(No Model.)

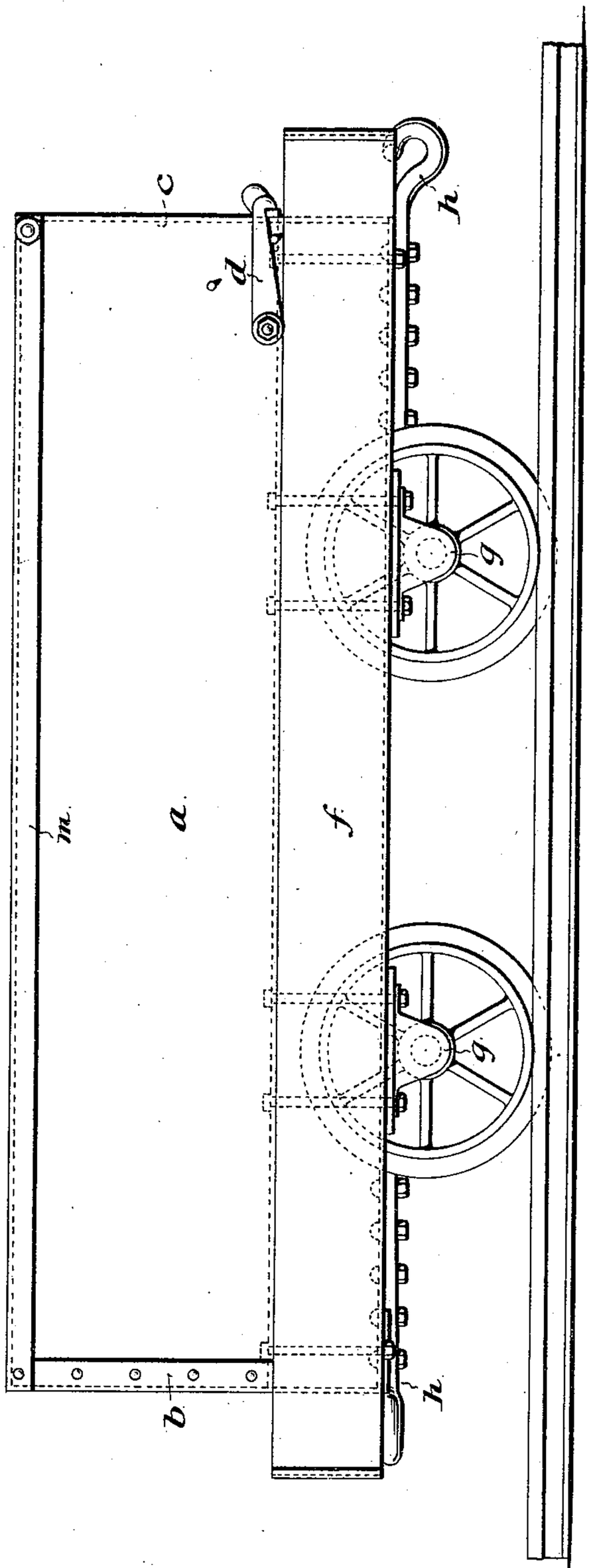
3 Sheets—Sheet 1.

H. M. BOIES.

TRAMWAY CAR.

No. 564,551. Patented July 21, 1896.

FIG. 1.



WITNESSES:

James H. Bell.

Henry N. Paul Jr.

INVENTOR:

