No. 770,537. PATENTED SEPT. 20, 1904.

J. F. RADERS.

CUSHIONING DRAFT GEAR.

APPLICATION FILED JAN. 19, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

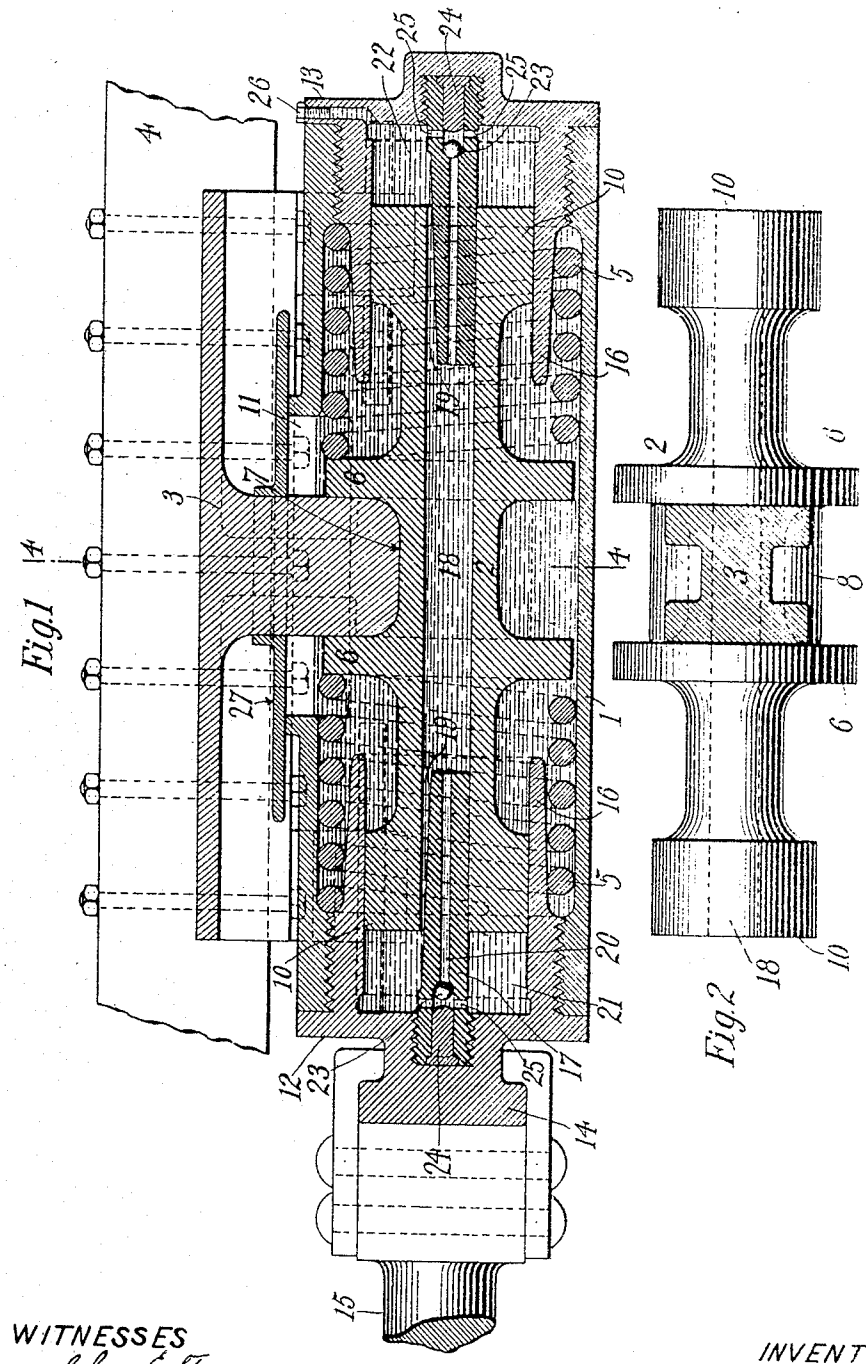

Fig. 1

Fig. 2

WITNESSES

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Fig. 3

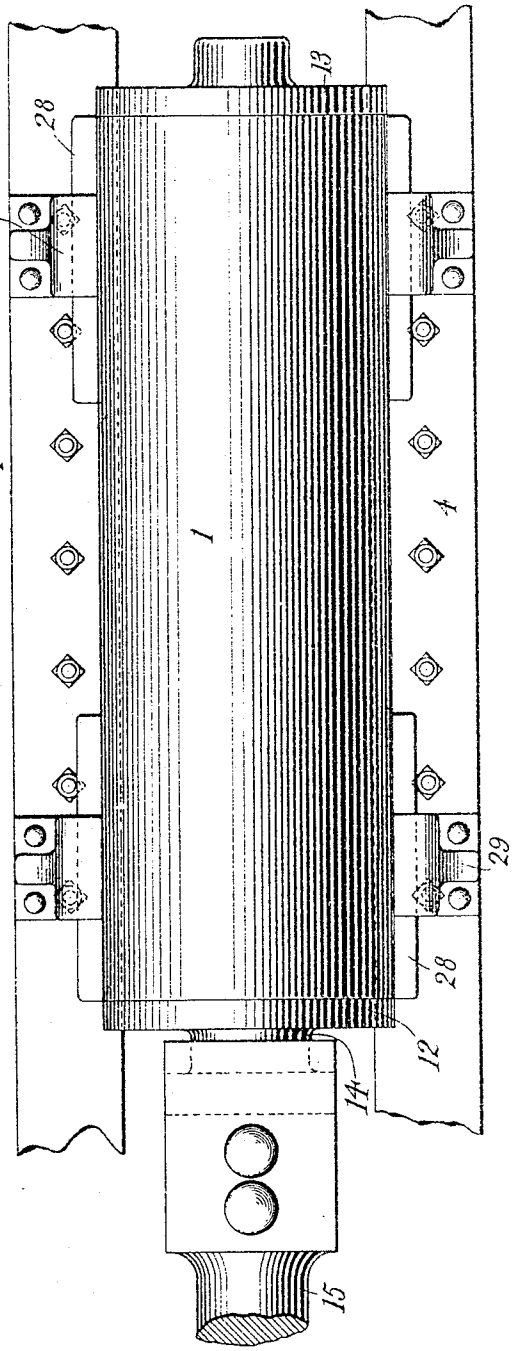

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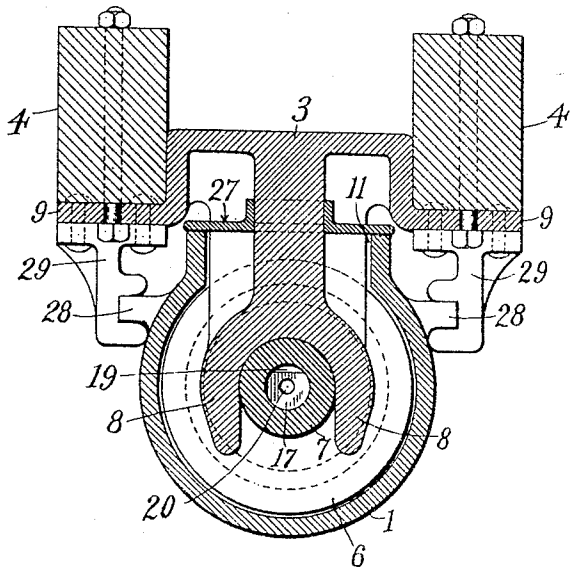
Fig. 4



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UNITED STATES PATENT OFFICE.

JOSEPH F. RADERS, OF NEW YORK, N. Y., ASSIGNOR TO ANTHONY GREF, OF NEW YORK, N. Y.

CUSHIONING DRAFT-GEAR.

SPECIFICATION forming part of Letters Patent No. 770,537, dated September 20, 1904.

Application filed January 19, 1903. Serial No. 139,718. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH F. RADERS, of 94 West One Hundred and Fourth street, borough of Manhattan, county and State of New York, have invented a new and useful Improvement in Cushioning Draft-Gear, of which the following is a specification.

The present invention relates to cushioning draft-gear designed for railroad-cars, and particularly it relates to devices whereby the initial force of both the buffing and draft strains incident to the operation of railroad-cars are absorbed in the work of displacing a liquid.

My invention is intended to provide a practicable and efficient device of this character which shall be so constructed that two liquid-containing compartments respectively cushioning strains in opposite directions are always provided with cushioning liquid. By this I mean that it will be practically impossible to create a vacuum in either of the cushioning-compartments. This result is attained by constructing the two liquid-containing compartments in such manner that they are in direct communication with each other and without any intermediate reservoir.

