

(No Model.)

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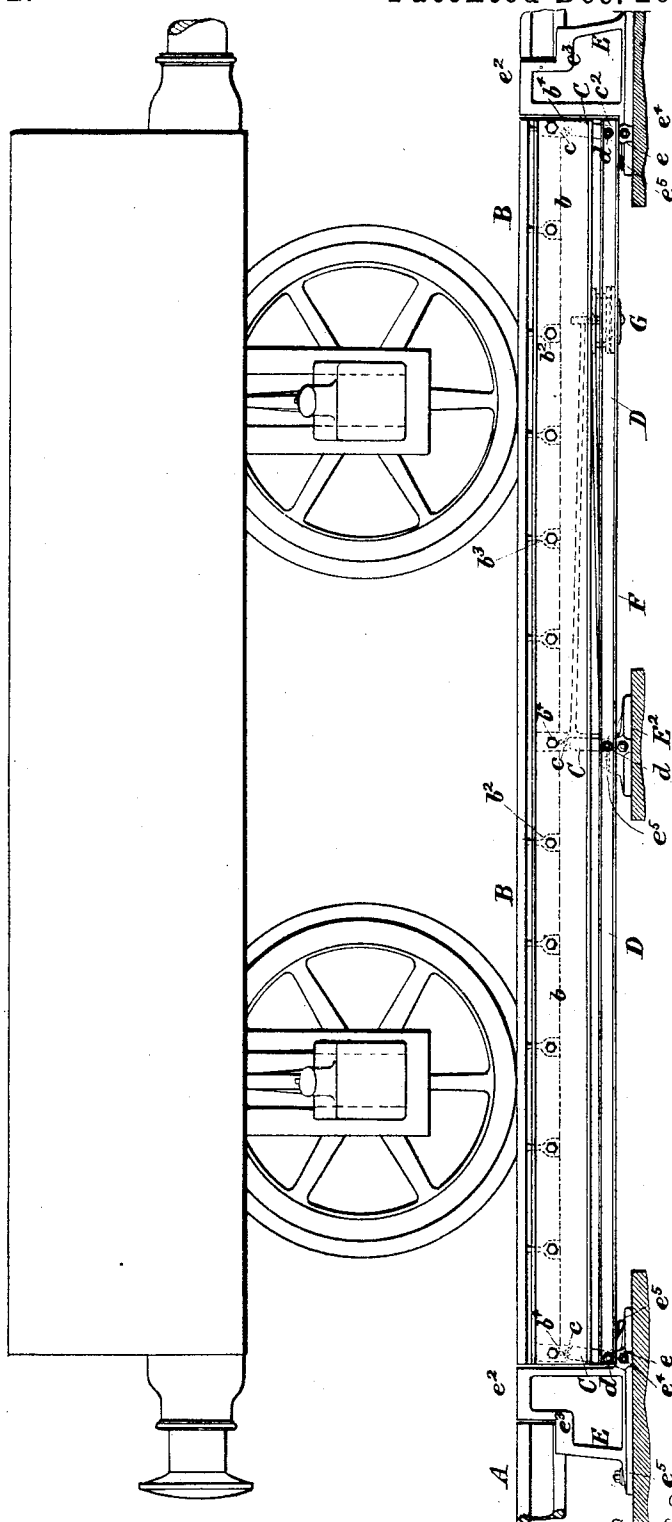
T. H. WARD.

RAILWAY TRACK SCALE.

No. 269,752.

Patented Dec. 26, 1882.

FIG. 1.



Witnesses
Hamilton D. Turner
James F. John

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Thomas H. Ward
by his Attorneys
Hosson and Long

(No Model.)

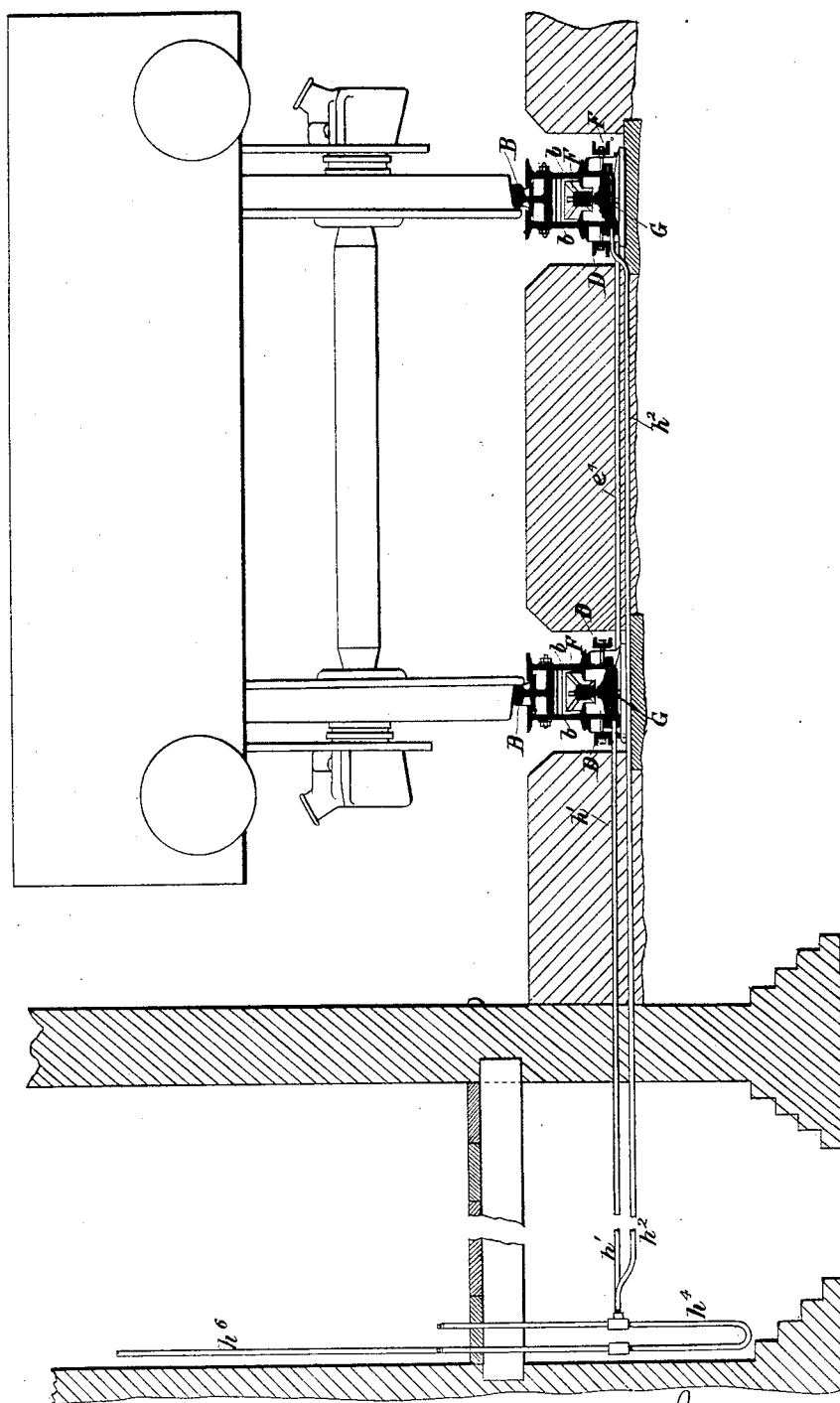
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FIG. 2.



