

Jan. 18, 1927.

W. H. COTTON

1,614,657

DRAFT GEAR

Filed Jan. 28, 1924

2 Sheets-Sheet 1

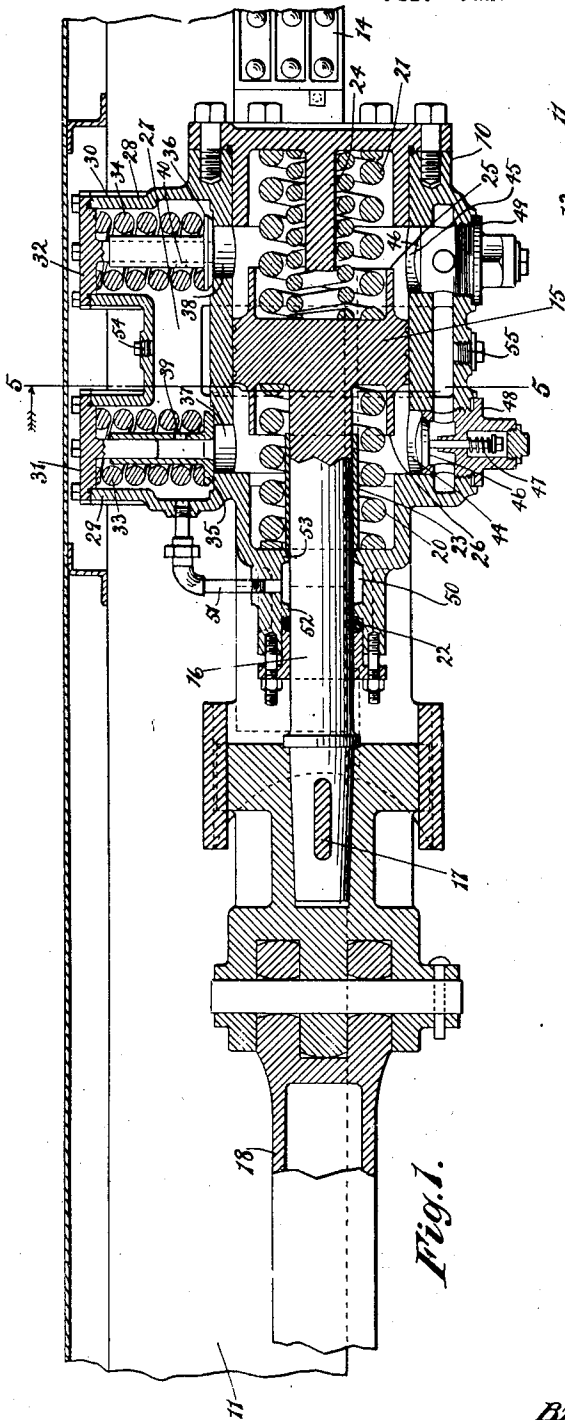


Fig. 1.

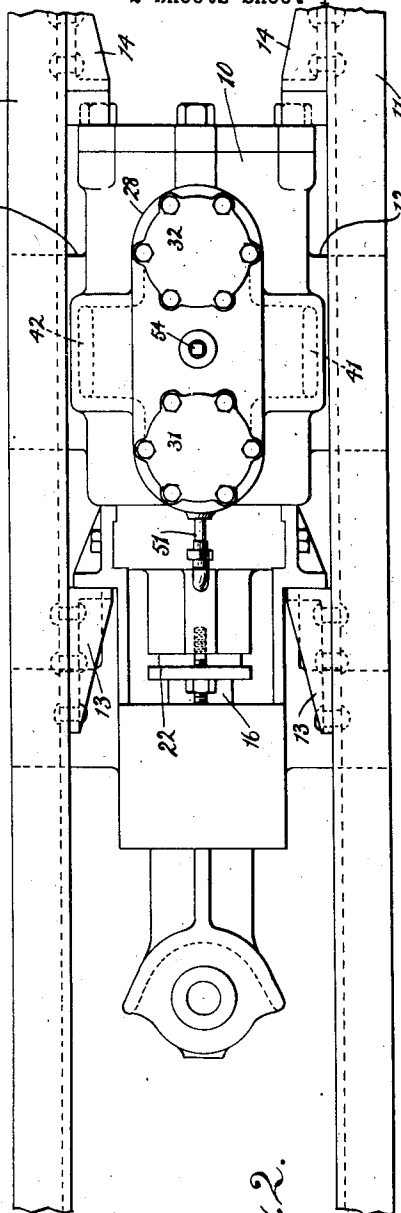


Fig. 2.

