

where the demand is for 100 tons or more daily the added expense becomes staggering. The situation seems to have become acute only within the past couple of weeks, and it is, of course, possible that it is sufficiently local in character to be short-lived. Nevertheless, under present conditions, wherein the regulation-hampered transportation systems of the country are glutted with freight that their arbitrarily-restricted facilities cannot handle, it becomes quite possible for such a coal-car shortage as exists in Ohio to spread over a considerable area, and it behooves every electric railway that produces its own power to be prepared to meet the condition. Stored coal is, perhaps, the most obvious safeguard, but another is the purchase of private cars by the power producer for use only in his coal service, and at least one of the companies affected by the present situation is considering this plan. However, whether this would be more desirable than the costlier plan of coal storage is incidental. The immediate necessity is preparedness in some form in case the coal-car shortage spreads.

AXLE-MOUNTED MOTORS ON FLEXIBLE TRACK

In connection with our comment of three weeks ago on the absence of damage to the track on the Chicago, Milwaukee & St. Paul Railway's electrified divisions there has been raised the question of cause and effect, reference being made to the fact that direct-mounted motors of very much less weight than those on the Milwaukee invariably make trouble with rails laid in city streets.

Admitting this to be absolutely true, however, does not render unreasonable the results that have been obtained with the Milwaukee's axle-mounted motors. On a track that is laid according to steam railroad standards, vertical flexibility is invariably present. Each tie "pumps" through a goodly fraction of an inch as heavily loaded wheels pass over it, and the rail, during the passage of a train, moves in a clearly-defined series of waves. In consequence of this freedom from rigidity, joint trouble such as that which occurs on city systems, where the rails are held rigidly in the plane of the street pavement, is absolutely unknown. Although the use of plain joint plates having only four small bolts might appear to be an invitation to joint trouble from the viewpoint of a city railway's maintenance engineer, such a construction has been in use for years under heavy electric locomotives without any evidences of distortion.

Flexibility of roadway is, no doubt, dependent to some extent upon climatic conditions, as exemplified by the fact that rail breakages on steam roads are more frequent in winter than in summer, one frequently advanced reason being that the frozen ground acts like a solid anvil upon which the rail is pounded. Yet the assumption of a hard-frozen track involves also the assumption of insufficient or imperfect drainage, and where ballasting of desirable materials and ample depth is provided it is difficult to see wherein general track conditions could be greatly affected by the existence of low temperatures.

In brief, the electrically operated railway, heretofore, has been almost invariably compelled to provide extreme rigidity of track, and with this has developed a conception of the phenomena of rolling loads that is based primarily upon this condition. Now that electric equipment is coming to be used upon the non-rigid roadbed common to steam railroad practice, a revision of ideas seems to have become necessary.

RAIL CORRUGATION STUDIES IN CHICAGO

The further testimony on the subject of rail corrugation, presented this week as a result of the studies made in Chicago, throws interesting light on the subject, although it does not conclusively prove or disprove any of the theories which have been advanced to account for this most mysterious phenomenon. Chicago is peculiarly well suited for a study of this kind, because much of the rail there was laid at about the same time, and also because two distinct types of track sub-construction were employed, namely, concrete and ballast. As steam railroad track which is laid on ballast is much less subject to corrugation than electric railway track, it has been hoped that the use of ballast in city track would reduce the trouble, but practically no difference was found in Chicago between the two types of sub-construction used. The natural conclusion is that where heavy girder rails are held tightly in the pavement and the sub-grade and ballast are thoroughly rolled, the conditions are as favorable to the development of corrugation—if corrugation is caused by rigidity—as if the track was laid on concrete.

The relation of the contour of the wheel to that of the rail was also considered in the Chicago analysis, and the conclusions reached were the same there as elsewhere, namely, that where the bearing of the wheels on the rail is only along the gage line, the steel in the rail becomes cold rolled and corrugation begins. As observations in the field showed slightly greater signs of cold rolling on rails having considerable corrugation than was found on rails where the wear appeared only along the gage line, the Chicago engineers believe there is some connection between the amount of cold rolling and the amount of corrugation, although they take care to explain that the cold rolling may have been effected by many other causes than merely by a difference in contour between wheel and rail.

Those in charge of the analysis do not advance any theory as to the cause of rail corrugation as a result of their observations. This is a wise policy, because while we believe the ultimate cause or causes will be determined and that progress is being made in this direction, we do not believe that the solution will be found from a study of the conditions on any one property. If it was otherwise, the cause would have been determined long ago. Nevertheless, it is only by such studies as have been made in Chicago and conducted with equal care that the problem will be solved. The answer is elusive, but that fact should not discourage investigation. Rather it should make the solution all the more eagerly sought.