Another object of my invention is to provide a construction in which the resistance or obstruction to the buffing and draft strains converted into displacement of the cushioning liquid is of minimum force at the commencement or first application of such strains and increases to maximum as the limit of movement through which the cushioning of the strain takes place is reached. This object is attained by constructing my device with a stationary and a movable member and providing two liquid-containing compartments, one at each end and between the opposed faces of the stationary and movable members, these two compartments connecting with each other and constituting, with their connecting passages and channel, a chamber or confined space shut off from outside communication. It follows from this construction that the decrease in size of either one of the two compartments due to the movement of the movable member effects the discharge of the liquid from said compartment and causes its direct transference to the other compartment.

Besides the foregoing there are other important improvements in the construction, which will be apparent in the detailed description which follows.

In the drawings I have illustrated a construction embodying my invention, although it will be understood that I do not limit myself to the precise form illustrated.

In the said drawings, Figure 1 is a view in central longitudinal section. Fig. 2 is a top plan view of the piston, showing the car-abutment in horizontal section. Fig. 3 is a bottom plan view. Fig. 4 is a vertical section along line of 4 4 in Fig. 1.

Like numerals of reference refer to like parts throughout the several views of the drawings.

Referring now to the construction in detail, 1 designates the movable member of my device, which is here illustrated as in the form of a cylinder.

2 is the stationary member or piston, and 3 designates the device or abutment against which said piston abuts to transmit buffing and draft strains to the body of the car, to the longitudinal sills 4 of which said abutment 3 is secured. The piston 2 is normally positioned centrally of the cylinder and is maintained in its normal position when idle by means of the springs 5, which extend between the flanges 6 of the piston and the respective ends of the cylinder. Between the flanges 6 the piston 2 is formed with a neck 7, which is embraced by the yoke 8 of the downwardly-depending portion of the abutment 3. The side faces of the yoke 8 are preferably made to come in contact with the inner faces of the flanges 6, so as to fill the space between them. Any suitable form may be given to the frame of which the abutment 3 forms a part, the construction shown in the drawings being provided with two lateral flanges 9, which are bolted to the sills 4. At each of its ends the piston 2 is provided with

a head 10, each of which heads works in a contracted portion of the cylinder 1, as hereinafter more fully referred to.

Referring now to the movable member 1, this is preferably made as illustrated in the drawings, in which it is in the form of a cylinder having an opening 11 on its upper surface, which opening is provided in order to permit the movement of the cylinder relatively to the piston 2 and abutment 3. Preferably the cylinder will be constructed with open ends closed by the heads 12 and 13, the head 12 having a neck 14, suitably constructed to be engaged by the draw-bar 15. These heads may be secured in the body of the cylinder in any manner; but I prefer to provide them with threads and screw them to position, as illustrated in the drawings. These heads both have an open-ended cylinder 16, formed integral therewith and projecting toward the center of the cylinder 1, in each of which cylinders 16 works one of the heads 10 of the piston 2. Of course the cylinders 16 may be made integral with the heads 12 and 13, as illustrated in the drawings, or may be made separate therefrom and secured in any suitable manner. As illustrated in the drawings, however, where they are formed integral with the heads 12 and 13, they are easy of manufacture and lend themselves to one object of the invention—namely, the provision of a device of the character here referred to which shall be liquid-tight and yet require no stuffing-boxes. Projecting centrally from the heads 12 and 13 are provided stems 17. These stems are of cylindrical form and extend a suitable distance into the channel 18, which passes entirely through the piston 2. Said stems are each provided with a graduated discharge-passage 19 and a valved inlet-passage 20, connecting between the channel 18 and one of said cushioning-compartments. There are of course two cushioning-compartments in order to cushion shocks or strains in opposite directions, these compartments being designated in the drawings by the numerals 21 and 22. It will be seen that the compartment 22 cushions the strains in the direction of the arrow, Fig. 1, while the compartment 21 cushions the strains of opposite direction. The operation of these compartments in actual use is as follows: It is to be understood that the compartments 21 and 22, the channel 18 and the passages 19 and 20 are filled with a suitable liquid and constitute together a closed chamber without any exterior communication, the piston-heads 10 of the piston 2 having a tight sliding fit in the cylinders 16. Now assuming a shock or strain to be applied in the direction of the arrow in Fig. 1 to the movable member 1, this will operate to diminish the size of the compartment 22, causing the discharge of the liquid therefrom through its graduated discharge-passage 19 into the channel 18, and the compartment 21, which is correspondingly increased in size as the compartment 22 is diminished in size, will take up liquid from the channel 18 through both the valved inlet-passage 20 and the graduated discharge-passage 19 in like amount and simultaneously with the discharge of the liquid from the compartment 22. It will be seen that during this operation the liquid from compartment 22 is discharged only through its graduated discharge-passage 19 (the ball-valve closing passage 20) and that the exit resistance of the liquid is increased by the decrease in size of the discharge-opening as the discharge progresses. It will be also apparent that the take-up of the liquid in compartment 21 is practically without resistance, for the reason that the inlet-passage 20 is of ample capacity. Of course some liquid may also pass through the discharge-passage connecting compartment 21 with channel 18; but this will be negligible, as the main flow will be through the passage of least resistance. Of course even if the compartments 21 and 22 were not provided with inlet-passages and were only provided each with a discharge-passage the liquid discharged from one compartment in the operation of the device would be taken up in like amount in the other compartment, so that both compartments would always be filled and always provided with cushioning fluid, which would not be the case if the liquid from one compartment were discharged into an intermediate reservoir and taken up in the other compartment from such reservoir. Without the valved inlet-passages, however, the resistance to movement of the movable member would be controlled both by the exit resistance of the liquid from one chamber and the inlet resistance of the other chamber. By the present construction, however, each of the two compartments respectively cushions shocks or strains in one direction only and acts as a reservoir or overflow for the other compartment when the shock or strain is in the opposite direction. From the foregoing it results that as the discharge of the liquid from either of said compartments takes place through the gradually-contracted passage 19 and the other compartment freely and simultaneously takes up the expelled liquid the cushioning resistance is gradually increased as the shock is absorbed, and the device is always in condition to immediately cushion strains, even though they follow each other in quick succession and are successively of opposite direction.

