No. 711,345. Patented Oct. 14, 1902.

J. F. RADERS & H. D. MEIER.

DRAFT GEAR AND BUFFING APPARATUS.

(Application filed Dec. 23, 1901.)

(No Model.) 2 Sheets—Sheet 1.

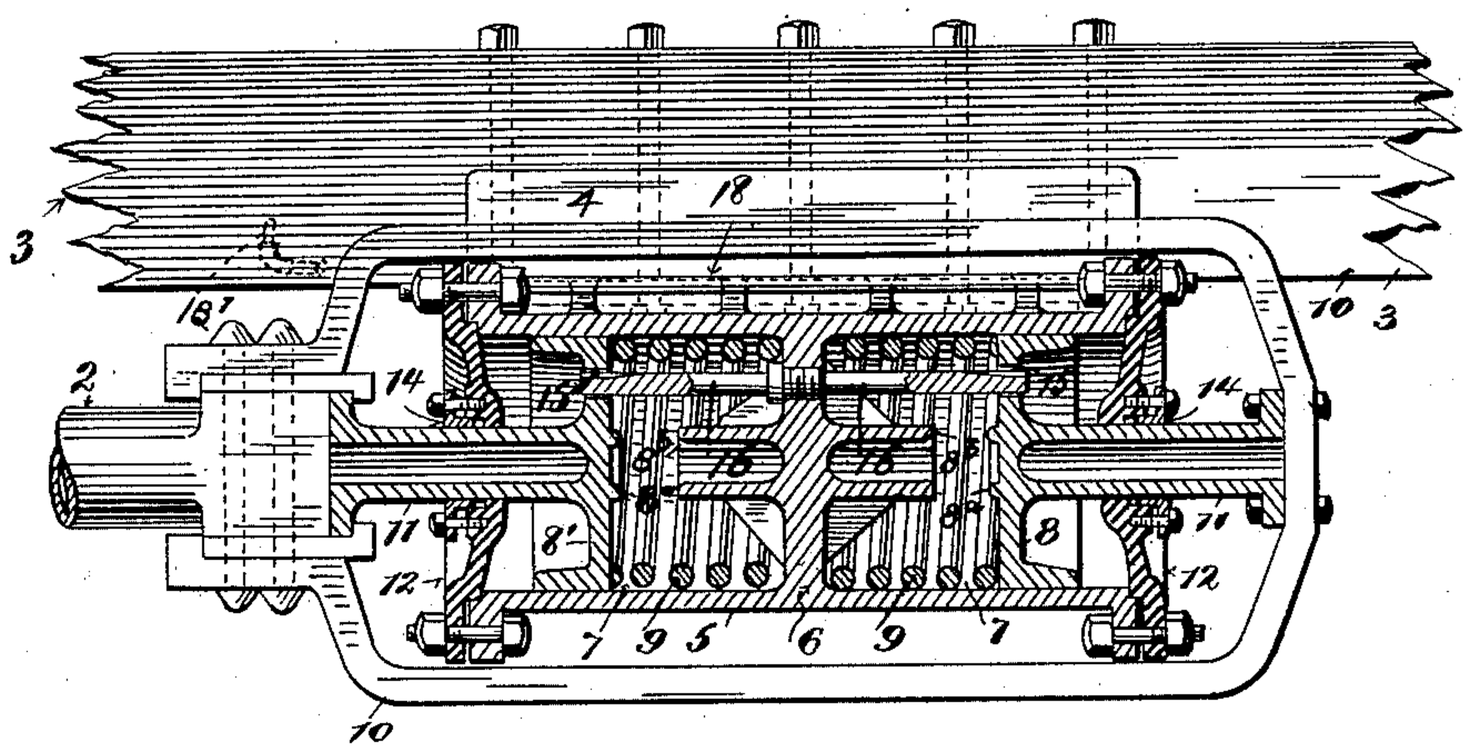

Fig. 1.