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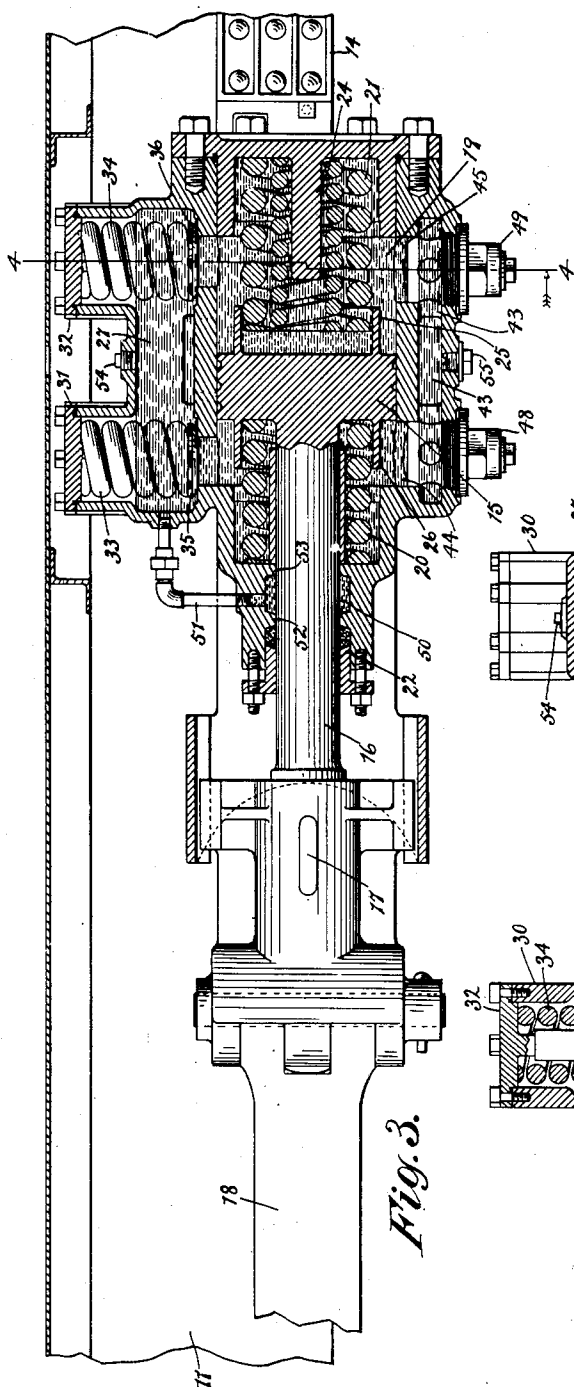


Fig. 3.

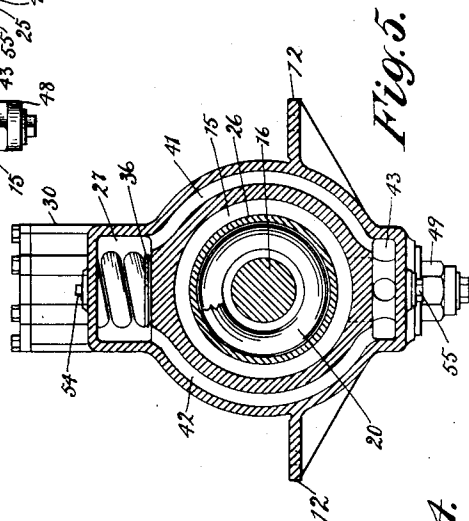


Fig. 4.

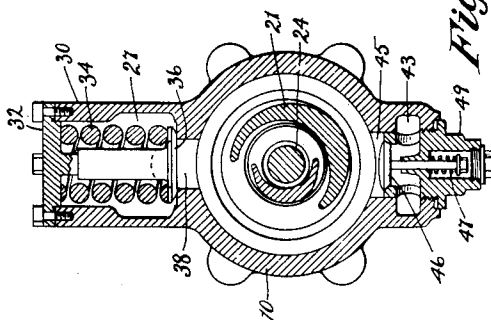


Fig. 5.