Witnesses
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FIG. 3.

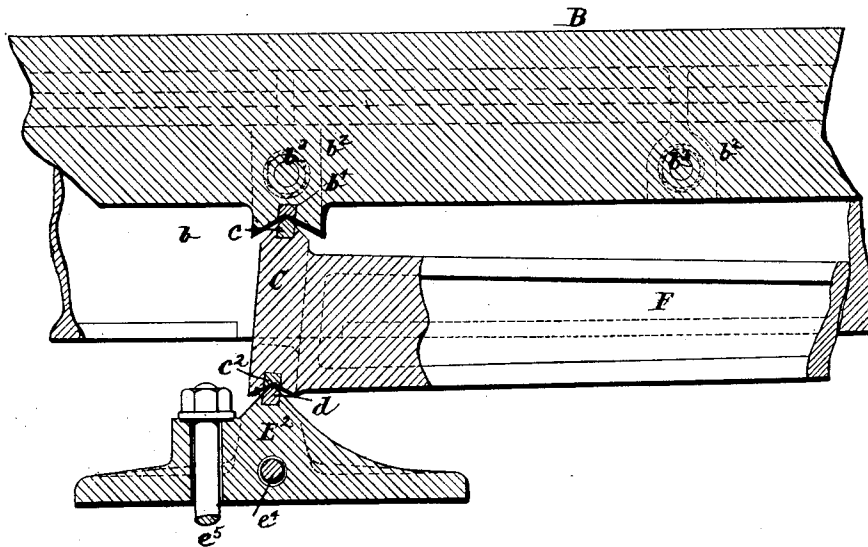
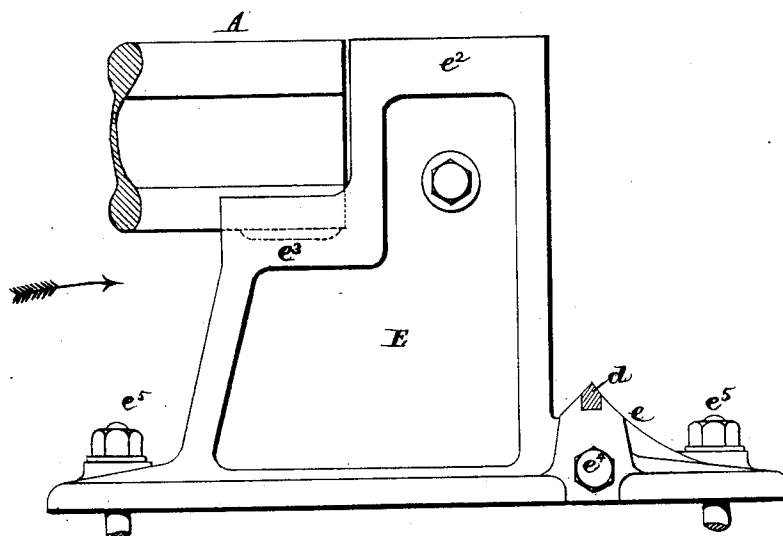


FIG. 4.



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(No Model.)

10 Sheets—Sheet 4.

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FIG 3. CONTINUED

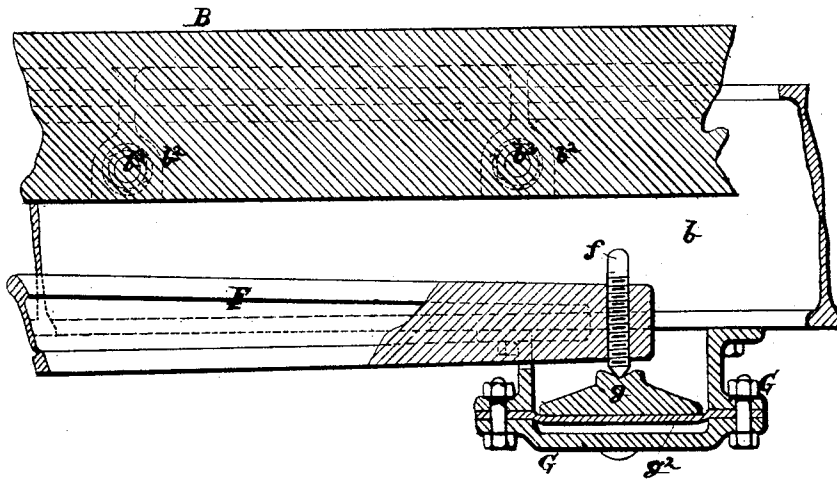
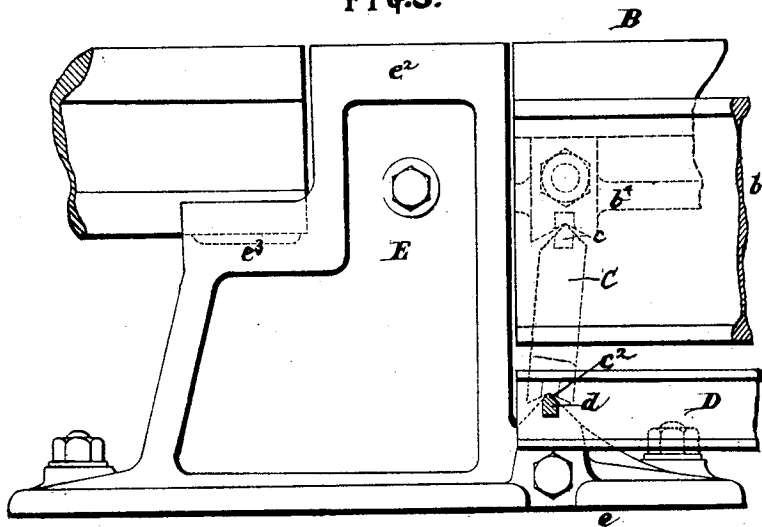


FIG. 5.



