phaltum, to a cold pipe, it is impossible to completely cover the pipe. The only kind of insulating covering which appears to afford certain protection is a layer of at least 1 or 2 inches of a material like coal tar pitch or asphaltum, of such a grade that it is not brittle and so will not crack, but yet is hard enough to remain in place. The best way to apply such a layer is to surround the pipe with a wooden box, support the pipe upon creosoted blocks of wood, or upon blocks of glass, and then fill the space between the box and pipe with the molten material. As a further protection an insulated coupling should be introduced at each end of the section, covered so that, even if the covering should become defective at any point or points, no current can reach the pipe to corrode it by electrolysis. A pipe treated in this way, with the work done so as to be mechanically perfect, would undoubtedly be protected from electrolysis. However, the cost of carrying out such an installation is absolutely prohibitive, except in a few special cases, such as service pipes in very bad localities, or in the case of some very important individual pipe lines of small size. It is not sufficient to apply the covering only in the positive district, nor on the other hand, is it always necessary to cover the entire length of line. The portions which must be insulated can only be determined by properly conducted electrical tests. Experience has also shown that embedding a pipe in cement or concrete, even if this is several inches in thickness, does not protect the pipe from electrolysis, and in some cases it has been found that the pipe in concrete is destroyed at least as rapidly as when it is buried in ground.

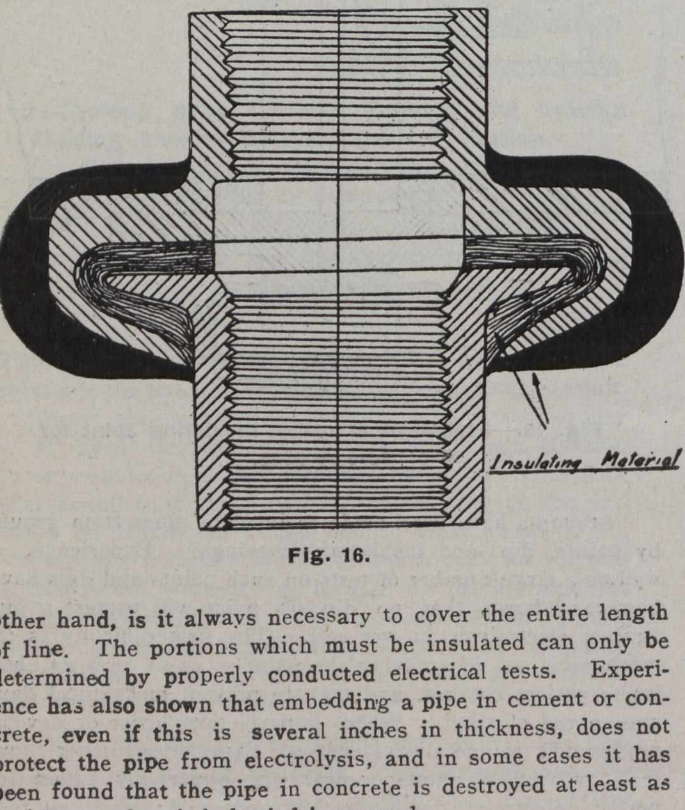

Fig. 16.

Current flow on pipe lines can also be practically prevented by using insulating joints for every joint. Cement joints as ordinarily made do not generally produce metallic connection between the two pipes, and may practically be classed with insulating joints. The cause of the high resistance of cement joints is probably due to the fact that, although every attempt is made to push the spigot end home into the bell when laying cast iron pipe, as a matter of fact in most cases the two pipes are not in metallic contact. Even where there is metallic contact this is probably over a comparatively small area, if not at a point. As the end of the spigot is always heavily coated with scale, such metallic contact generally forms a poor electrical connection of comparatively high resistance. It is a simple matter to positively prevent metallic contact by inserting a ring of some cheap insulating material, such as fibre or cardboard, between the end of the spigot and the interior of the bell, and this has been done in some cases. The resistance of cement joints is, then, the electrical resistance of the cement intervening between the spigot and bell, and while cement is not an insulator, but, on the contrary, is probably as good a conductor as ordinary soil, yet, compared with iron, the resistance is so high that the cement joints practically interrupt the electrical continuity of the pipe line. A pipe line laid with all cement joints or with all insulating joints is, therefore, a discontinuous electrical conductor and is not capable of carrying stray electric currents. Such a pipe line, therefore, cannot pick up current in an extensive negative area to discharge it in a restricted positive area, which is generally the cause of the most serious electrolytic danger. For this reason a piping system with all cement or insulating joints is, on the whole, much less likely to be affected by electrolysis than a piping system with all lead or screw coupling joints. Experience has shown, however, that a cement jointed piping system is by no means immune from electrolysis, and there is abundant experience which shows that cement jointed mains, and especially service pipes from such mains, can suffer severely from electrolysis. In these cases the stray currents reach the mains and service pipes from other pipes or by other paths. An example of a gas service pipe from a cement jointed main destroyed by electrolysis from stray currents which reached the gas service pipe from the water piping is illustrated in Fig. 12.

A convenient form of insulating joint for small wrought iron or steel pipes is the Macallen, illustrated in Fig. 15. This is very largely used for insulating water and gas service pipes. A convenient form of insulating joint for large pipes is illustrated in Fig. 16, where a flanged joint is shown with a fibre disc between the surfaces of the flanges, the bolts being insulated with fibre tubing and the bolt heads and nuts insulated with fibre washers. This form of flanged insulating joint has been very largely used for water and gas mains. The Dresser insulating joints are also very satisfactory. Insulating joints can often be used to great advantage in special cases; as, for example, in the case illustrated in Fig. 12, where an insulating joint in the gas service inside of the building would protect the gas service pipe by preventing the current from flowing out of the building on this pipe. Insulating joints on mains must, however, be used with very great caution, as they can under unfavorable conditions do more harm than good. It is sometimes possible to use comparatively few insulating joints to break up the electrical continuity of a pipe line and protect the pipe line from electrolysis, but such joints must be installed only after careful tests have shown that the current is not likely to shunt through ground around them. This depends largely upon the potential gradient through ground and upon the electrical resistance of the ground.

(To be continued).

FORT GARRY HOTEL.

The Fort Garry Hotel, Winnipeg, is the recipient of probably the largest single shipment ever sent from the Amherst plant of the International Engineering Works, Limited. This hotel, which is being erected by the Grand Trunk Pacific Railway is to have a complete power plant furnished by the above company. It will consist of four 300 horse-power Robb-Brady Scotch boilers and three vertical high-speed cross compound engines with two duplex air compressors, smoke connection for the boilers, and auxiliary apparatus. The boilers weigh 32 tons each, are 10 feet in diameter by 17 feet long, with double furnaces 4 feet in diameter by 14 feet 2 inches long.