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UNITED STATES PATENT OFFICE.

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DRAFT GEAR.

Application filed January 28, 1924. Serial No. 689,042.

The invention relates to draft gear for railway cars, and is particularly adapted for use in passenger service. The gear is of the so-called hydraulic type, in which a liquid, preferably an oil, constitutes in part the shock-absorbing agent.

While it has been possible to design draft gears of the metallic friction type of very high capacity for absorbing shocks, the parts of such gears are not always in the proper relative position to perform work. As a consequence, in passenger service, great annoyance and discomfort of the occupants of a train is occasioned by the sudden application of high power, as in an effort to set a heavy train in motion, and by a sudden checking of the movement of the train, as by an emergency application of the brakes or in coupling operations.

In many types of gears the recoil is sufficiently abrupt to cause annoyance and discomfort, and this trouble is accentuated when the movement of the train is suddenly arrested while the gear is under compression, as the arresting force meets with no resistance in the gear until the recoil has taken place.

The objects of the present invention are to effectively overcome these disadvantages in existing practice by securing a smoothness of action, the prevention of abrupt and sudden movement of parts of the gear, and the arresting of sudden shocks in whatever position the parts of the gear may be at the time of their application.

A further object is to provide for a cushioning of the gear as it approaches the limits of its compression, and a still further object is to reduce to a minimum the leakage of liquid in a hydraulic gear.

These various objects are secured by a construction such as is hereinafter described, and as illustrated in the accompanying drawings, in which—

Fig. 1 is a vertical central longitudinal section of the gear, details of associated parts of the car being shown partly in elevation and partly in section;

Fig. 2 is a plan view of the gear with details of associated parts;

Fig. 3 is a view similar to Fig. 1, the parts being shown in different positions;

Fig. 4 is a sectional view on the line 4—4 of Fig. 3; and

Fig. 5 is a sectional view on the line 5—5 of Fig. 1.

The gear comprises a cylinder 10, which is adapted to be secured directly to a pair of draft sills 11, 11, the cylinder being provided with a pair of lateral attaching plates 12, 12, which may fit against and be bolted to flanges of the sills. The cylinder is located between, and constantly bears against, a pair of draft lugs 13, 13, and a pair of buffing lugs 14, 14, which are fixed to the draft sills.

Within the cylinder 10 there reciprocates a piston 15, the stem 16 of which projects forwardly and is attached, as by means of a key 17, to an element of a coupler 18. The coupler may be of any preferred form of construction, and the particular manner of attaching the piston stem to it is not the essence of the invention.

The cylinder 10 is filled with a liquid, indicated at 19, which is caused to shift from one end of the cylinder to the other by suitable by-passes, by the movement of the piston, under the influence of draft or buffing stresses transmitted to it through the coupler. The liquid used is preferably an oil which is but slightly changed in its consistency by variations in temperature.

Springs are employed for resisting the movement of the gear in either direction from normal or central position, and for restoring the parts to such position when the forces to be resisted have ceased to act. As shown, and, so far as now advised, preferably these springs 20, 21, are inclosed within the cylinder, are helical in form, and react between the opposite faces of the piston 15 and the ends of the cylinder. The forward spring, 20, encircles the stem 16 of the piston, and preferably the latter is encased in a loose sleeve 23 for preventing abrasion of the stem 16. The rear spring, 21, here shown as a pair of nested springs, is held in place by a central finger 24, which may be cast integrally with the cylinder end. The inner ends of the springs are inclosed within cup-shaped flanges 25, 26, formed on the two faces of the piston 15.

A conserving or displacement chamber 27 is provided within an upwardly projecting extension or casing 28, which may be cast integrally with the cylinder 10, as shown, and this casing in turn is provided with up-

ward extensions 29, 30, the tops of which are closed by caps 31, 32. These caps constitute seats for springs 33, 34, which react upon and resist the opening of a pair of valves 35, 36, controlling a pair of ports 37, 38, of comparatively large size, in the cylinder wall, and located, respectively, adjacent its ends.