Witnesses
Hamilton D. Turner
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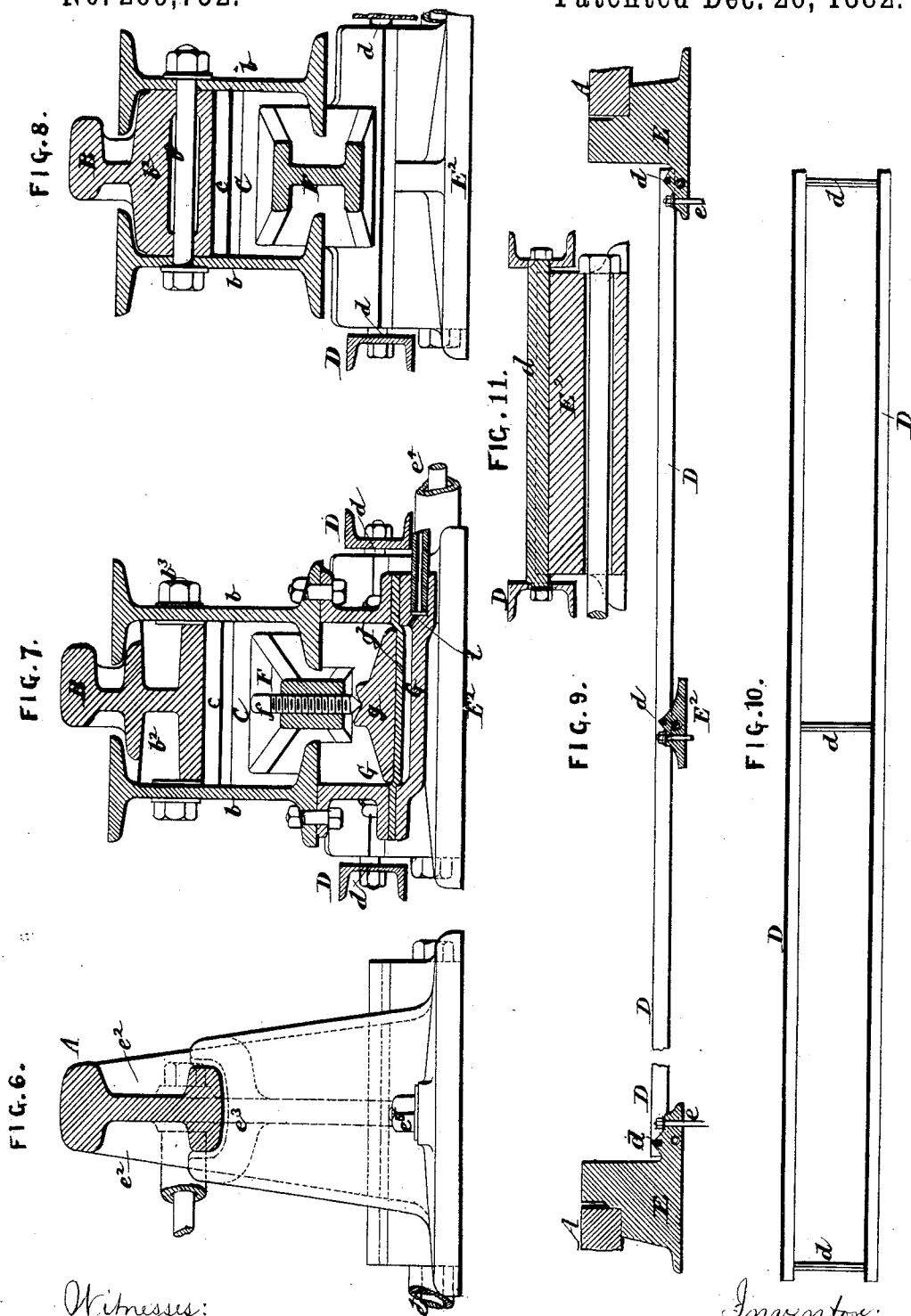
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FIG. 13.

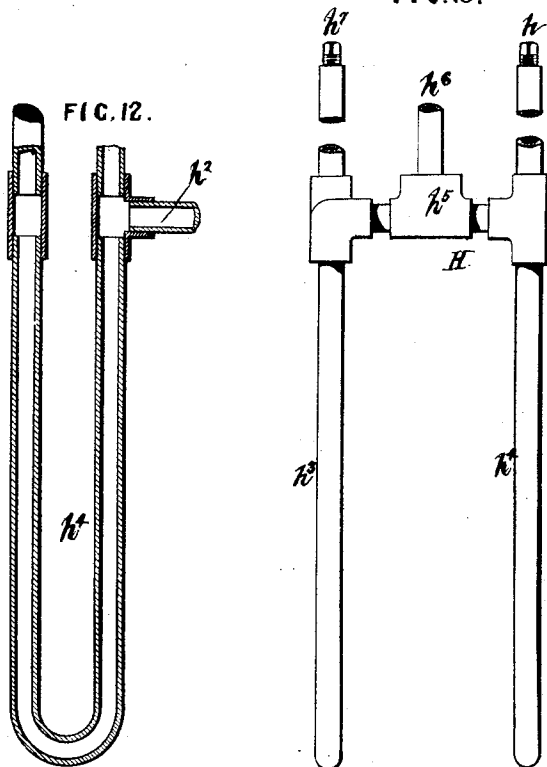


FIG. 14.