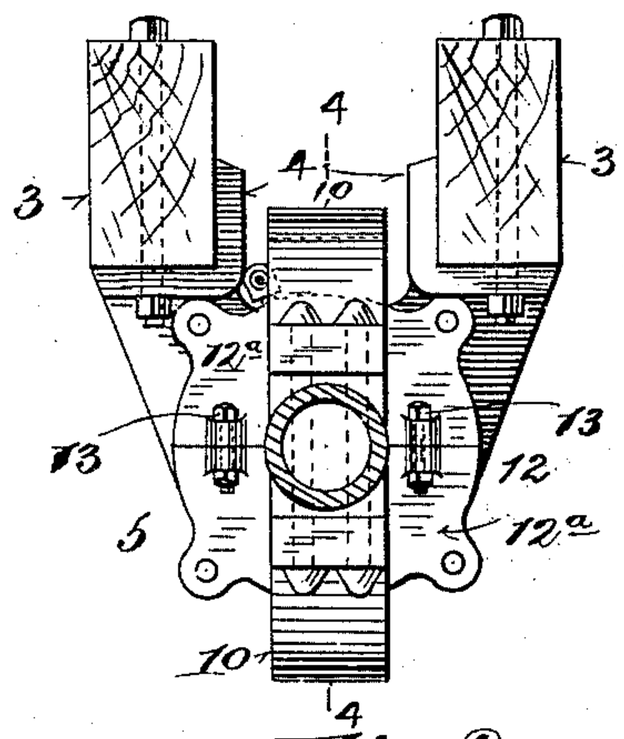

Fig. 2.

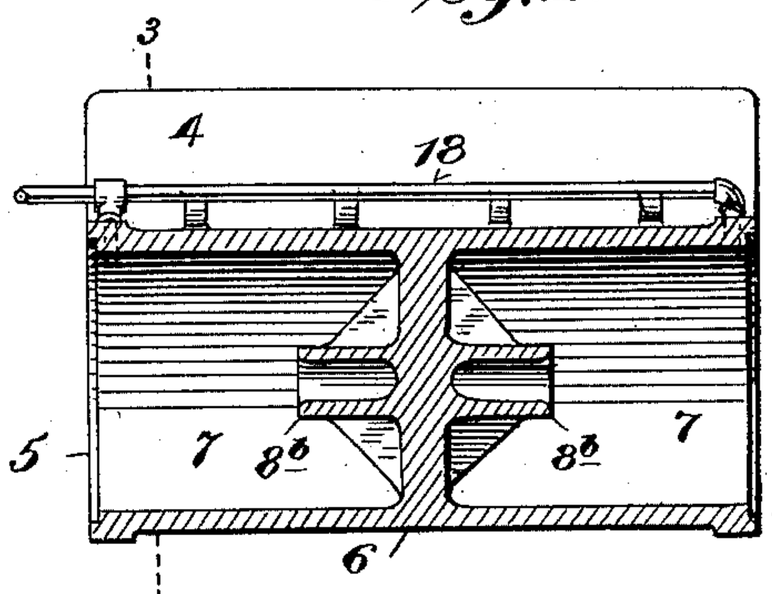

Fig. 4.

