variably happens that the weaker car is seriously damaged, and if the stronger car provides any additional safety for passengers it is confined entirely to passengers in that particular car, and is obtained at the expense of greatly decreased protection for passengers in adjacent cars. This point should have very careful consideration when designing any type of car for any class of service and if it had been considered long ago, especially in regard to the operating of cars of light construction, in trains with heavier cars, the destruction which is due almost entirely to the strong cars crushing the weaker, would have been avoided.

The standard 72′ 8″ sleeping car that has been selected for this example represents about the maximum requirements of load carrying capacity for passenger cars in general use. As illustrated in Fig. 1, Pl. I., the car is assumed to be equipped with a body suspended dynamo and two sets of batteries, each set consisting of 12 lead cells. There is the usual body brake rigging including auxiliary and supplementary reservoirs and water tank with air pressure system for lifting the water into the car. In addition to these items, the water tank is assumed to be filled with water, and the car equipped with a storm sash. The live load is considered to be 53 passengers at 160 pounds each, with 50 pounds each additional for luggage.

An examination of the weight distribution indicates that the smoking-room half of the car will produce the maximum bending moments, partly on account of the weight of the batteries and dynamo, and partly because there is less weight beyond the bolster at this end of the car than at the other where the heater is located.

To simplify calculations, the car is assumed to be symmetrical about its cross centre line.

The four distinct types referred to may be described as follows: No. 1,—Heavy centre sill construction, the centre sills acting as the main carrying member. No. 2,—Side carrying construction, the sides of the car acting as the main carrying members, having their support at the bolster. No. 3,—Underframe construction in which the load is carried by all the longitudinal members of the lower frame. (The lower frame in this case is interpreted to include the side girder below the windows.) No. 4,—Combination construction, in which the side frames carry a part of the load, transferring it to the centre sills at points remote from the centre plates so as to utilize the uniform centre sill area.

It is obvious that type 1 construction cannot possibly equal the others in weight, therefore, no diagrams or other particulars are submitted concerning it.