Where conditions permit, it is desirable to have the alinement of crossovers between frog points straight. In the case of crossovers between parallel curved tracks, it is not generally possible to meet this requirement using standard frog numbers, a special frog being necessary in such cases. The writer has known of a number of instances where this requirement of straight track between the frogs of a crossover was of sufficient importance to justify the ordering of the special frog necessary, frog points being comparatively close together in most crossover work.

Ladder Tracks.—In order to obtain the maximum car capacity of the body tracks connected to a ladder track, the angle of the ladder track should be made the greatest possible under the conditions. The criterion for maximum ladder angle is given by the formula (see Fig. 15):

$$\text{Sine of maximum ladder angle} = \frac{\text{Distance between switch points K}}{\text{Distance centre to centre of body tracks.}}$$

In order that road engines may operate over the ladder track it is desirable that the curve beyond the main track frog be made as light as possible. In a number of extensive ladder layouts the writer has used two and three degree curves in such places with very good effect. The method of staking out such ladder tracks is as follows:

After locating the position of the main track frog the point of intersection of the centre line of the ladder track with the centre line of the main track, B, is found by measuring off the distance AB. The instrument is set up at B, the ladder angle turned off and the frog points along the ladder located by measuring the computed distances from B. At the same time the points of intersection of the centre line of various body tracks with the centre line of the ladder track are located by measuring the distance DC, FE, etc., from the frog points. The curve beyond the main track frog is now located. The instrument is then set up at the points C, E, etc., and the body tracks staked out by foresight established at the opposite ends of these tracks by measuring over the respective track centres of each track from the main track. The curves connecting the various body tracks to the ladder track being very short, it is sufficient to locate only their middle and end points.

To compute the distance AB (Fig. 16), let

T = Tangent distance of curve FL
ICD = Ladder track angle

Then

DI = T sin F
FD = T cos F
CD = DI cot ICD
FC = FD—CD
AB = BE—AE
= gauge × cot ICD—FC.

While the writer believes that the above method of laying out ladder tracks represents the best practice, there are a number of engineers who prefer to make the ladder angle equal to the angle of the frog to be used in the ladder track, thus making the ladder track frogs line up straight with the body tracks. The central angle of the curve beyond the main track frog is then simply the difference between the angles of the main and ladder track frogs. However, the writer sees no justification in sacrificing valuable ground space and consequent car capacity for the little, if any, advantage that is gained by eliminating the slight curve beyond the ladder track frogs. Those who favor this method claim that by the elimination of this curve in the body tracks, switching operations are rendered more safe by reason of the better views afforded trainmen. However, the writer believes this apparent advantage is more imaginary than real.

CONTROL AND REGULATION OF NIAGARA RIVER.

Hearings were held on January 22 and 23 before the United States House Committee on Foreign Affairs on the new bill controlling the diversion of water on the American side of the Niagara River and the importation of electricity from Canada. The Burton Act expires by limitation on March 4, and a fight is in progress to take from the federal government the control of the diversion of water in navigable rivers and, in the Niagara Falls case, vesting it in the State of New York. The Secretary of War has appointed a board to report upon the problem of diversion of water from Niagara Falls, consisting of Lieutenant-Colonel Mason M. Patrick, Colonel Francis J. Kernan and Major Charles Keller, all of the Corps of Engineers, U.S.A.

The treaty between Great Britain and the United States authorizes the United States to permit the diversion of not more than 20,000 cubic feet of water per second, while the Canadian government is empowered to authorize the diversion of not more than 36,000 cubic feet per second. At present the diversion on the American side of the Niagara River aggregates 15,600 cubic feet per second. The bill now before Congress does not permit the diversion of any more than that amount, and whereas the Burton Act permitted the importation of a maximum of 35,000 h.p. from Canada, the present bill limits the amount to 200,000 h.p. It also makes it obligatory for the generating companies to utilize the water at its maximum efficiency and stipulates that the companies receiving permits for the transmission or delivery of electrical energy shall be regulated to rates, etc., by the Public Service Commission of the State, or where such a commission is lacking by the governor of the State.

At the hearing on January 22 the State of New York through its attorney-general claimed, after the government has decided how much water may be diverted from the Niagara River, that it is entitled to control the diversion of the water and to decide the parties to whom it shall go. It was contended that while the federal government has a right to determine the quantity of water that may be diverted from a boundary stream in the exercise of its constitutional rights to control navigation, that power is exercised pursuant to that constitutional right only for the purpose of regulating and controlling navigation and for no other.

The president of the New York State Conservation Commission expressed opposition to any legislation which will permit the existing generating companies to get any additional water from Niagara Falls. He said that the present policy of the State is to utilize all the undeveloped waterpowers for the benefit of the people generally. The generation of electricity which is to be transmitted to the various municipalities and through them to the ultimate consumer at practically the cost of its development. He also maintained that true conservation presupposes the utilization of all the water permitted by the treaty at its maximum efficiency.

It was brought out at the hearing that the taxes of the Niagara Falls Power Company to the State and municipalities aggregate $3 per horse-power, while the Canadian government charges practically $1 per horse-power. The Cataract Power and Conduit Company, which distributes Niagara energy in Buffalo, pays the Niagara Falls Power Company $16 per horse-power-year and sells it at practically $25 per horse-power-year; the difference being used to pay all the charges of transformation and transmission to Buffalo and its distribution in that city. The Hydro-Electric Power Commission of Ontario pays $9.40 per horse-power-year for energy to the Ontario Power Company delivered at the terminals of the transforming apparatus, or practically at the power house.