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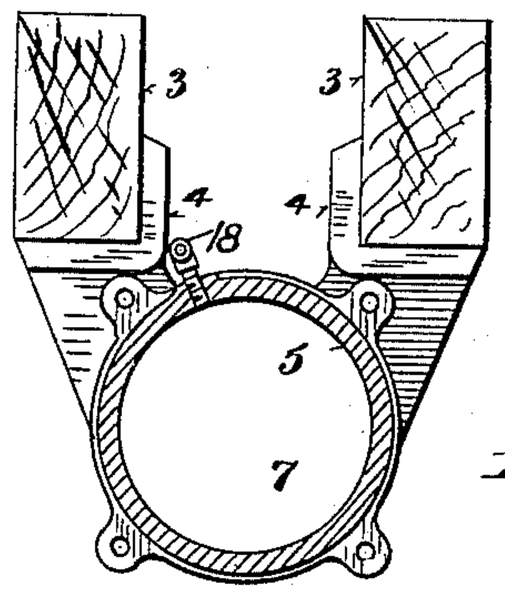
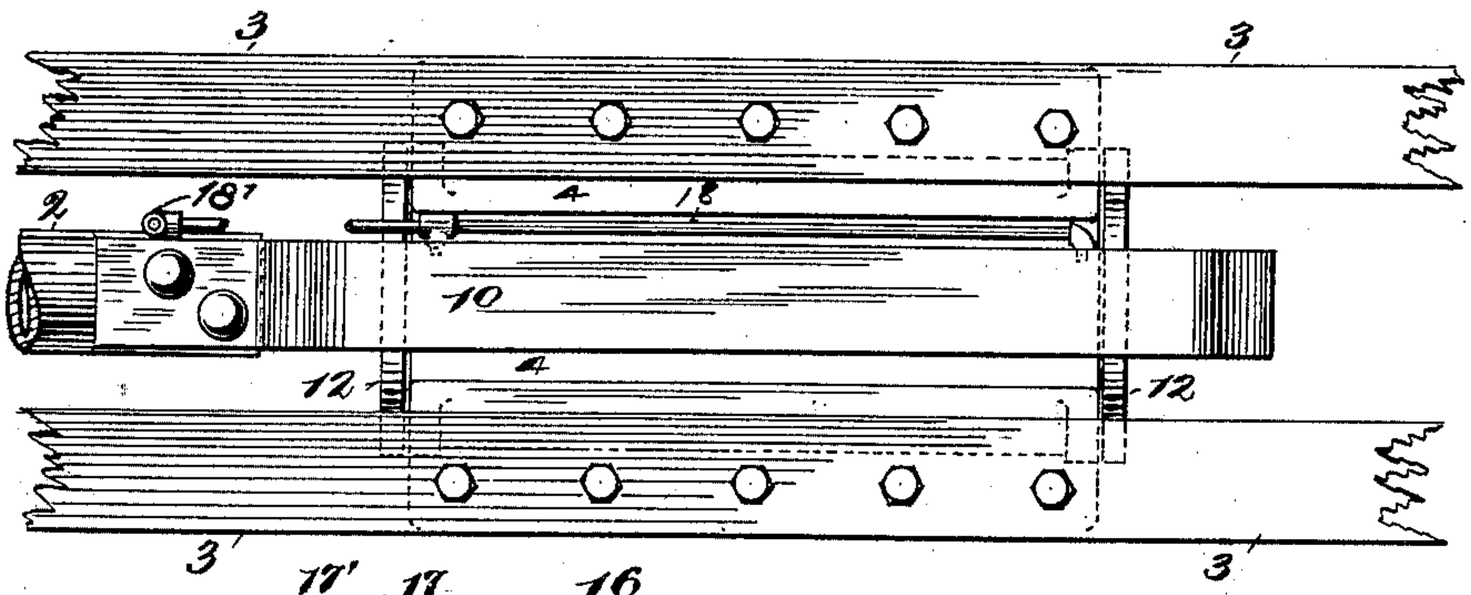


Fig. 3.

Fig. 5.



