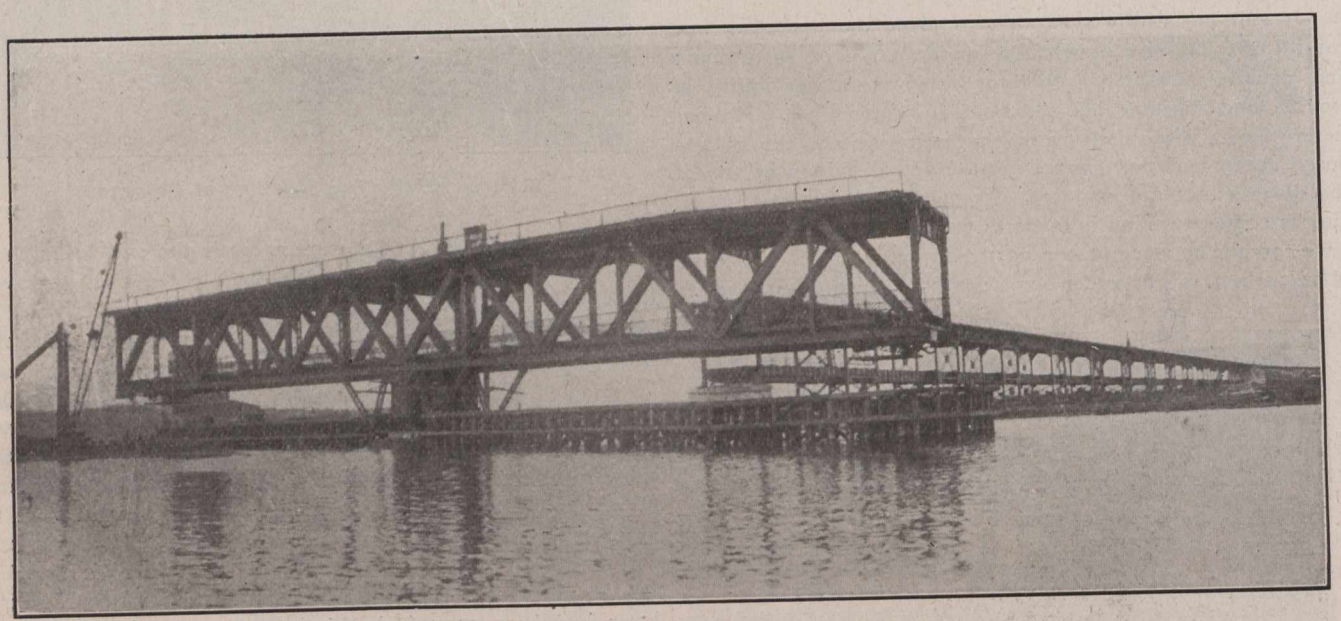
It is preferably performed by a double lantern and extinguishing the red and lighting the green by suitable contacts in the leaf indicator switch.

Generating and Storage Battery Plants.

The adoption of electric power for the operation of drawbridges has usually been contingent on being able to secure direct current at the standard voltages or two-phase or three-phase alternating current at 60 cycles or 25 cycles. The electrical operation of many important drawbridges, however, is so desirable that even the impossibility of obtaining electric current from existing power plants for 24-hour service should not deter the engineers from its adoption.

The improvements in gasoline engine design and construction have made it possible to operate, to a good degree of economy, comparatively small isolated electric generating plants. The use of such a plant makes it possible to obtain all the advantages of electrical operation and control of drawbridges without being dependent on the plants and transmission line of others. Under this scheme two arrangements are possible. One is to have the generating unit of sufficient capacity to supply current direct to the several motors on the bridge as required. The objection to this scheme is that all of the motors on the bridge have a considerable overload capacity and are subject to overloads under a good many conditions. The gasoline engine, on the other hand, has practically no overload capacity other than momentary, and it is therefore necessary to use a large and expensive engine for a comparatively small current consumption. If it is necessary to install the generating plant on the bridge, this means a large engine room and heavy floor construction to prevent excessive vibration. Another plan is to install a storage battery of high enough discharge rate to take care of the operation of the bridge under the most severe conditions and of sufficient ampere-hour capacity to operate the bridge for at least 24 hours without recharging. The gasoline-driven generating unit in this case may be very small, the requirements simply being that it must be able to recharge the storage battery at the desired intervals, it not being necessary for it to supply current direct to the motors on the bridge.

A still better arrangement, however, in the mind of the writer is a combination of the last two plans mentioned. This consists of the installation of a storage battery of a sufficiently high discharge rate to operate the bridge under the most severe conditions of wind and weather, and of sufficient capacity to give the bridge from 24 to 40 openings. The generating plant consists of two direct connected gasoline engine driven units, the combined capacity of which is sufficient to operate the bridge independent of the storage battery, and either of which is available for the charging of the battery. The advantage of this system is that the bridge may be kept in commission even if the storage battery is discharged or out of service for any reason. It is also possible to charge the battery from either generating unit if the other is out of service from any cause. Furthermore, under extreme conditions it is possible to supplement the storage battery by using either or both generating units connected up with it for supplying current to the bridge. The generators and engines in the two units being duplicates, there is small possibility of both being out of commission at the same time. The engines may be started by turning current from the storage battery on to the generators connected up as motors during the period of starting. In either case the generating plant may be located either on the bridge structure or in a power-house built for this special purpose on the shore. The latter arrangement is likely to require more attendants, but has the advantage of providing a more stable support for the storage battery and a better foundation for the generating units. Locating the battery plant on the shore also involves the use of submarine cables for supplying current to the bridge, if it be a swing span.



St. Louis River Bridge.

Equipment of the St. Louis River Bridge.

One of the most recent installations with which the writer has been connected was the operation and control of a 300-ft. double deck draw span recently built for the Interstate Transfer Railway Company over the St. Louis River near Duluth, Minn. The span weighs approximately 1,152 tons and is swung by two 25-h.p. 500-volt series motors. The wedges at each end of the bridge are operated by a 15-h.p. motor and the four wedges at the centre are operated by a 5-h.p. motor. There are sliding rail joints for double tracks on each deck at either end of the bridge. These, however, are all operated by the end life mechanism so that no separate