly negative district.

In Fig. 11 is also shown a water main and service pipe crossing under trolley rails and under telephone ducts. At this point the pipe is also negative to the trolley rails, but positive to the lead sheaths of the telephone cable, the potential condition with reference to the cables being caused by the fact that the telephone cable sheaths are bonded to the railway return conductor at the power station. As shown in the diagram, current flows from the rails to the water pipe, and leaves the water service pipe where it crosses under the telephone ducts to flow to the cable sheaths, resulting in the destruction of the service pipe. An examination showed pits extending entirely through the service pipe, directly under the telephone ducts and facing the ducts. This, therefore, affords another illustration of destruction of a service pipe in a negative district.

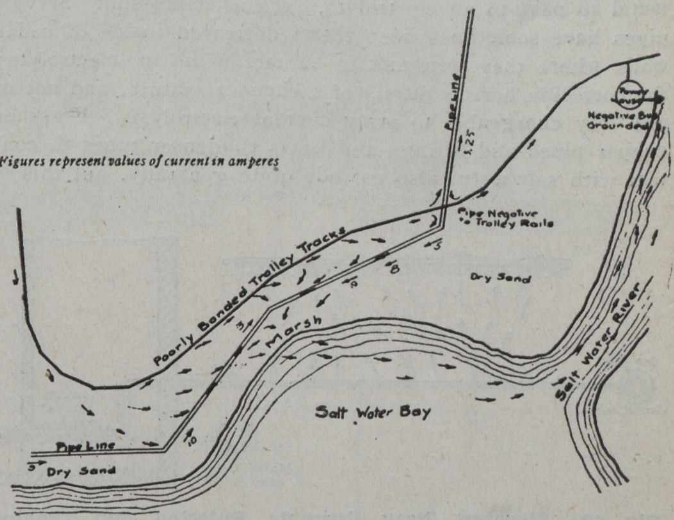


**Fig. 10.—Diagram Showing Stray Current Leaving Water Main in Negative District.**

Besides danger from electrolytic destruction of the pipes, stray currents, where they flow on underground piping systems, frequently enter buildings through service connections and produce a serious fire hazard. For example, current may flow into a building through a water service pipe, then flow from the house water piping to the house gas piping, and then out from the building through the gas service pipe. An example of this kind frequently met in practice is illustrated in Fig. 12. Such contacts between service pipes, or between a service pipe and the lead sheathing of a telephone or a power cable, frequently occur through metal ceilings,

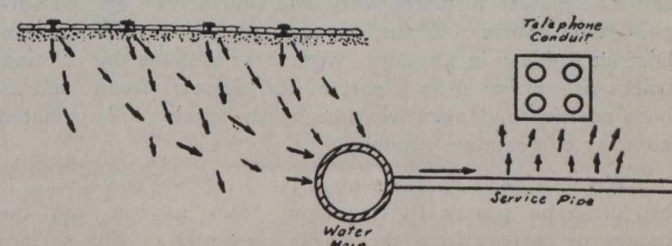


**Fig. 11.—Example of Service Pipe Negative to Trolley Rails and Destroyed by Electrolysis Due to Currents Flowing from Rails to Pipe and from Pipe to Telephone Cable Sheaths.**

or where the pipes rest against each other. Since dangerous heating may be produced where the current flows through such contacts, or where vibration may momentarily separate the contacts and produce an arc, nearby inflammable material is in danger of being set on fire. The author has in fact found many cases where currents up to 30 amperes were flowing into-and-out of buildings through service pipes or lead cable sheaths. Evidences or arcing having occurred between such contacts in buildings have also been found. There is no doubt that many fires have started in this way, but it is always difficult to prove the cause of a fire because of the destruction resulting from the fires.