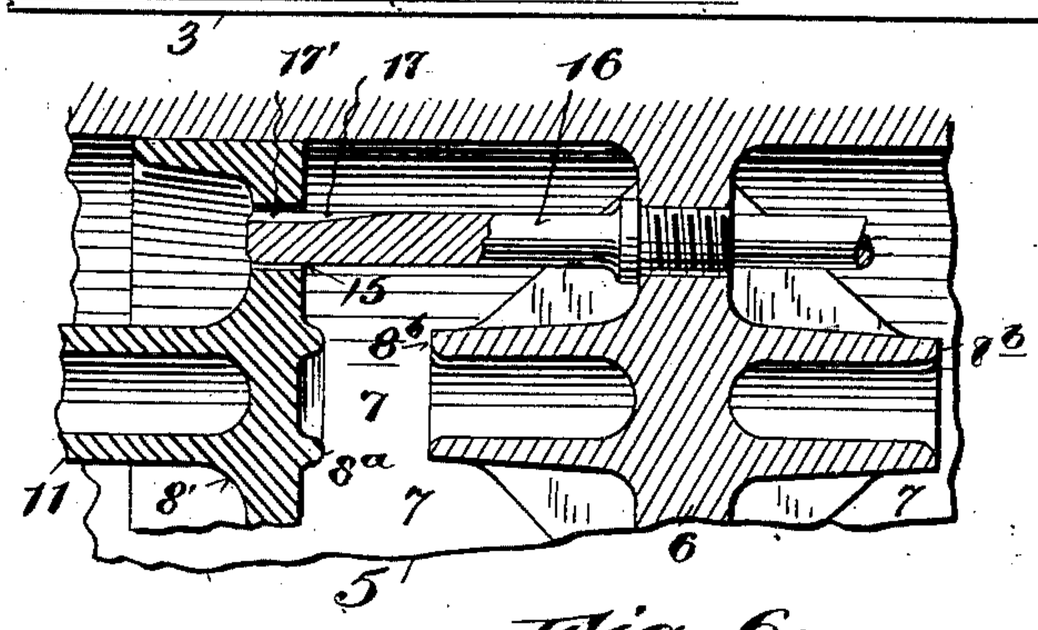


Fig. 6.

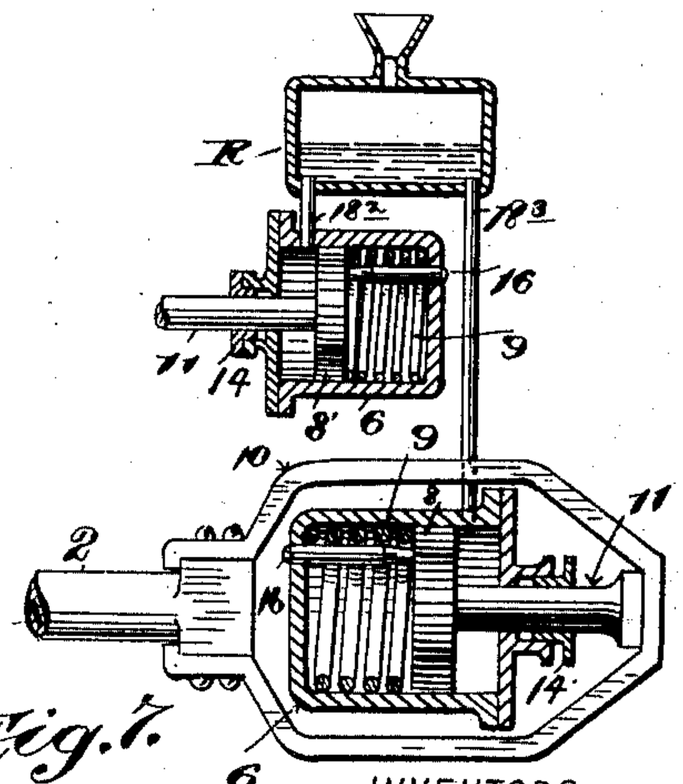


Fig. 7.

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UNITED STATES PATENT OFFICE.

JOSEPH F. RADERS AND HUGH D. MEIER, OF BROOKLYN, NEW YORK, ASSIGNORS OF ONE-TENTH TO DAVID CORBIN.

DRAFT-GEAR AND BUFFING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 711,345, dated October 14, 1902.

Application filed December 23, 1901. Serial No. 87,011. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH F. RADERS and HUGH D. MEIER, of the borough of Brooklyn, city and State of New York, have invented a certain new and useful Improvement in Draft-Gear and Buffing Apparatus, of which the following is a specification.