H. M. Boies

By Jno. C. Riley

Attorney

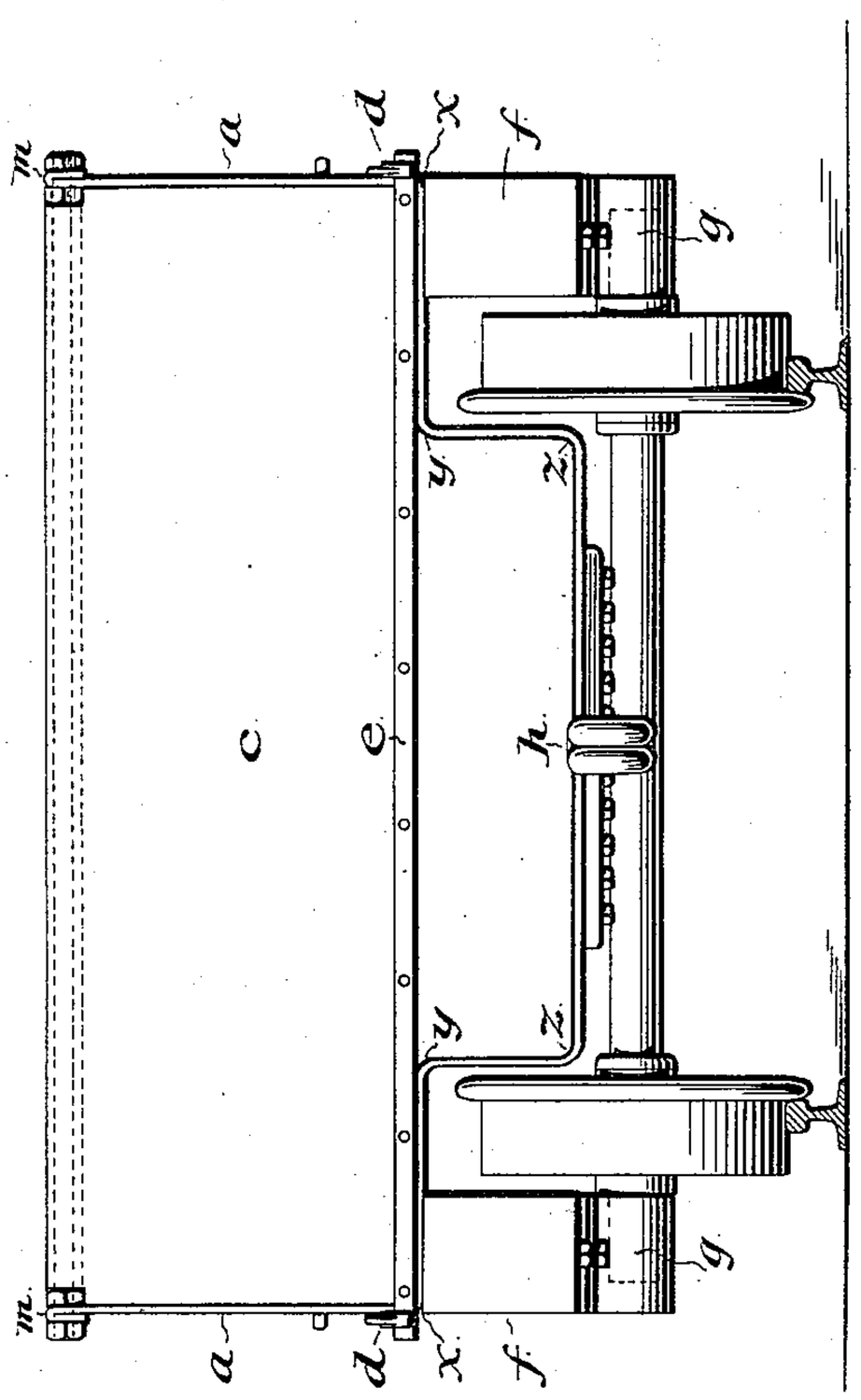
(No Model.) 3 Sheets—Sheet 2.

H. M. BOIES.

TRAMWAY CAR.

No. 564,551. Patented July 21, 1896.

FIG. 2.



WITNESSES:

James H. Bell

Henry N. Paul Jr.

INVENTOR:

H. M. Boies

By W. E. Foley

attorney

(No Model.) 3 Sheets—Sheet 3.

H. M. BOIES.

TRAMWAY CAR.

No. 564,551. Patented July 21, 1896.