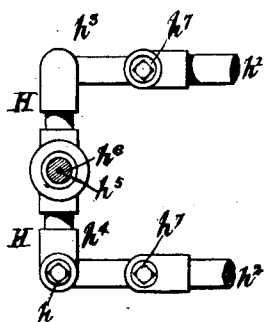
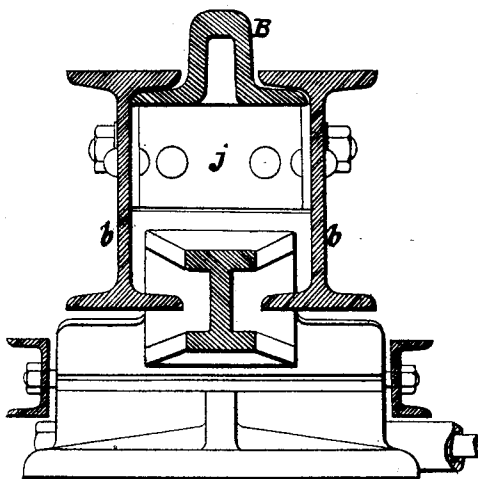


FIG. 15.



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Fig. 18.

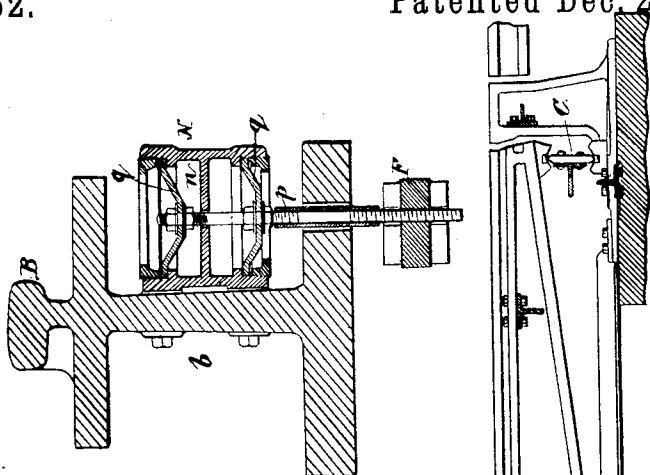
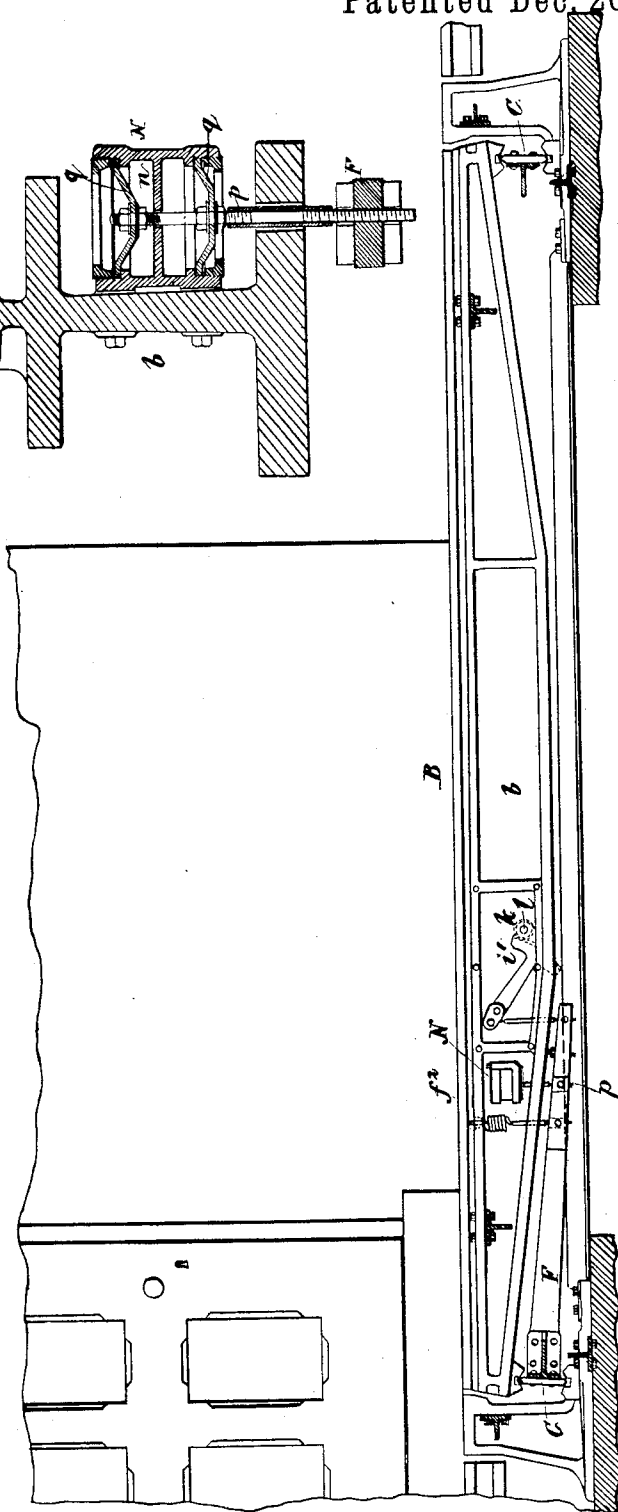


Fig. 16.



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(No Model.)