Our present invention is in the nature of an improvement upon that disclosed in Letters Patent of the United States No. 573,534, granted to Joseph F. Raders on December 22, 1896; and it pertains to a device for receiving and counteracting the shocks and jars incident to the operation of railroad rolling-stock, embodying particularly an apparatus designed to cushion, absorb, and properly dissipate the tractive and buffing forces and stresses (and particularly those that are suddenly applied) encountered in the haulage of trains.

Where the tractive and retarding forces are transmitted from car to car through appliances which embody springs or analogous contrivances as an essential feature in their construction, the conditions are not such as to minimize the wear and tear on the rolling-stock. With the ordinary grade and track of to-day and under the conditions prescribed by the methods of operating the usual train-service there must be constant alterations between compression and tension throughout the train. As the engine is slackened or as the train runs down grade the cars run together. Then without stopping the train is again stretched out. If now the recoil of the buffer-springs is brought into play concurrently with the forward motion of the masses of the locomotive and the leading cars, a set of conditions is established which is very favorable to a break-in-two—that is to say, by reason of the fact that the springs through which the varying and alternating forces are transmitted operate to suddenly return such forces when permitted to do so and in practically undiminished amount a series of recoils result which continue with changing conditions of grade, track, tractive forces, &c. This action, subjecting, as it does, the parts to injurious stresses, causes a rapid deterioration of the rolling-stock and is oftentimes productive of more or less disastrous results.

The present invention has for an object to provide an apparatus through which the forces may be transmitted without engendering a recoil or reaction such as characterizes the operation of devices of the foregoing type and, broadly speaking, provides a hydraulic-pressure apparatus so organized as that it will not be caused to leak through the forces and stresses to which it will be subjected in use.

In the drawings accompanying the present specification, Figure 1 is a longitudinal vertical section through a draft-gear and buffing apparatus embodying our present improvements. Fig. 2 is an end view thereof. Fig. 3 is a cross-section on the plane of the line 3 3 of Fig. 4. Fig. 4 is a longitudinal section on the plane of the line 4 4 of Fig. 2, parts being omitted. Fig. 5 is a plan view of the device of Fig. 1. Fig. 6 is a longitudinal section of a portion of the apparatus, illustrating upon a somewhat enlarged scale the means employed for throttling the flow of the fluid as it passes from one point to another under an applied force. Fig. 7 is a sectional view illustrating a modification and shows diagrammatically an application of the invention to a draft-gear and buffing apparatus especially adapted for use on passenger-cars or under conditions where the traction and buffing appliances are separate and distinct from each other.

Similar characters of reference designate corresponding parts in all figures.

In some cases—for instance, in freight-car construction—it is the prevailing practice to utilize the draw-bar as a means for not only applying the traction forces to the car, but also for receiving the buffing stresses, whereas in passenger-car construction, on the contrary, the general practice is to employ separate devices for these purposes. We have therefore illustrated in the drawings attached to the present specification an application of our invention to both purposes, showing in Figs. 1 to 6, inclusive, a construction embodying a combined draft-gear and buffing apparatus for freight-car service, and in Fig. 7 a modified form suitable for use on passenger-cars where the conditions to be fulfilled are as outlined above.

Stated in a general way, the present draft-

gear and buffing apparatus comprises a piston and pressure-cylinder movable with relation to each other under the varying and applied tractive and other forces and serving as the result of such relative motion to displace a liquid from one chamber to another, the resistance to the flow of the liquid being controlled by the relative position of the piston and cylinder.

Referring at first to Figs. 1 to 6, inclusive, the draw-bar 2 is provided with a suitable coupling-head (not shown) and is fitted to move longitudinally within a short range below the center sills 3 of the car in the ordinary manner.