Of course some clearance is required between the piston-head and the inner walls of the cylinder 16, and some liquid may possibly be forced through between these surfaces. To provide for this, I fill the entire space in the cylinder 1 and outside of the piston 2 with liquid, so that if any slight leakage should occur from the cushioning of excessive shocks a partial vacuum will of course result inside

the closed chamber consisting of the compartments 21 and 22 and the channel 18, which vacuum would be destroyed and the closed chamber filled with liquid by the atmospheric pressure on the liquid contained in the cylinder 1 outside of the piston 2 when the parts are entirely or substantially stationary.

Recurring now to the construction of the stems 17, it will be understood that they are threaded at the base, as illustrated in the drawings, so as to be screwed into recesses formed in the heads 12 and 13, respectively, the central inlet-passages 20 being provided at their outer ends with a valve-seat and a ball 23. This ball is inserted through an opening drilled in the base of the stem, which is closed by the plug 24, a number of radiating ports 25 being bored through the side walls of the stems 17, communicating between the inlet-passages 20 and the compartments 21 and 22, respectively. For the purpose of filling the closed chamber, which, as before stated, consists of the compartments 21 22 and the channel 18, with the appertaining passages, I provide an opening in one of the heads, as 13, which may be closed by a set-screw 26.

To close the opening 11 in the cylinder 1, I provide a cover 27 of any suitable construction, fitting around the abutment 3, so as to exclude dirt, &c., this cover being of such length as to cover the opening throughout the movements of the cylinder 1.

Referring to Figs. 3 and 4, it will be seen that the cylinder 1 is provided with two pairs of lugs 28, one pair located at the forward end and the other at the rear end of the cylinder, which lugs work in corresponding guide-pieces 29, secured to the lateral flanges 9. The length of these lugs and their corresponding guides is such as to support the weight of the cylinder throughout the entire range of its longitudinal movement when in operation.

It will of course be obvious that whenever the device is relieved from strain, whether buffing or tension strain, the equalizing-springs 5 will bring the movable and stationary members to normal position relatively central of each other, so that the device is ready to cushion either a buffing or draft strain or shock.

What is claimed as new is—

1. The combination of a double-ended fixed piston, compartments in which the ends of the piston fit, a constricted passage between said compartments, said compartments and passage being filled with liquid which is sealed in, and returning-springs bearing against the piston.

2. The combination of a double-ended piston having a longitudinal bore, compartments in which the ends of the piston fit, opposite studs fixed in the compartments and fitting within said bore, each stud being provided with a constricted passage, and liquid in said compartments.

3. The combination of a double-ended piston having a longitudinal bore, compartments in which the ends of the piston fit, opposite studs supported in the compartments and fitting within said bore, each stud having a constricted passage which is tapering in form, liquid filling said compartments and springs bearing against said piston for restoring its normal position in the compartments.

