DESIGN OF A PREPAYMENT CAR FOR CITY SERVICE

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OF
PREPAYMENT CAR
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PREFACE

The subject of car design, if considered in all its branches, is one of great magnitude, involving many phases of engineering skill. The constant advance and progress of our civilization demands innovations in every line and it is therefore necessary for car builders to incorporate in their product whatever is worthy of the designers attention.

This thesis is not presented in order to revolutionize car design but to advance a few ideas which may be acceptable to the car designer.
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INTRODUCTION

The design of a car for city service may be made with one or more ideas in view. From the standpoint of the company operating the system, the car that is cheap in first cost, that requires little attention as far as the question of repairs is concerned, and is economical in power consumption is one to be desired. From the standpoint of the public, however, the more or less perfect fulfillment of the preceding aims may seem to be attained at the expense of comfort or convenience.

To neglect the point of view of the public is now seen by traction companies to be a short sighted policy, and to improve the service is recognized as an ultimately paying investment. It is with the latter aim in view, that of improving the service by providing a more comfortable and sanitary car, that this thesis is presented.

The car is intended for use in a large city such as Chicago, where traffic is heavy at all times and where it reaches enormous proportions in the morning and evening, the times of heaviest traffic being appropriately known as the rush hours.

The general arrangement of Chicago cars is such that exit is possible at either the front or rear of the
car. When the car is crowded it is difficult to reach either exit, and in particular is this true of the front one, where it is necessary to pass through the front platform smoking compartment to reach the street. To make matters worse, this part of the car is usually crowded with laborers, and the atmosphere is anything but pleasant, making exit from the car disagreeable as well as difficult.

SCOPE

The primary object of the design is to eliminate the above mentioned objectionable feature by isolating the smokers from the other passengers and from the immediate exit. The design while excluding truck construction and the body framing will cover in a general way the various things to be considered in the construction of the car body. Particular attention will be devoted to the subject of car ventilation, the various types of ventilators available, and the advantages and disadvantages of each.
GENERAL CONSTRUCTION

To obtain a smoking compartment comparable in floor space with the one obtained by the use of the whole front platform, it was necessary to use a longer platform. To accomplish this, the body of the car was made two feet shorter than that of a standard car now in use in Chicago, while the overall length was somewhat increased, the actual dimensions being as shown on the plan view.

These features of the design gave a length of thirty feet for the car body, giving with fourteen cross seats and four longitudinal seats, a seating capacity of thirty-six. The overall length was made forty-seven feet eight inches, each platform being eight feet ten inches in length, while the overall width of the car was eight feet six inches.

In deciding on the type of roof to use, the plain arch was adopted as being easier of construction and lighter in weight, the value of the last quality being readily appreciated when it is recognized that the expense of carrying each pound is about five cents a year. The arch roof's disadvantage, that of having no transom to open, is eliminated by the installation of an adequate ventilating system.
Although the matter of truck or motor design has not been considered in detail, the use of a single motor truck has been indicated, the reason for this being the increased efficiency obtainable with single motor trucks. Lessening of the number of parts to be repaired and cared for is also a consideration and directly affects the shop expense of a traction company. The increased efficiency might be expected from the fact that almost universally when small units are replaced by a fewer number of larger ones, efficiencies are increased.

VESTIBULE ARRANGEMENT

For the construction of the smoking compartment a partition on the platform was used as shown on the plan view, a sliding door opposite the exit allowing smokers to leave the car; passengers from the body of the car may leave at the rear, or at the front door, by way of the exit passage.

It is intended that the L shaped compartment occupied by the motorman, shall not be used by passengers, except when leaving the car, the purpose of this being to make egress easy. An additional advantage is obtained in the fact that the motorman is isolated from the pas-
sengers and is therefore better able to concentrate his attention on the work he is doing, and thus lessen the chance of accidents occurring due to carelessness in running the car.

Although separated from the passengers, the motorman is able to observe the exit door and thus its operation, opening and closing, may be in his hands as is the case with the ordinary car in Chicago today, where a series of levers is used to operate the door from the motorman's position.

With the size of smoker indicated, the square feet of floor space for this part of the car is about twenty, while in the ordinary type of car, using the whole width of platform the area is about twenty-four square feet. Thus, while the planned arrangement shows a slightly smaller smoker, the efficiency of this space is increased, for no part of it is used as a passage way.

The construction of the rear platform is the same as that of the front one, so that the car may be operated in either direction. On the rear platform, the door leading from the smoking compartment is fastened open as shown on the plan view. This arrangement is
intended for use under heavy traffic conditions and when
the weather is not too cold. In severely cold weather it
is intended that both doors be normally closed, the vesti-
bule effect tending to eliminate the draft and inrush of
air that would ordinarily occur on a car without a vesti-
bule, when passengers are taken on.

Throughout the car, sliding doors have been used,
being selected on account of the fact that it is unnecessary
to jostle the passengers when opening them, as is the case
with the swinging variety. The self closing feature of
the swinging type is obtainable in the sliding door by the
use of weights.

VENTILATION

Systems of ventilation may be divided into two
classes, mechanical and natural. In the former, a fan is
used, either to bring air into the car or to discharge it
from the car, the operation of such a system involving the
expense of a motor for each car, while in addition to the
motor expense is the cost of operation. In most natural
systems air enters the car through ducts, being lead through
heaters before being discharged into the car. The active
part is usually the exhaust ventilator, which, operating on the aspirator principle uses the velocity head of the air passing the car to draw the vitiated air from within.

Comparing the two systems, the natural one has in its favor lower first cost and the elimination of operating expense, and was therefore chosen for this installation. The type of ventilator best adapted to street car use was the next point to be determined.

Of the several ventilators now on the market, the Wilson Ventilator was adopted on account of its positive action. Its great capacity, as demonstrated in tests on cars in Chicago and Indianapolis, as well as its positive action marked it as a valuable device for use on the up-to-date street car.

**DISTRIBUTION OF VENTILATORS**

The arrangement of the ventilators can best be seen from the side and end elevations of the car, eight exhausts and eight intakes being used on the body of the car, while in the vestibules one of each is used. In the body of the car the inlets are so constructed that the air must pass through the truss plank heaters as it enters.
while in either vestibule a similar condition exists, the platform heater being employed to temper the incoming air.

Corresponding to the ten inlets used are ten exhaust ventilators, located in the roof of the car and placed approximately over the exhausts. In the body of the car the exhausts are in two rows, one on each side of the trolley board, while at each end is one exhaust, centrally located with respect to the vestibule, and thus drawing air from the smoker only. This arrangement was used because it was thought that air in sufficient quantities for the use of the motorman would enter through the exit door, when it was opened at the various stops.

In the enlarged detail of the exhaust ventilator may be seen the way in which the discharging action is produced, the small arrows indicating the motion of the air with respect to the ventilator, the large arrow showing the direction of motion of the car.

The dimensions shown may be varied to suit varying conditions of installation.
CONCLUSION

The type of car indicated in the preceding pages has a seating capacity of thirty-six as may be seen from the plan view, and in its general construction it is designed to handle heavy traffic such as is met with in large cities. By the isolation of the smoking compartment and the use of efficient ventilators it is thought that a more sanitary atmosphere may be maintained and that the comfort of the passengers may be increased. Lastly, the exclusion of passengers from the motorman's compartment is considered to be a factor in the prevention of accidents, at least those due to carelessness or inattention of the men who run the cars.