Tractive forces and stresses and forces of buffing applied to the draw-bar 2 are transmitted therefrom to the car-frame through a resistance mechanism embodying our improvement and conveniently supported by frame-pieces 4 4, secured in any proper manner to the sills 3. This mechanism includes a fixed member, which in the construction shown consists of a pressure-cylinder 5, fixedly secured to the frame-pieces 4 4, the latter in this instance being integral with the pressure-cylinder. In the combined form of the device shown in the first six figures this cylinder constitutes an element of both the draft-gear and the buffing apparatus, a diaphragm or transverse wall 6 extending across the cylinder at a point within the bore of the cylinder and dividing the latter into two open-ended cylindrical chambers 7 7, in one of which is adapted to work a piston 8, forming the traction-piston, and in the other a piston 8′, forming the buffing-piston.

The diaphragm 6 constitutes not only a wall for separating one cylindrical chamber from the other, but also performs the further function of a stop or abutment for transmitting the traction and buffing forces to the car-frame and a positive stop for limiting the inward movement of both the traction and the buffing pistons. In the construction shown the piston 8 is provided with a stop-face 8^a, adapted to contact with a projection 8^b of the diaphragm when the traction-piston has moved inward to its greatest extent, and similarly the piston 8′ has a stop-face 8^a, adapted to contact with a projection 8^b on the opposite side of the diaphragm to limit the corresponding movement of the buffing-piston.

In the normal condition of the parts the traction and buffing pistons occupy positions in which each is out of contact with the diaphragm 6, this condition being determined and assured by springs 9 9, inserted between the respective pistons and the adjacent faces of the diaphragm. These springs act not only as a means for returning the pistons to their normal positions upon the release of the traction or the buffing force, but serve to resiliently resist these forces when they are of minor magnitude, the tractive spring being compressed upon the inward movement of the tractive piston and the buffing-spring being likewise compressed upon the similar movement of the buffing-piston.

Both the pistons 8 and 8′ are connected to the draw-bar 2, the construction for this purpose including a yoke or strap 10, extending lengthwise of the pressure-cylinder and fixedly secured at one end to the piston-rod 11 of the traction-piston 8 and at the opposite end to the inner end of the draw-bar, to which is also rigidly affixed the piston-rod 11 of the buffing-piston 8′. This yoke in the form thereof shown extends both above and below the pressure-cylinder, and it is obvious that the construction is such as to cause the pistons to move in unison when either is moved inward, accordingly as the device is called upon to resist tractive or buffing forces.

While, as before stated, the springs 9 9 will suffice to yieldingly resist the minor tractive and buffing forces and return the parts upon their release to their normal positions, those of greater magnitude, calculated to produce injurious shocks and jars, are expended in a device embodying the present invention in forcing a comparatively non-compressible liquid through an orifice the size of which, and consequently the resistance opposing the movement of the piston, varies with the position of the latter. This liquid—such as oil, glycerin, or other liquids appropriate to the conditions under which it will be used—occupies the space between each piston and the diaphragm 6 and being displaced from the space forwardly of the corresponding piston as the result of the forward or inward movement thereof to a receiving-chamber, the resistance to such displacement, however, gradually increasing as the piston advances. Each moving piston therefore serves to throttle the flow of the liquid as it moves inward under the action of the applied force either of traction or buffing, and we find it convenient to cause the flow of the liquid to take place through an opening in the piston, although, of course, other means may be adopted to enable the moving piston to exert a throttling action upon the liquid than that about to be described.

Proceeding to a description of the particular organization herein illustrated, it may be premised that the means combined with one cylinder and to be described is in this instance a duplicate of that combined with the other, and a description of one will suffice for both.

To each end of the pressure-cylinder 5 is attached a head 12, each head being shown as bolted in place and being sectional in form, comprising sections 12^a 12^a to enable them to be readily placed in position, when they may be secured together by bolts 13. Each head is also provided with a stuffing-box 14, through which the piston-rod at that end extends. These heads constitute a convenient means for forming an alternating receiving and supply chamber at each end of the pressure-cylinder, into which the liquid forwardly of the

corresponding piston flows as the latter moves inward and from which it returns upon a reverse movement of the piston. Such flow upon the movement of the piston 8′ takes place through a passage 15 therein and which as the throttling device is herein organized extends substantially parallel with the axis of the cylinder.