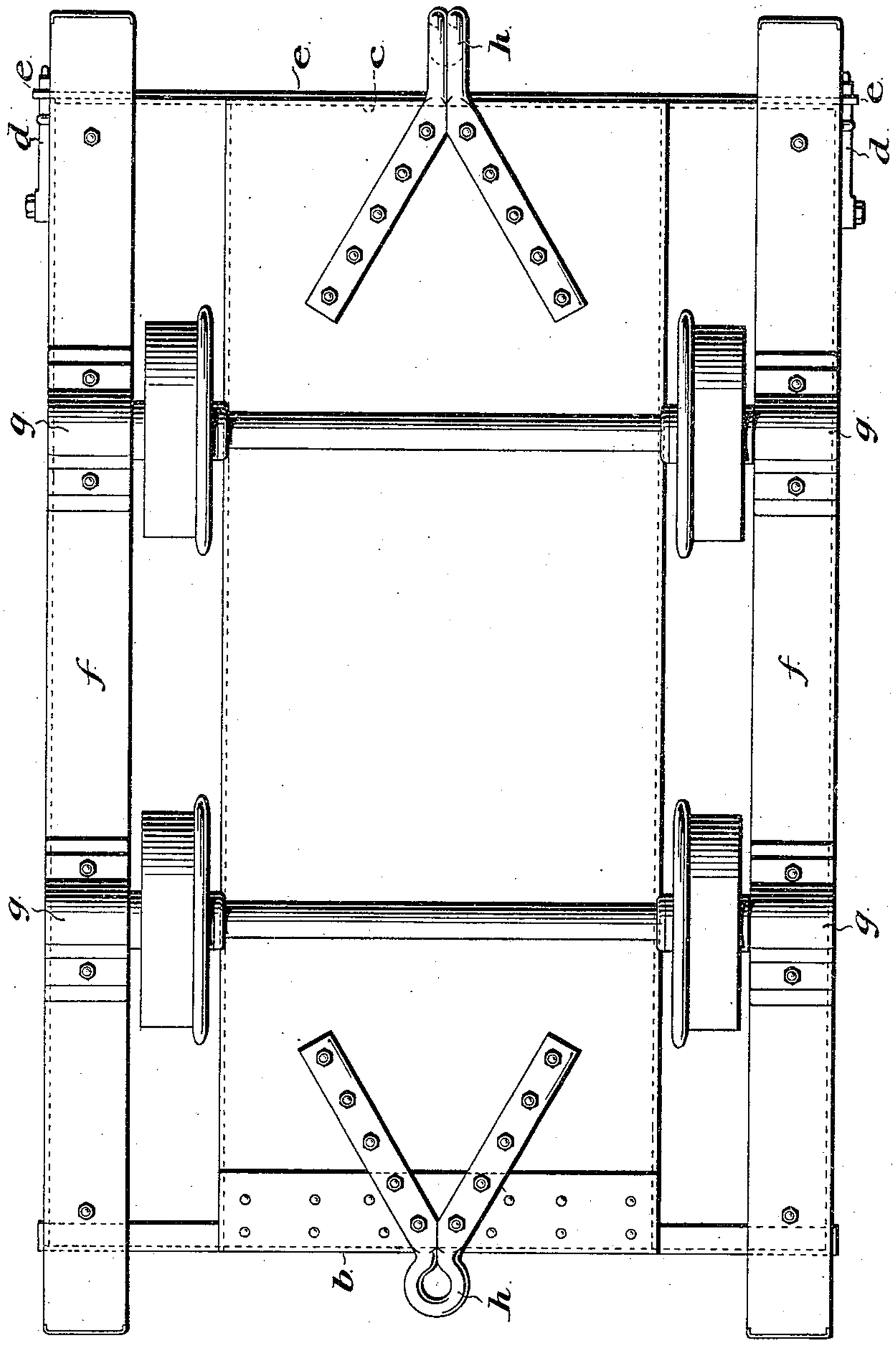


FIG. 3.

WITNESSES:
James H. Bell
Henry N. Paul Jr.

INVENTOR:
H. M. Boies
By W. G. Mackey attorney

UNITED STATES PATENT OFFICE.

HENRY M. BOIES, OF SCRANTON, PENNSYLVANIA, ASSIGNOR TO THE BOIES STEEL WHEEL COMPANY, OF PENNSYLVANIA.

TRAMWAY-CAR.

SPECIFICATION forming part of Letters Patent No. 564,551, dated July 21, 1896.

Application filed November 14, 1895. Serial No. 568,908. (No model.)

To all whom it may concern:

Be it known that I, HENRY M. BOIES, of the city of Scranton, county of Lackawanna, and State of Pennsylvania, have invented certain new and useful Improvements in Tramway-Cars, of which the following is a specification, reference being had to the accompanying drawings.

Said improvements appertain more specifically to a new method of construction for tramway-cars for the conveyance of materials in bulk, such as are used in and about mines and industrial establishments.