A pair of smaller ports 39, 40, are located, respectively, on opposite sides of the normal or central position of the piston 15, and open to the displacement chamber 27. These ports may be positioned in any convenient location, and are shown as opening through the walls of the hollow stems of the valves 35, 36. The ports 39, 40, provide the initial path of transfer of the liquid from end to end of the cylinder. Under the influence of severe stresses one of the valves 35, 36, will be displaced.

Ducts 41, 42, lead from the chamber 27 around the cylinder walls to a passage 43, cored in the lower wall of the cylinder and leading to a pair of ports 44, 45, which open to the cylinder chamber adjacent its opposite ends, these ports being controlled by a pair of inwardly opening valves 46, 46, which are held to their seats by light springs, as 47, the free inflow of liquid back of the advancing piston being thus provided for. The valves 46, 46, are carried by casings 48, 49, which may be screwed into suitable openings in the cylinder wall.

The piston stem 16 plays through a stuffing box 22, which prevents the leakage of liquid from the cylinder. It has been found in practice that in devices of this general character it is impossible to entirely prevent leakage by means of a stuffing box, and in this instance such a device is supplemented by a receiving chamber 50 at the inner end of the box, from which chamber leads a duct 51 to the conserving chamber 27. At each side of the chamber 50 the extended neck of the cylinder, which constitutes a part of the stuffing box 22, is provided with an annular rib 52, 53, which makes a close but easy fit upon the stem 16. While the forward movement of the piston 15 will cause the escape of a small portion of the liquid content of the cylinder into the chamber 50, such liquid is free to pass into the chamber 27, within which there is at no time any appreciable development of pressure, and, consequently, the stuffing box 22 is not required to resist any serious fluid pressure.

While, in the form of construction shown, the duct or pipe 51 provides adequate escape for the liquid from the chamber 50, the relief duct from this chamber may be formed in or through any of the parts of the device, whether movable or stationary, providing it will deliver directly or eventually to either side of the piston.

It is unnecessary to provide the piston 15 with packing or sealing rings. The piston may make merely a close fit with the cylinder, and inasmuch as the action of the device is dependent upon the transfer of liquid from end to end of the cylinder, it is quite permissible that this transfer may be provided for in part by leakage past the piston.

Inasmuch as the piston rod 16 is necessarily of considerable diameter, in order to provide adequate strength, it has the effect of reducing the area of the front face of the piston. The piston being thus of the differential type, the displacement of liquid on its forward or outstroke is less than on its backward or instroke. On the outstroke, therefore, no more liquid is drawn from the displacement chamber 27 through the port 45 than is delivered to it through the ports 37 or 39, while on the instroke there is less liquid delivered through the port 44 than is forced into the chamber 27 through the ports 38 or 40. For this reason it is important that in supplying the device with oil it should not entirely fill the displacement chamber, and in practice the normal level of the liquid should be approximately as shown in Fig. 3. A filling opening is provided in the top wall of the casing 28, and is shown as normally closed by means of a plug 54. A drain opening is provided in the bottom wall of the cylinder, communicating with the passage 43, and is normally closed by means of a screw plug 55.

Inasmuch as no dependence is placed upon the compression of air within the displacement chamber, the two upward extensions 29, 30, may, if desired, be merged together. In any event, however, it is desirable that the filling opening be so located as to prevent filling beyond a suitable level.

The normal or constant pull of the engine is resisted by the spring 20, which should exceed in capacity the normal tractive effort of the locomotive.

In Fig. 3 the piston is shown in the position it occupies when the train is being drawn forward at approximately uniform speed. Should any sudden shock occur tending either to accelerate or check the train movement, one of the valves 35, 36, will be opened to an extent corresponding to the intensity of the shock, which will be absorbed by the combined resistance of the piston spring which is compressed, the spring of the unseated valve, and the movement of the fluid through the opened port and to the opposite end of the cylinder. Any severe shocks, occurring at whatever status of the train, are taken care of in like manner.