Adapted to coöperate with the passage 15 in each piston is a fixed rod 16, secured to the diaphragm 6 and projecting from the adjacent side of the diaphragm in alinement with the piston-passage. The organization is such that as each piston moves inward it will serve to gradually constrict the opening through the passage extending through it. One mode of effecting this result is illustrated, each projecting rod 16 having a tapering slot 17 adjacent to its outer end, which for a portion at least of the piston movement coöperates, as aforesaid, with the passage therein. As shown, each slot 17 has a portion 17′ of uniform depth at that end of the slot adjacent to the extremity of the rod in which it is formed, thus permitting the free flow of the liquid during the first portion of the piston movement.

Assume, for instance, that the piston at the right (the tractive piston in Fig. 1) moves inward as the result of a more or less sudden access of tractive force. Liquid in the space forwardly of that piston is forced into the chamber at the rear therof, the resistance to such flow, and hence to the inward movement of the piston, increasing with the continued movement of the latter. By reason of the fact that the chamber at the rear of each piston is in part occupied by the piston-rod at that end of the device the motion of the piston inward tends to cause a change in the level of the liquid in such chamber. Moreover, it is obvious that as one piston moves inward the other piston simultaneously moves outward and draws liquid from the chamber at the rear of the latter piston into the space forward of this piston, thus reversing the conditions prevailing at the opposite end of the pressure-cylinder. In order to equalize the flow into and from the chambers at the rear sides of the pistons, we preferably employ an equalizing-pipe 18, which serves to place such chambers in communication one with the other. This pipe is also shown provided with an upright pipe 18′, which may lead to a reservoir, (not shown,) through which liquid may be introduced for filling the chambers, &c., and serving also to accommodate any slight fluctuation in the level of the liquid which may occur.

Referring to the modified form set forth in Fig. 7, this, as before stated, is adapted to cases in which the tractive and buffing forces and stresses are applied through independent members—such, for instance, as ordinarily employed at the present day in passenger-car construction. In this construction the draft-gear and buffing apparatus are separated from each other, and as the construction is analogous to that already described and as the corresponding parts of the two forms of the device are designated by like characters to those used in Figs. 1 to 6 no further description is deemed necessary for a full understanding thereof, it being sufficient to state that R is the reservoir, already adverted to, while the equalizer-pipe 18 of the first six figures is in Fig. 7 replaced by upright pipes 18^2 and 18^3, placing the respective pressure-cylinders in communication with the said reservoir.

It will be noticed that although in both constructions the various forces and stresses are transmitted through members which pass through stuffing-boxes, yet the organization is such as to exempt these stuffing-boxes from a tendency to leak, since the only pressure on the liquid in contact with the stuffing-boxes is that due to the vertical height of the liquid above the boxes and the atmospheric pressure on such liquid.

Having described our invention, we claim—

1. The combination with a pressure-cylinder and a piston movable relatively one to the other, said piston having an opening for the passage of a liquid from one side of the piston to the other, of a spring for resisting such relative movement and means for decreasing the size of the opening in the piston in proportion as the displacement of the members from their normal position and the resistance of said spring increases.

2. The combination with a pressure-cylinder and a piston movable relatively one to the other, said piston having an opening for the passage of a liquid from one side of the piston to the other, of a piston-rod extending from the piston rearward thereof, a stuffing-box encircling said piston-rod, a spring for resisting the relative movement of said piston and cylinder, and means for decreasing the size of the opening in the piston in proportion as the relative displacement of the members and of the resistance of the spring increases to thereby throttle to an increasing extent the passage of the liquid from the space forward of the piston through said opening into the space rearward thereof.

