

then should his colleague from Cleveland complain because "men who formerly made eight trips for ten-hours pay now had to make nine trips and were paid less per trip"? Would these union representatives have street railroading put on a "piece work" basis? Why should they pick out a system where the wage scale is among the highest in the country and denounce efficiency methods which make possible a low rate of fare? Surely the employees will get nowhere with such contentions.

The members of the Federal Commission undoubtedly expected to have a helpful constructive program presented by the labor representatives. In making their report they will want to deal fairly with the railway situation as affecting the public, the employee and the investor. No one would make any serious opposition to the claims of employees for proper working conditions and a suitable wage scale. However, no burdens can be imposed which the traffic will not bear, and the commissioners are not likely to make recommendations which will impose too heavy a burden on the traveling public. The investor is asking only a reasonable return and is willing to co-operate with the highest possible efficiency of management. The employee should not ask more nor expect to do less.

Passenger Locomotives for St. Paul Cascade Electrification Ready for Service

WHILE the locomotives which were exhibited before a notable gathering of railroad men at Erie, Pa., on Nov. 7 represent a logical development in the field of direct-current equipment, they also embody several novel ideas. They may be said to be of a composite design or type, evolved from the experience of the manufacturers in connection with the New York Central and earlier St. Paul machines. We hope at an early date to be able to take up a number of the technical features of the new type of locomotive in some detail.

Among other features which attracted attention at Erie, one was the provision for permitting sidewise motion of the ends of the body with respect to the end trucks, the weight being carried upon rollers. Another was the way in which the heater cab including its contents, is installed as a unit and hung from the operating cabs. It can thus be lifted off intact and replaced. Again the motor ventilation was considered rather unique in that a fan is placed directly over each motor, the fans being motor-driven in pairs, with a fan on each end of a motor shaft. This gives an air circuit much shorter than in the earlier locomotives and the result shows in a low motor temperature under sustained load.

In the new locomotive the bipolar type of motor, used successfully for many years on the New York Central, was adopted in the interest of simplicity. This permits the use of a gearless drive in which the motor armature can be dropped out between the pole pieces without disturbing the field in any way. It also makes possible a series arrangement of the field poles with the entire locomotive serving as the return magnetic circuit, thus conducing to weight economy in the locomotive.

Of course this simplicity carries with it a number of compensatory disadvantages, the effects of which have to be minimized as far as possible. For example, a large air gap between armature and pole surfaces must be allowed, and the pole areas are smaller proportionately than in standard motors, to provide clearance for getting the armatures out. This in turn entails high field magnetomotive force—in other words, many ampere-turns. The field coils obviously must contain much copper. In regeneration also a considerable field current must be supplied to the motors, in this case eight out of twelve, which are acting as generators. Again, the mounting of the armature upon the axle lowers the center of gravity of the locomotive, and subjects the armature to a certain amount of jarring action.

By way of mitigation of these handicaps the designers of the locomotive have shown no small ingenuity. For example, four of the motors have been utilized in regeneration to furnish the exciting current, thus rendering unnecessary a large motor-generator set which would have been required if the plan used on the earlier St. Paul locomotives had been adopted. Further, the center of gravity has been raised fairly high by placing much of the auxiliary equipment as far above the wheel treads as possible. As to the durability of the armature, the New York Central's experience proves that on first-class track, at any rate, armature maintenance is a very small item in the year's expense account.

Referring to the size of the field coils, it must be remembered that these are carried on the spring-supported part of the locomotive and the only dead weight is that of the armature which is built directly on the axle. This construction reduces considerably the dead or non-spring-borne weight which in the geared locomotive is approximately one-half that of the geared locomotive now in operation.

The center of gravity of the gearless locomotive as a whole is about 6 in. lower than that of the geared units. However, the G. E. engineers maintain that the effect of location of center of gravity upon the riding qualities of the locomotive is of secondary importance as compared with the question of proper design of leading and trailing trucks. By such proper design a movement of the front and rear ends of the locomotive can be obtained at high speeds which reproduces the effects which on the locomotive are attributed to the high center of gravity. This claim appears to be justified by the results of the tests, as the locomotive exhibited remarkably smooth riding qualities up to speeds of 65 m.p.h.

Design problems and their solutions other than those suggested above will be taken up in due course. The purpose of this comment is simply to indicate where the new locomotive stands in respect to its predecessors. If the testimony of the speakers at the dinner which followed the Erie demonstration is taken at its face value the completion of these machines is a real achievement. It is also highly creditable to the Erie works of the General Electric Company, barely eight years old, which built their mechanical as well as electrical parts.