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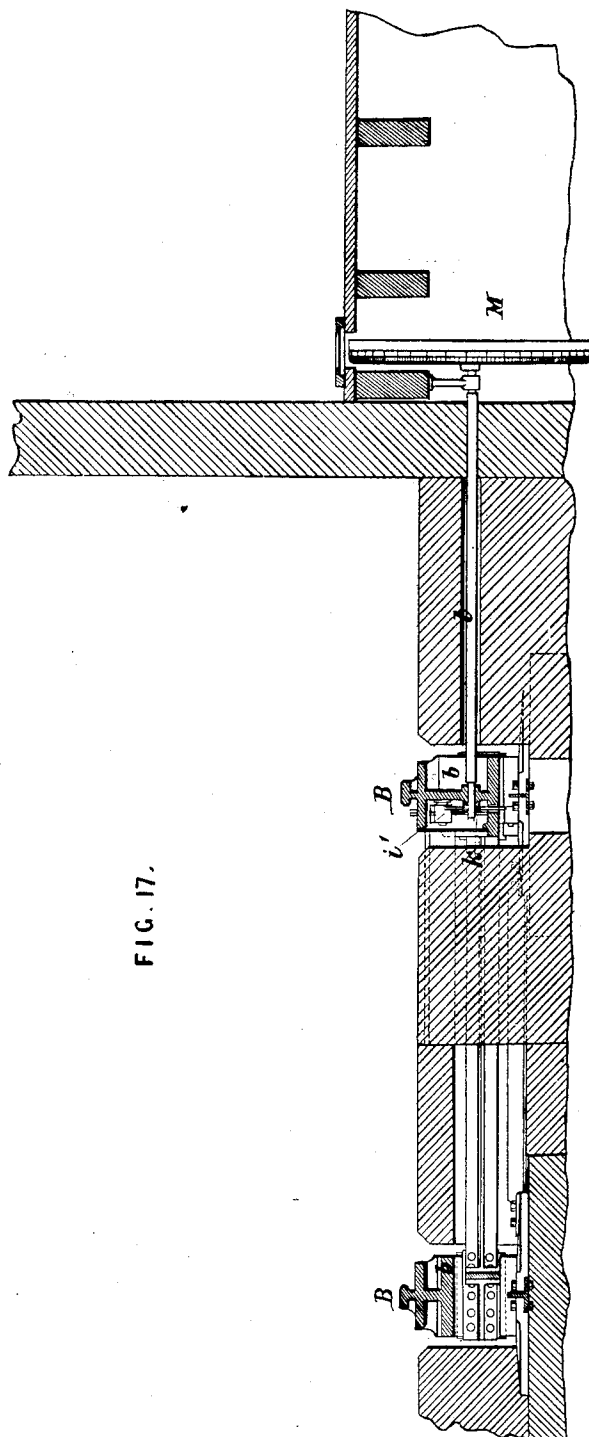


FIG. 17.

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(No Model.)

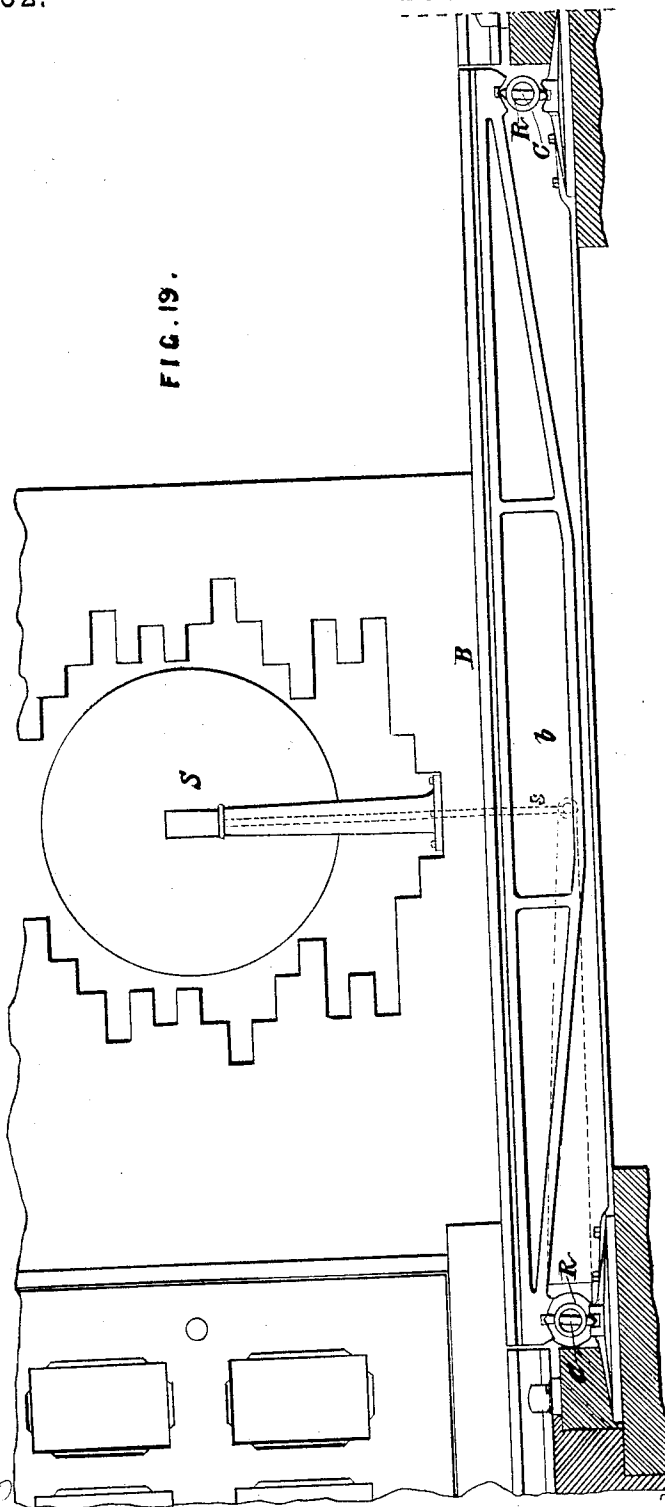
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FIG. 19.