4. The combination of a double-ended piston provided with a longitudinal bore, fluid-containing compartments in which the ends of the piston fit, and studs supported in the compartments and projecting within the bore so as to constrict the passage for fluid therethrough; said studs being of sufficient length to remain within said bore during substantially the entire relative movement of compartment and piston in either direction.

5. The combination of a double-ended piston provided with a longitudinal bore, fluid-containing compartments in which the ends of the piston fit, and fixed obstructing means within the bore and substantially fitting the same for preventing free movement of liquid therethrough, a tapering passage being formed at each end of the piston between one of said piston and obstruction elements.

6. The combination of a double-ended piston provided with a longitudinal bore, fluid-containing compartments in which the ends of the piston fit, and studs supported in the compartments and projecting within the bore; each stud having a part tapering from its inner end outwardly, and being of sufficient length to remain within the bore during substantially the entire relative movement of compartment and piston.

7. The combination of a double-ended piston provided with a longitudinal bore, fluid-containing compartments in which the ends of the piston fit, and studs supported in the compartments and projecting within the bore; each stud coöperating with said bore to form a restricted passage for the liquid, and each stud also having a valved inlet to its compartment.

8. The combination of a double-ended piston, fluid-containing compartments in which the ends of the piston fit, said piston being provided with a pair of flanges between said compartments, and also having a constricted longitudinal passage communicating with said compartments, and a piston-controlling yoke confined between said flanges.

9. The combination of a double-ended piston, fluid-containing compartments in which the ends of the piston fit, and springs working between said piston and said compartments for restoring their normal relation after actuation; said piston having therein a restricted passage connecting both of said compartments.

10. The combination of a double-ended piston, compartments in which the ends of the piston fit, a constricted passage in said piston

connecting said compartments, liquid sealed in said compartments, a casing in which said compartments are inclosed, and liquid in said casing in which said piston is immersed.

11. The combination of a piston, opposite compartments in which said piston fits, said piston having a portion outside of said compartments, a casing in which said outside portion is confined, liquid in said casing immersing said outside portion, a constricted passage between said compartments, and liquid sealed in said compartments and passage.

12. The combination of a double-ended piston, separated compartments in which the ends of said piston fit, a constricted passage being provided between said compartments, springs working between said piston and said compartments to restore their normal relation after actuation in either direction, a casing inclosing the portion of the piston between said compartments, liquid in said casing immersing said portion of the piston, and piston-controlling means extending into the casing and engaging said piston between its ends.

13. The combination of a double-ended piston, a pair of liquid-filled cylinders in which the ends of said piston fit, said piston being provided with a bore communicating with said cylinders, studs supported in the cylinders and projecting within the bore and constricting the same, a casing in whose ends said cylinders are secured, liquid in said casing immersing said piston, a pair of flanges provided upon said piston between said cylinders, springs coiled around said cylinders within said casing and bearing against said flanges, and a yoke confined between said flanges for controlling said piston.

14. The combination of a casing of cylindrical form, a pair of cylinders screwed into the ends of said casing and closing the same and each having an integral head, central studs projecting inwardly from said heads, a double-ended piston fitting in said cylinders and having a central bore into which said studs project, said bore and studs forming a constricted passage between the cylinders, flanges upon said piston between said cylinders, springs bearing upon said flanges, a piston-controlling yoke extending through said casing and confined between said flanges, liquid filling said cylinders, and liquid in said casing immersing said piston.

15. The combination of a double-ended piston, compartments in which the ends of the piston fit, a constricted passage being provided between said compartments, liquid sealed in said compartments, a casing inclosing the portion of the piston between said compartments, liquid in said casing immersing the piston, said casing being provided with a top opening, a cover closing said opening, and a piston-controlling device extending down through said cover and engaging the piston between its ends.

16. The combination of a double-ended piston, a frame formed for attachment directly to a car-body and having a part engaging said piston between its ends, a casing having opposite compartments in which the piston ends fit, said compartments containing liquid, and said casing also containing liquid immersing said piston, and a constricted passage being provided longitudinally through said piston between said compartments, supports upon said frame whereon said casing may slide, and means upon said casing for attachment to a draw-bar.

17. A cushioning draft-gear comprising a stationary member, a movable member, a sealed liquid-filled chamber comprising two compartments and a constricted passage between them, and means for causing the liquid to be discharged through the constricted passage from one compartment to the other.