3. The combination with a pressure-cylinder and a piston movable relatively one to the other, said piston having an opening for the passage of a liquid from one side of the piston to the other, of a piston-rod extending from the piston rearward thereof, a stuffing-box encircling said piston-rod, a spring for resisting the relative movement of said piston and cylinder, and a rod adapted to cooperate with said opening to decrease the flow therethrough from the forward side of the piston to the side on which said stuffing-box is located in proportion as the relative displacement of the piston and cylinder increases.

4. The combination with a pressure-cylinder and a piston movable relatively one to

the other, said piston having an opening for the passage of a liquid from one side of the piston to the other, of a piston-rod having a tapering cross-section and extending from the piston rearward thereof, a stuffing-box encircling said piston-rod, a spring for resisting the relative movement of said piston and cylinder, and a rod adapted to coöperate with said opening to decrease the flow therethrough from the forward side of the piston to the side on which said stuffing-box is located in proportion as the relative displacement of the piston and cylinder increases.

5. The combination with a pressure-cylinder and a piston movable relatively one to the other, said piston having an opening for the passage of a liquid from one side of the piston to the other, of a piston-rod having a tapering cross-section and extending from the piston rearward thereof, a stuffing-box encircling said piston-rod, a spring interposed between the forward side of said piston and the opposite end wall of said cylinder, and a rod adapted to coöperate with said opening to decrease the flow therethrough from the forward side of the piston to the side on which said stuffing-box is located in proportion as the relative displacement of the piston and cylinder increases.

6. In an apparatus of the character described, the combination with a draw-bar, of a piston having an opening for the passage of a liquid, a pressure-cylinder, a piston-rod to which the draw-bar is secured, a stuffing-box through which the piston-rod extends, and a rod disposed in line with said opening and having a tapering cross-section.

7. In an apparatus of the character described, the combination with a draw-bar of a piston having an opening for the passage of a liquid, a pressure-cylinder, a piston-rod to which the draw-bar is secured, a chamber, a stuffing-box in the wall of the chamber through which said piston-rod extends, a conduit communicating with this chamber, and a rod disposed in line with said opening and having a tapering cross-section.

8. In an apparatus of the character described, the combination with a draw-bar, of a pressure-cylinder, a cross-wall therein, pistons located upon opposite sides of said cross-wall, and having openings for the passage of a liquid, piston-rods extending from the pistons, chambers at each end of said cylinder, stuffing-boxes in the walls of said chambers through which said piston-rods extend, means connecting said piston-rods with the draw-bar, a rod disposed in line with each opening and each having a tapering cross-section and a conduit placing said chambers in communication.

9. In an apparatus of the character described, the combination with a draw-bar, of a pressure-cylinder, a cross-wall therein, pistons located upon opposite sides of said cross-wall, and each having an opening for the passage of a liquid, springs interposed between said cross-wall and said pistons, piston-rods extending from the pistons, a chamber at each end of said cylinder, stuffing-boxes in the walls of said chambers through which said piston-rods extend, means connecting said piston-rods with the draw-bar, a rod disposed in line with each opening and each having a tapering cross-section, and a conduit placing said chambers in communication.

10. In an apparatus of the character described, the combination with a draw-bar, of a pressure-cylinder, a cross-wall therein, pistons located upon opposite sides of said cross-wall and each having an opening for the passage of a liquid, springs interposed between said cross-wall and said pistons, piston-rods extending from the pistons, stops for limiting the movements of the pistons, a chamber at each end of said cylinder, stuffing-boxes in the walls of said chambers through which said piston-rods extend, means connecting said piston-rods with the draw-bar, a rod disposed in line with each opening and each having a tapering cross-section and a conduit placing said chambers in communication.

In testimony whereof we have hereunto signed our names in the presence of two subscribing witnesses.

JOSEPH F. RADERS.
HUGH D. MEIER.

Witnesses:
DAVID CORBIN,
IRVING CORBIN.