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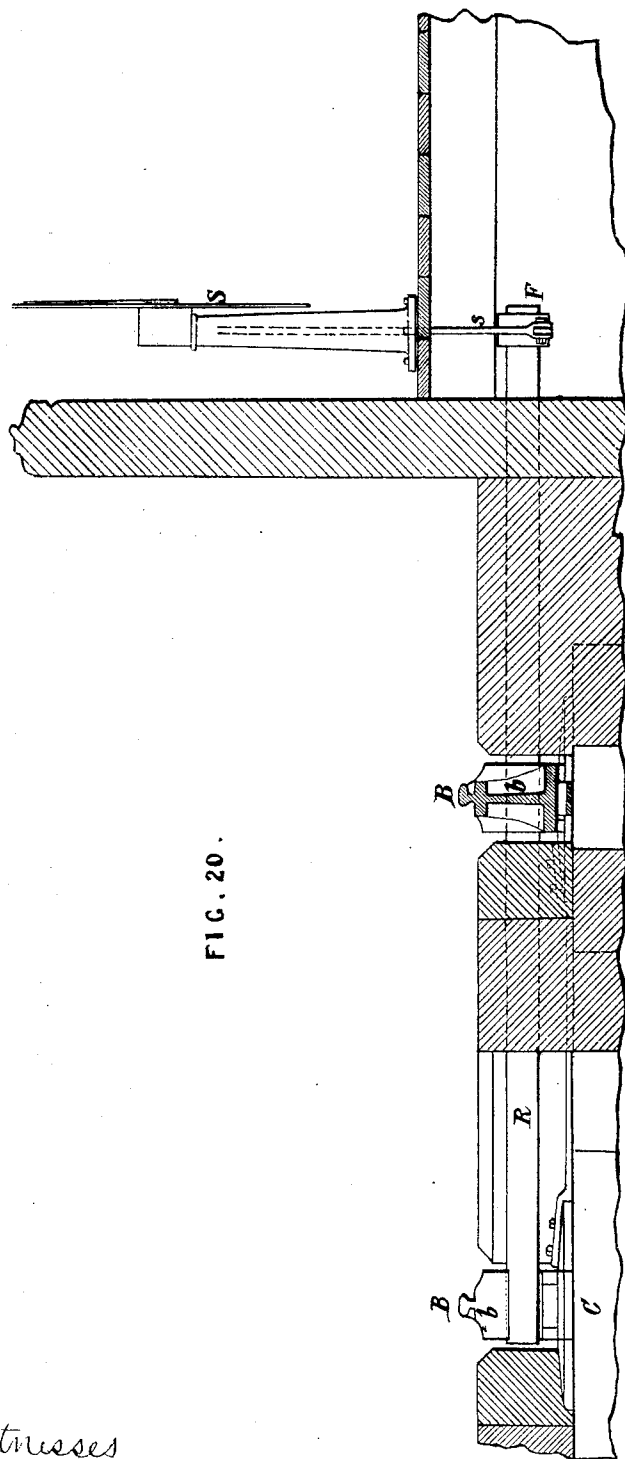
(No Model.)

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Patented Dec. 26, 1882.



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UNITED STATES PATENT OFFICE.

THOMAS H. WARD, OF TIPTON, COUNTY OF STAFFORD, ENGLAND.

RAILWAY-TRACK SCALE.

SPECIFICATION forming part of Letters Patent No. 269,752, dated December 26, 1882.

Application filed April 10, 1882. (No model.) Patented in England August 17, 1881, No. 3,580.

To all whom it may concern:

Be it known that I, THOMAS HENRY WARD, (of the firm of Howl, Ward & Howl,) a subject of the Queen of Great Britain, and residing at Tipton, in the county of Stafford, England, have invented certain Improvements in Weighing Machines or Apparatus, (for which I have obtained a patent in Great Britain, No. 3,580, dated August 17, 1881,) of which the following is a specification.

My invention relates to that class of apparatus known as "platform weighing-machines," more particularly suitable for weighing loads on railway or tramway trucks, and it has reference to improvements upon the platform weighing-machine described in the specification to British Letters Patent granted to me, dated the 6th of November, 1876, No. 4,294, in which the weight of a load is ascertained by measuring the deflection from its normal path of struts, tumblers, or rockers, upon the principle of the parallelogram of forces, the object of my present invention being to produce an apparatus of more economical construction without impairing its efficiency and detracting from the mathematical precision of its indications.

In carrying out my invention two rails, corresponding and forming a continuation of the rails on which the truck runs, are carried upon girders rocking upon knife-edges, which are fixed to, say, two, three, or any other suitable number of struts, tumblers, or rockers. The latter, having a motion perfectly parallel to each other, rock or deflect on lower knife-edges constituting fulcra, which form the base or foundation plate or plates of the machine. In order to insure perfect parallel motion, the fulcra are rigidly secured together, while the rocking girders above fix the top knife-edges. To any one of these rockers is attached a horizontal lever, the outer end of which bears upon a plunger, which is let into a shallow cylinder containing liquid.

In order to make a liquid-tight joint and to allow the plunger free play at the same time, and yet avoid the friction due to ordinary hydraulic leather packing, I interpose a diaphragm of leather or india-rubber, or a corrugated metallic diaphragm between the plunger and the liquid, fixing it to the cylinder water-

tight. The liquid in this cylinder is conveyed into the office through a small pipe, (underneath the floor for convenience,) which may terminate in an inverted siphon of mercury, so that any pressure of water is communicated to the mercury and forced up the far leg. Up to the present point the apparatus is in duplicate—that is to say, there is one complete apparatus for each rail, the two being independent of each other. The far legs of each of these mercurial siphons are connected together by means of a breeches-pipe discharging itself into one glass tube common to these two siphons, which is carried up the wall through the floor and extends up the wall of the office. This tube is graduated—say, from floor to ceiling—and contains a column of liquid which will show by its rise and fall (as actuated by the two mercurial siphons) the resultant load of the two sides of the truck, so that the machine is automatic. A thumb-screw plug is inserted in the breeches-pipe, so that any leakage or evaporation or expansion and contraction of the liquid or mercury can be adjusted to the graduations from time to time. The knife-edges are so wide, and each machine is so short in height, that there is no tendency to tip them over when the load comes on. Hence there is no necessity for tying the machine down or together at all.

In order to insure that the wagons shall be drawn onto the machine with as little jerk as possible, an elevated portion or rail the exact height of the track is provided, situated between and forming a continuation of the rails of the track and of the apparatus, with suitable clearance between. The said elevated portions may be cast in one with the outer fulcra-plates, and may serve also as chairs upon which to rest the ends of the rails of the track, whereby the tendency to spring is greatly prevented.

In order to prevent a sudden flow of the liquid as the load comes on the machine, which would have a tendency to force the mercury over the breeches-pipe, the water in the cylinders has communication with the pipes only through very small pin-drill holes, so that whatever the load may be the rise and fall of the liquid is retarded. Hence it is steady in its action.

It will be understood that by the foregoing arrangements the ordinary platform extending from side to side may be dispensed with.

The measuring apparatus may be modified by the employment of rack-and-pinion gear, and a spring may be used as a resistance to each apparatus, as in the weighing-machine described in the specification to former British Letters Patent granted to me, dated the 4th of October, 1877, No. 3,700. The measuring-gear may also be otherwise modified, as hereinafter described. The measuring-gear, it will be evident, may be in duplicate in one or more offices. The machine itself may also be modified by connecting the rails and girders at each side together and supporting them on rockers, one pair being fixed on a shaft common to the two rockers, the torsion of which shaft is resisted through a lever connected to a Salter's spring-balance or to other levers for indicating the weight. Similar shafts may connect the other pair or pairs of rockers.