In the accompanying drawings, Figure 1 is a side elevation of a car embodying my invention. Fig. 2 is a front elevation of the same; and Fig. 3 is a plan view of such a car, viewed from beneath.

My invention consists generally in a frameless tram-car; that is to say, a tram-car from which is entirely omitted the usual framework upon which, according to the ordinary methods of construction, the body of the car is supported and the running-gear and draft-rigging attached. In place of this framework the car-body itself is so constructed as to have sufficient strength to serve both as car body and frame, thus reducing the weight of the car as well as the number of parts liable to destruction. The car-body itself is constructed in a novel way, the construction being guided by the endeavor to produce a structure which shall embody a proper recognition of the nature of the internal strains to which a loaded car is subjected, and which shall preserve its integrity at all times notwithstanding the renewal of such parts as may become worn out in consequence of the extraordinary wear necessarily put upon them. I accomplish this end, furthermore, by means of unusual simplicity, the car-body being practically composed of but three pieces of metal.

Tram-cars for the conveyance of ores, coal, and loose materials have heretofore been made with a framework of sills, to which framework the boxes for the axles have been fastened and the draft arrangements attached, and upon which the body or box for holding the load has been held by a frame built into it. In accordance with this plan of construction, considerations of cost and weight have generally restricted builders to the use of wood, both for framework and floor and sides of the body of the car, strengthened as much as possible by bolts, braces, and irons of various kinds. The loading and unloading of these cars with heavy burdens of coal, ores, &c., and the rough usage of mine service make the repairs of such cars a large item of expense. The accidental delays and hindrances caused by the breaking down of such cars, and the greatly-increased amount of motive power required to haul them when out of order, add much to the expense of the operator. In order to secure strength and durability with such a construction, the number of braces and their size and weight have been so increased that the weight of the tram-car is now usually about equal to or greater than the load of material which it is intended to carry. The result is a car objectionable not only by reason of its weight, but also by reason of the too great interdependence of its parts. Any unusual strain which results in breaking one part tends to disintegrate the whole car and destroy its contents. I have aimed to obviate these objections and have succeeded in overcoming them by a recognition of the exact nature of the strains, both internal and external, to which a car is liable to be subjected, and by affording the simplest possible means of resisting them. I thus greatly decrease the cost of maintenance and operation and also the chances of the destruction of the car.

I will now describe the car which is illustrated in the drawings, adverting from time to time to the advantages which have resulted from each novel principle of construction.

First, the car-body. This is constructed as follows: A single piece *a* of sheet metal, iron, or preferably steel forms the bottom and two sides. It is about one-quarter of an inch in thickness and of a width equal to the length of the car. Primarily it is bent only along the two lines *x x*, Fig. 2, which form the two lower side corners; but my method of construction lends itself especially well to a form of car-body having the maximum capacity joined to the greatest possible lower-

ing of the center of gravity. To this end it is secondarily bent along the lines *y y*, *z z*, Fig. 2, whereby two shoulders are produced, and thus the entire center between the wheels lowered until it almost touches the axles. It will be noted that this bending of the sheet subjects it to no unnatural strains, as all the lines along which the bending occurs are parallel. Furthermore, this construction cannot be attained in a car-body formed by stamping or die-pressure out of a single piece of metal. This method of bending the bottom of the car-body gives to it great strength in withstanding lengthwise pressure or pull, owing to the fact that the car thus constructed has the equivalent of six angle-irons extending from one end to the other. It also gives to the car the greatest possible capacity with the lowest possible center of gravity. The bottom and sides having been thus formed, the two ends are each made of a single piece of sheet metal cut to the corresponding shape. The piece for the rear end *b* is flanged to fit around the sides and bottom of that end and through the flanges bolted or riveted in place, the flanges serving in addition to stiffen the corners. In order to add stiffness and strength to the upper edge of the body, both plate *a* and plate *b* may have their upper edges turned over upon themselves, as seen at *m*, thus doubling their thickness, or, if desired, they may be turned to an angle, or over a rod which extends around the upper edge of the body and is held in place by the plate bent over it. The piece for the forward end *c* is not flanged, but is cut so as to cover snugly the space which it occupies. It is swiveled along its upper edge upon a rod of metal running between the two upper forward corners of the car and bolted thereto. It is further held in place at the bottom by two metal hooks *d*, pivoted to the sides of the car, and which engage with the projecting ends of a bar *e*, fastened across the front of the plate *c* near the bottom, as customary in such cars. These three pieces complete the car-body, every element of which has a distinct advantage over previous methods of construction. The bottom being of a single piece of metal of great strength, it is practicable to attach the draft-rigging directly thereto, in accordance with the principles of construction about to be explained, by which the framework is omitted, while at the same time the body is especially adapted to withstand the internal strains to which such a car is subjected in use. The strain caused by the weight of the load, it must be understood, is comparatively small in a car of this size as far as lateral pressure is concerned. The sudden starting or stoppage of the car, however, does subject the rear and forward ends of the car to a severe strain, growing out, respectively, of the inertia or momentum of the load. This is resisted in this car by the single solid piece of metal connecting these two ends around the three sides, with the additional advantage that if in the course of time the ends become bent or battered they may be readily removed without any alteration of the rest of the body.