18. A cushioning draft-gear comprising a stationary member, a movable member, a sealed liquid-filled chamber comprising two communicating compartments, and means for causing the liquid to be discharged from one compartment to the other with gradually-increasing resistance during the full stroke of said movable member.

19. A cushioning draft-gear comprising a stationary member, a movable member, a sealed liquid-filled chamber comprising two communicating compartments, means for causing the liquid to be discharged from one compartment to the other with gradually-increasing resistance during the stroke of said movable member, and springs for returning said movable member to normal position after actuation in either direction.

20. A cushioning draft-gear comprising a stationary member, a movable member, one of said members having fluid-filled compartments, and the other having a passage between said compartments, and means coöperating with the member having said passage for offering gradually-increasing resistance to the movement of the liquid through said passage throughout substantially the entire stroke of the movable member.

21. A cushioning draft-gear comprising a movable member and a stationary member, one of said members having fluid-filled compartments, and one of said members being confined within the other and being stationary and having therethrough a constricted closed passage connecting said compartments.

22. A cushioning draft-gear comprising a movable member having compartments and a stationary member having portions fitting in said compartments and a constricted closed passage extending from one of said compartments to the other.

23. A cushioning draft-gear comprising a movable member, a stationary member, one of said members having fluid-filled compartments, and one of said members being con-

fined within the other and being stationary and having a constricted closed passage extending from one of said compartments to the other, and springs for returning said movable member in either direction to normal position after actuation.

24. A cushioning draft-gear comprising a stationary and a movable member, two liquid-containing compartments respectively cushioning strains of opposite direction, said compartments being in direct communication with each other and each provided with an inlet-passage and a graduated discharge-passage.

25. A cushioning draft-gear comprising a stationary and a movable member, two liquid-containing compartments respectively cushioning strains of opposite direction, a closed channel directly communicating said compartments, an inlet-passage and a graduated discharge-passage for each of said compartments, said passages communicating between said channel and their respective compartments.

26. A cushioning draft-gear comprising a stationary and a movable member, two liquid-containing compartments respectively cushioning strains of opposite direction, a closed channel directly communicating said compartments, and an outlet and inlet passage between each of said compartments and said channel.

27. A cushioning draft-gear comprising a stationary and a movable member, a closed liquid-containing chamber divided into two compartments, said compartments respectively cushioning strains of opposite direction, a channel through one of said members communicating said compartments, a graduated discharge-passage and a valved inlet passage communicating between each of said compartments and said channel.

28. A cushioning draft-gear comprising a stationary and a movable member, means for normally maintaining said members in central coincidence, a closed liquid-containing chamber divided into two compartments, said compartments respectively cushioning strains of opposite direction, a channel through one of said members communicating said compartments, a graduated discharge-passage and a valved inlet-passage communicating between each of said compartments and said channel.

29. A cushioning draft-gear comprising a stationary piston having a channel passing through it, a movable cylinder, a closed liquid-containing chamber divided into two compartments, a stem projecting from each end of said cylinder into said channel, and a valved passage through each of said stems communicating between said channel and the respective compartments.

30. A cushioning draft-gear comprising a stationary piston having a channel passing through it, an abutment secured to the car and engaging said piston, a movable cylinder, a closed liquid-containing chamber divided into two compartments, one located at each end of said piston and between the opposed walls of the piston and cylinder, said compartments cushioning strains of opposite direction and being in communication with each other through said channel, a stem projecting from each end of said cylinder and extending into the channel of the piston, each of said stems being provided with a valved inlet-passage and a graduated discharge-passage communicating between said channel and one of said compartments, and means for normally maintaining the piston and cylinder in central coincidence.

31. A cushioning draft-gear comprising a frame secured to the car, an abutment connected to said frame, a piston separate from said abutment and in engagement therewith, and a movable cylinder.

32. A cushioning draft-gear comprising a fluid-filled movable member, a stationary member operating to control the movement of the movable member by means of a graduated throttling device penetrating the stationary member throughout the relative movement of the parts.

33. A cushioning draft-gear comprising a fluid-filled movable member and a stationary member and a leakage-reservoir intermediate of the operative ends thereof.

34. A cushioning draft-gear comprising elements movable relatively to each other between cushioning liquid *in vacuo* and a liquid under atmospheric pressure.

In witness whereof I have hereunto set my hand this 13th day of January, 1903.

JOSEPH F. RADERS.

Witnesses:

ERNEST HOPKINSON,

F. C. DORÉ.