When the car is standing the piston 15 will assume the central position, as shown in Fig. 1. As the car is drawn forward the

piston will advance slowly against the resistance of the spring 20 and hydraulic resistance. Upon the cessation of the application of force tending to move the piston in either direction, it is slowly returned to or toward central position by the action of the spring. There is no sudden recoil of the gear, as the return action is retarded by the liquid.

As the resisting action is equally effective whatever may be the position of the piston at the time the shock occurs, it follows that should there be a quick succession of shocks, due to variations in pull or buff or the sudden reversal of the engine, before the springs could restore the piston to central position, they will be resisted and absorbed by the liquid as effectively as if complete restoration had occurred.

The flanges 25, 26, are of such length and diameter that they enter and make a sufficiently close fit with the reduced diameter of the ends of the cylinder to serve as limiting stops by trapping the liquid within the cylinder end, thus defining the range of movement of the piston, or at least preventing violent contact of the piston with a positive stop.

While an efficient and, so far as I am advised, a preferred form of construction, is disclosed, various changes in the form and arrangement of the parts may be made within the scope of the invention. For example, while the ports 39, 40, are shown as communicating with the displacement chamber, this is for simplicity in manufacture,—it being necessary only that each shall communicate with the opposite end of the cylinder.

I claim as my invention—

1. In a hydraulic device for absorbing shocks of variable intensity, in combination, a cylinder, a piston reciprocable in the cylinder, a by-pass of small capacity connecting the end portions of the cylinder at opposite sides of the normal position of the piston, a similarly arranged by-pass of larger capacity, outwardly opening pressure-seated valves for the ports of the larger by-pass, and means for returning the parts to normal position after compression.

2. In a shock absorbing device, a cylinder, a piston for said cylinder, a chamber having ports in communication with said cylinder at opposite sides of the normal position of said piston, normally closed valves for said ports, and means for restoring the parts to normal position after compression of said device.

3. In a hydraulic device for absorbing shocks of variable intensity, in combination, a cylinder, a differential piston reciprocable therein, a displacement chamber, ports connecting the end portions of the cylinder

with such chamber, normally closed valves for such ports, the chamber being provided with an extension above the normal level of the contained liquid, and means for returning the parts to normal position after compression.

4. In a hydraulic draft gear, in combination, a cylinder, a reciprocable piston in the cylinder, such cylinder being adapted to contain a liquid for retarding the movement of the piston, a by-pass being provided for the transfer of the liquid from side to side of the piston, normally closed valves for said by-pass and spring means resisting the advance of the piston and being of sufficient capacity to sustain the normal pulling stresses.

5. In a hydraulic draft gear, in combination, a cylinder, a reciprocable piston in the cylinder, such cylinder being adapted to contain a liquid for retarding the movement of the piston, a by-pass being provided for the transfer of the liquid from side to side of the piston, spring means resisting the advance of the piston and being of sufficient capacity to sustain the normal pulling stresses, a supplemental by-pass, and spring-closed valves for the ports thereof.

6. A hydraulic draft gear, comprising a cylinder having its bore reduced adjacent its ends, and a piston reciprocable in the cylinder and having an imperforate annular flange projecting from each face of approximately the diameter of the reduced end portions of the cylinder and adapted to telescope the same, and means for restoring the piston to central position after displacement therefrom.

7. A hydraulic draft gear, comprising a cylinder having its bore reduced adjacent its ends, the reduced portions being unported and an imperforate piston reciprocable in the cylinder and having a projection on each face of approximately the diameter of the reduced end portions of the cylinder and adapted to telescope the same, and means for restoring the piston to central position after displacement therefrom.

8. In a hydraulic draft gear, in combination, a cylinder, a displacement chamber above the cylinder, a plurality of ports differentiated in size connecting each end portion of the cylinder with the chamber, the larger ports being normally closed by spring-seated outwardly opening valves, the cylinder being provided with ports near each end normally closed by inwardly opening valves, a passage leading from the displacement chamber to each of the last-named ports, and a piston reciprocable in the cylinder.

9. In a hydraulic draft gear, in combination, a cylinder, a displacement chamber above the cylinder, a plurality of ports differentiated in size connecting each end por-

tion of the cylinder with the chamber, the larger ports being normally closed by spring-seated outwardly opening valves, the cylinder being provided with ports near each end

5 normally closed by inwardly opening valves, a passage leading from the displacement chamber to each of the last-named ports, a piston reciprocable in the cylinder, and springs acting on the piston to normally
10 position it approximately central in the cylinder and being of sufficient capacity to resist the normal stresses of draft.