Second, the draft-rigging, running-gear, and bumpers. The car-body thus formed is not mounted upon any framework, such as has heretofore been employed. The omission of this framework is possible not only on account of the strength of the body itself, but the recognition of certain principles which have not been hitherto properly developed in the construction of cars of this character.

I have found that a car-body made or constructed of sheet metal, according to the principles which I have explained, will be strong enough to resist all the normal strains to which it is subjected, including the work of pulling the train which is behind it, with the single exception of the pressure to which it is liable to be subjected by the sudden stoppage of the train. Consequently the draft hooks or chains *h h* are riveted or bolted or otherwise fastened directly to the bottom of the car-body. To resist this compression, I provide two straight timbers *f f*, slightly longer than the car-body and fortified at their ends by iron plates. These timbers are independently bolted longitudinally to the bottom of the car-body, one along each side, so that their ends project sufficiently at either end of the car. These timbers take up the entire strain of compression to which the car is subjected, and may be as strong as the usage to which they are to be put demands. They are, however, as has been explained, entirely independent of the body itself, and therefore if destroyed may be readily replaced, as they have no integral connection with the car proper. One of the great disadvantages growing out of a joined framework on which a car-body is mounted is that the destruction of the bumpers nearly always entails the destruction of the car-body, by reason of the interdependence of the two in construction. This disadvantage I entirely avoid, in addition to securing the greatest possible resistance to the destructive strains with the smallest possible increase to the weight of the car.

It is convenient to attach the running-gear to these timbers by means of the journal-boxes *g g*, as seen in the drawings, although, if preferred, the axles may be journaled directly upon the bottom of the car. Thus is formed, without any frame, a tram-car strong enough for the service required, and of extreme simplicity, consisting of the fewest possible parts liable to break and require repairs, and much lighter than is known in any other method of construction.

Although most tram-cars are made chiefly of wood, I am aware that they have been made of sheet-metal boxes or bodies, but these have always been made of thin metal and required a frame of some kind, as, for instance, in United States Letters Patent No.

208,393, where the frame is not of itself sufficiently strong, but has to be supplemented by a heavy iron draw-bar which runs from end to end of the car and up the front and back, and to which the running-gear and draft-rigging are attached. Consequently they have not come into extensive use on account of objectionable features.

Having thus described my invention, I claim—

1. A frameless tram-car, consisting of the following elements: a metallic car-body, of which the sides and bottom are formed from a single piece of sheet metal bent at right angles along the six lines, *x x*, *y y*, *z z;* draft-rigging attached directly to the bottom of the car-body; a pair of timbers of greater length than the car-body and fastened to the bottom of the car-body longitudinally one on either side; and running-gears attached to the bumper-timbers, substantially as set forth.

2. A frameless tram-car, consisting of the following elements: a metallic car-body, of which the sides and bottom are formed from a single piece of sheet metal bent at right angles along the six lines, *x x*, *y y*, *z z*, so as to form a longitudinal central depression in the bottom between the wheels and reaching almost to the axles; draft-rigging directly attached to the bottom of the car-body; a pair of timbers of greater length than the car-body and fastened to the bottom of the car-body longitudinally one on either side of said depression; and running-gears attached to the bumper-timbers, the wheels of which occupy the spaces on both sides between the timbers and the said depression, substantially as set forth.

HENRY M. BOIES.

Witnesses:
W. H. JESSUP, Jr.,
JOHN D. SHERER.