In order that my said invention may be fully understood I shall now proceed more particularly to describe the same, and for that purpose shall refer to the several figures on the annexed sheets of drawings, the same letters of reference indicating corresponding parts in all the figures.

Figure 1 represents in longitudinal or side elevation, and Fig. 2 in transverse section, apparatus constructed according to my said invention. Figs. 3 to 14 represent details thereof, some of which are drawn to an enlarged scale, as hereinafter described. Figs. 15 to 20 represent modifications thereof, also hereinafter described.

Of the two rails of the line upon which the truck runs and with which my weighing apparatus is combined the one shown in the drawings is marked A. I will describe the arrangement as applied to one rail of a pair of rails, it being understood that the other rail of the pair has a precisely-similar arrangement combined therewith, as seen clearly in Fig. 2.

In each line, and forming a continuation thereof, is a rail, B, carried by girders *b*, the said rail B being furnished at its under part at intervals with lugs *b*², through which and through the said girders bolts *b*³ are passed and fastened by nuts to secure the said rails B to the said girders *b*, as shown clearly in Figs. 7 and 8, which are transverse sections taken the one on a line between two of the said bolts and the other in a line with one of the said bolts. The rail is provided on its under side with female knife-edges *b*⁴, formed in strips let into slots in projecting parts of the said under side of the rail. The two end knife-edges each rest upon a male knife-edge similarly formed on strips *c* let into struts, tumblers, or rockers *c*, furnished at their lower parts with similar strips *c*², having female knife-edges formed therein and resting in the case of the end rockers upon male knife-edges formed on similar strips, *d*, let into a projection, *e*, from the chair E, which is situated at each end of

the said rail B, the knife-edge upon which the middle rocker rests being carried by a chair, E².

The rockers C are preferably broader at their lower part than at their upper, the knife-edges *c*² and *d* being similarly broader than the knife-edges *b*⁴ and *e* to give a firm base to the apparatus. In order to preserve the proper relative position of these knife-edges *d*, which form the base upon which the apparatus acts, their ends are let into longitudinal braces D.

Fig. 9 is a section of the chairs and knife-edges and their connecting-braces, and Fig. 10 is a plan of the said knife-edges and braces. Fig. 11 is a transverse section, drawn to an enlarged scale, of one of the chairs, E², with its knife-edge *d*, showing also the braces D in section.

The normal position of the rockers C is in accordance with the principle laid down in the specification of my aforesaid former patent—*videlicet*, slightly inclined to the vertical line. To the middle rocker (or it may be to one of the other rockers) is attached or cast a lever, F, the outer end of which carries a screw-pin, *f*, which bears upon the plunger *g* of a shallow cylinder, G, carried by the girders *b*. This plunger acts upon a diaphragm, *g*², of leather or india-rubber or corrugated metal or the like, bolted water-tight between the flanges of the said cylinder G and its cover, as shown clearly in Figs. 3 and 7, which former figure is a longitudinal section of the central part of the rail B and of the lever F. This arrangement of piston and diaphragm may be replaced by a plunger or ram sliding liquid-tight in the cylinder G. Pipes *h*¹ and *h*² communicate respectively with the interior of each cylinder G, each of the said pipes terminating in an inverted siphon, *h*³ *h*⁴, containing mercury. The other legs of the said siphons opposite those into which the said pipes *h*¹ *h*² open are connected by a breeches-pipe, H, so that they both communicate with one pipe or T-piece *h*⁵, in which is held the graduated glass tube *h*⁶, which contains the indicating-liquid, and is led into the place where the indications of the apparatus are to be exhibited, as shown in Fig. 2.

Fig. 12 is a vertical section, Fig. 13 a back view, and Fig. 14 a plan, of the pair of siphons.

The machine being in duplicate up to a certain point, any load brought on the rail of either side will force the liquid (by preference mercury) up its independent tube *h*¹ *h*² independently of the other side, each side thus forming a hydrostatic equilibrium of its own. Further, as the two pipes are afterward connected by a breeches-pipe opening into one indicating-tube, and as this breeches-pipe and the said indicating-tube contain a liquid of a very much less specific gravity than that in the duplicate parts of the apparatus, the hydrostatic equilibrium of the one side of the machine does not interfere with that of the other side; but they both act mutually upon the liquid of less specific gravity to give one common indication of their combined displacement.

In the simplest form of the machine the pipes

h' h^2 would communicate with vertical pipes leading into the one common indicating-tube; but in order to save the expense of a large quantity of mercury a cheaper fluid can intervene 5 between the cylinders G and a small quantity of mercury contained in siphons. This is the arrangement shown in the drawings. The legs of the siphons into which the pipes h' h^2 open are continued upward, as shown in Figs. 2, 13, 10 and 14, and are each provided with a screw-plug, h^7 . The breeches-pipe H is also provided with a screw-plug, h . These plugs serve by adjustment to compensate for any leakage or evaporation or expansion and contraction of 15 the mercury or of the liquid which fills the space in the cylinders G , pipes h' h^2 , and legs of the siphons h^3 h^4 , into which they open between the under side of the diaphragm g^2 and the mercury in the said siphons. The mercury in the siphons should be at a level in each 20 leg when no load is on the machine.

The fulera-plates or chairs E are cast with an elevated portion, e^2 , the exact height of the rails A and B , and forming a continuation 25 thereof, the said chairs being also cast with a seating at e^3 for the ends of the rails. Figs. 4 and 5 are side elevations of one of the said chairs, and Fig. 6 is an end elevation of the same, looking in the direction of the arrow in 30 Fig. 4, Fig. 4 showing the end of a rail in position and Fig. 5 showing also the end of a rail, B , and girder b , and a rocker, C , of the weighing apparatus. The chairs or fulera-plates of each rail of the pair of rails B B E E^2 are 35 bound transversely together by means of tie-rods e^4 , and they are fastened down to a level bed of concrete or stone or the like by bolts e^5 .