10. In a draft gear, in combination, a cylinder adapted for fixed attachment to a car,
15 a piston reciprocable in the cylinder and having a stem for attachment to a coupler, springs for urging the piston to central position, a displacement chamber associated with the cylinder, comparatively restricted ports
20 connecting the cylinder and displacement chamber at opposite sides of the normal piston position, a pair of larger ports leading from the end portions of the cylinder to the chamber, outwardly opening spring-closed
25 valves for the larger ports, a pair of return ports communicating with the end portions of the cylinder and with the chamber, and normally closed inwardly opening valves for the last-named ports.

30 11. In a draft gear, in combination, a cylinder adapted for fixed attachment to a car, a piston reciprocable in the cylinder and having a stem for attachment to a coupler, centering springs reacting between the piston and the ends of the cylinder, a displacement chamber associated with the cylinder,
35 ports connecting the cylinder and displacement chamber at opposite sides of the normal piston position, a pair of larger ports leading from the end portions of the cylinder to the chamber, outwardly opening
40 spring-closed valves for the larger ports, a pair of return ports communicating with the end portions of the cylinder and with the chamber, normally closed inwardly-opening
45 valves for the last-named ports, a stuffing box through which the stem of the piston projects and having a chamber intermediate of its ends, and a duct connecting such
50 chamber with the displacement chamber.

12. In a draft gear, in combination, a cylinder adapted for fixed attachment to a car, a piston reciprocating in the cylinder, a by-pass connecting the end portions of the cylinder,
55 a stuffing box having a chamber intermediate of its ends and being normally out of communication with the cylinder cham-

ber, a piston stem passing through the stuffing box and its chamber, and a duct connecting the stuffing box chamber with the
60 by-pass.

13. A hydraulic draft gear for railway cars comprising a fluid containing cylinder, a piston reciprocating within the cylinder and having a stem for attachment to a draw-
65 bar, a spring for resisting the forward movement of the piston and having sufficient capacity to resist the normal draft for moving a car to which the gear is attached, a by-pass connecting opposite ends of the
70 cylinder, and a spring-seated check valve in the forward end of the by-pass.

14. In a hydraulic draft gear, a cylinder, a piston for said cylinder, a chamber having comparatively large ports in communication with said cylinder at the end
75 portions thereof, valves for said ports, yielding means for normally holding said valves in closed position, and means for restoring the piston to normal position after compression.
80

15. In a hydraulic draft gear, a cylinder for containing a liquid, a piston for said cylinder, a displacement chamber having inlet and outlet ports for said cylinder, said
85 inlet ports being located below the normal level of the liquid in said cylinder, spring-pressed valves for said ports, and means for restoring the parts to normal position after compression.

16. In combination, a cylinder having a
90 by-pass connecting its ends and a piston reciprocating therein and adapted to move liquid through the by-pass, a stuffing box associated with the cylinder and having a chamber through which the stem of the piston
95 directly passes, such chamber being normally out of communication with the cylinder and having communication with the transfer passage for the liquid.

17. In combination, a chambered casing,
100 means for developing pressure in the chamber thereof, a shaft for actuating the compressing means, a stuffing box in the wall of the casing through which the shaft projects, such stuffing box having a chamber through
105 which the shaft directly extends and which is normally out of communication with the chamber of the casing and is provided with an outlet delivering to a chamber under less pressure than that developed in the first
110 named chamber and in communication therewith.

WALTER H. COTTON.

CERTIFICATE OF CORRECTION.**Patent No. 1,614,657,****granted January 18, 1927.****to WALTER H. COTTON.**

It is hereby certified that error appears in the printed specification of the above mentioned patent requiring correction as follows: Page 3, line 108, claim 7, strike out the words "an imperforate" and insert the article "a", and line 109, strike out the article "a" and insert instead the words "an imperforate"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office. Signed and sealed this 22nd day of February, A. D. 1927.

Seal.**M. J. Moore,
Acting Commissioner of Patents.**