To prevent the mercury being forced over the breeches-pipe H the liquid has communication from each of the cylinders G to each of 40 the pipes h' h^2 by a hole, i , shown in Fig. 7, so much smaller in capacity or sectional area than the bore of the said pipes as to retard the flow of liquid sufficiently to prevent such 45 overflow of mercury.

In using the apparatus the truck or vehicle to be weighed is run from the rails A over the elevated portion e^2 of the chairs E onto the rails B . The weight of the said vehicle therefore causes a deflection of each of the rails B 50 and their rockers C C upon their knife-edges, and consequently the weight brought to bear on each rail B is respectively and independently conveyed by the pipes h' and h^2 to the mercury in the siphons h^3 h^4 , owing to the pressure put through the levers F upon the pistons 55 g of the cylinders G , forcing the liquid through the hole i of each cylinder into and along the said pipes h' h^2 , and forcing (each with an independent pressure) the mercury down in the legs on one side of the said siphons and up in the other legs. The pressures are thereafter caused through the breeches-pipe H to conjoin and act upon the liquid in the tube h^6 , the extent of the rise of which will consequently give 65 the resultant of the loads brought to bear upon both rails of the apparatus, or, in other words,

the total weight of the truck or vehicle and its contents. The tube h^6 may be transparent to show the indications, or the rise and fall of the 70 liquid therein may be ascertained by other suitable means.

Fig. 15 represents a modification of the means for connecting the rails B to their girders b . The rail B employed in this case is a double-flanged channel-rail, which is supported at intervals by cross-pieces formed by the body 75 part of double T -pieces, as at j , bolted or riveted or otherwise fastened to the girders b .

Fig. 16 represents in longitudinal elevation, 80 and Fig. 17 in transverse section, an apparatus similar to that hereinbefore described; but wherein, instead of the cylinders G and pipes for conveying the pressure through siphons to the indicating-tube h^6 , there is employed measuring apparatus of the kind described in the 85 specification of British Letters Patent No. 3,700, granted to me as of the 4th day of October, in the year of our Lord 1877. Each of the girders b and rails B are here shown as 90 being formed in one casting mounted upon two rockers, C —one at each end—the said girders and their corresponding rockers being firmly braced and connected together by cross-binding girder bars or the like. One of the rockers 95 of one of the girders carries the lever F , which, acting against a spring, f^2 , operates a segmental rack, i' , gearing with a pinion, k , upon a shaft, l , extending to the place where the indications are to be shown, and there carrying a graduated indicating-wheel, M , or being 100 connected to other indicating device.

The lever F is analogous to the lever F shown in the drawings attached to the prior specification of my said Patent 3,700, in the 105 year of our Lord 1877, and the mechanism upon which it operates is arranged and acts in a manner essentially similar to that described in the said prior specification, and therefore further description thereof is unnecessary. 110 There is combined therewith for the purpose of preventing shocks by the load suddenly acting upon the lever F a double cylinder, N . (Shown separately in vertical section in Fig. 18.) The compartments of this cylinder are 115 separated by a partition, n , and through the said cylinder and partition passes a rod, p , adjustable in length and connected at one end with the lever F and at the other end with two diaphragms, q q , of india-rubber, corrugated 120 metal, or the like, one in each chamber of the double cylinder N . Thus liquid being in the one chamber, the lever F can only move at a rate determined by the rapidity with which the liquid can pass out of this chamber into 125 the other chamber through a small hole in the partition n .

Fig. 19 represents in longitudinal elevation, and Fig. 20 in end elevation, partly in transverse section, another modification of the ap- 130 paratus. In this case, as in the preceding, the girders b and rails B of the apparatus are shown as being cast in one, and the two at each side, as also their chairs E , are firmly con-

nected together. The rockers C are carried in slots in tubes or hollow or solid shafts R, which serve as distance-pieces and connectors for the corresponding rockers of each rail B. The lever F is carried by a continuation of one of the said tubes or shafts R, the outer end of the said lever being connected by the lever or connection s with a Salter's spring-balance, S, or other weight-indicating apparatus.

Although I have shown but one pair of machines, Figs. 1 to 15, yet it will be evident that any number may be combined in a similar manner—that is to say, each with a separate hydrostatic equilibrium, the pressure from each machine being led to one indicator, essentially as described. For example, the machines may be arranged in lines of pairs and a whole train of trucks or the like be weighed by them and the whole weight indicated on one indicator. The machines may each be of any length to accommodate one or more trucks or the like.

Having now described and particularly ascertained the nature of my said invention, and the manner in which the same is or may be used or carried into effect, I wish to be understood that I do not limit myself to the precise details hereinbefore described, and illustrated in the accompanying drawings, as the same may be varied without departing from the nature of my invention; but

What I consider to be novel and original, and therefore claim as the invention secured to me by the hereinbefore in part recited Letters Patent, is—

1. The combination of rails or ways of a platform-scale supported on rockers C and chairs, with a lever connected to one of said rockers and acting upon indicating mechanism, substantially as set forth.

2. The combination of two rails supported separately on rockers C and chairs, with a lever, F, connected to a rocker supporting each rail, the two levers operating the same indicating apparatus, substantially as described.

3. The combination of the two rails or ways of a platform-weighing apparatus and independent weighing devices, substantially as described, with two tubes containing dense fluids acted on independently by said two weighing devices, and a common indicating-tube with which both said tubes communicate, all substantially as specified.

4. The combination of the rail or support of a platform-scale, rockers C, and lever with a cylinder and a diaphragm acted on by said lever, siphon-tube, and indicator, and a tube connecting the cylinder with the siphon, all substantially as described.

5. The combination of the rail B and girders with rockers, lever F, acting on the indicating apparatus, and a supporting-chair, substantially as set forth.

6. The chair E, having a seat for one end of a fixed rail, an elevated portion, e^2 , and a knife-edge bearing for the rocker of a weighing apparatus.

7. The combination of the rail or support of a platform scale, rockers C, and lever F, having a set-screw, f , with cylinder, diaphragm, and plunger g , the cylinder on the under side of the diaphragm communicating with an indicating-tube.

8. The combination of the rail or support of a platform-scale, rockers C, and lever F with a cylinder containing a column of liquid acted on by said lever, indicator, and a contracted communicating passage, i , substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

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Witnesses:

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JOHN M. DICKINSON,
U. S. Consulate, Birmingham.