No. 741,558. PATENTED OCT. 13, 1903.

E. G. SHORTT.

DIFFERENTIAL BUFFER.

APPLICATION FILED DEC. 22, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

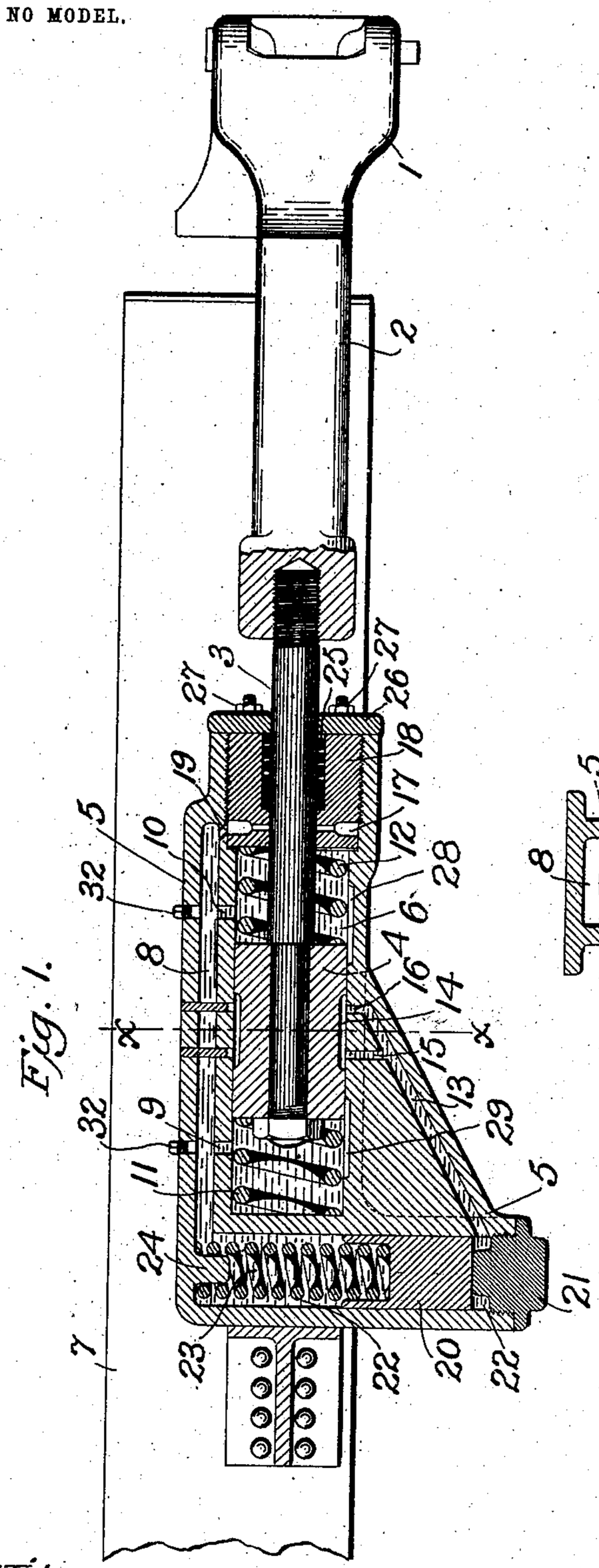

Fig. 1.

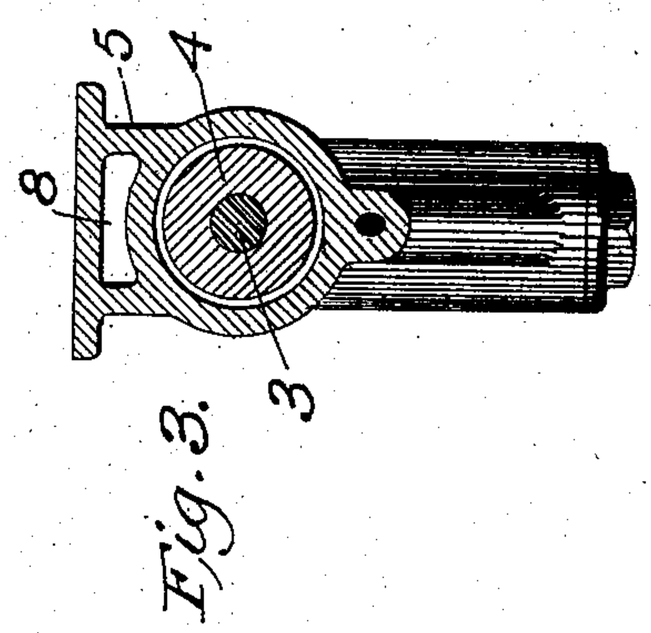

Fig. 3.

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Inventor:
Edward G. Shortt,
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NO MODEL. 2 SHEETS—SHEET 2.

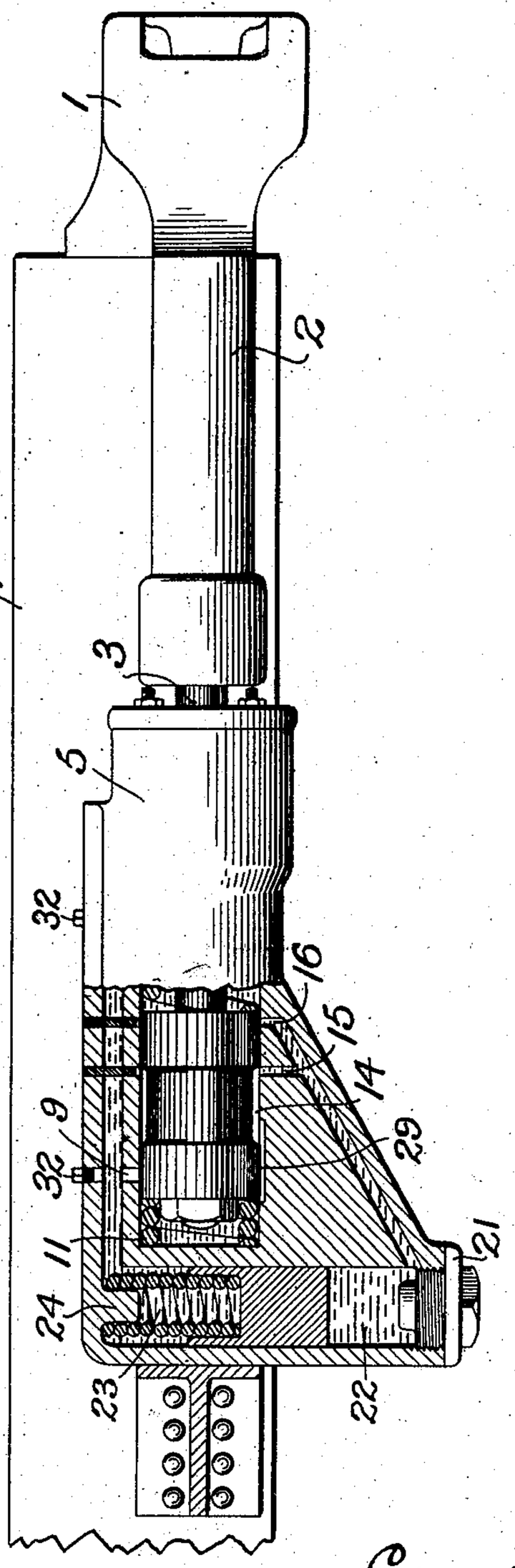

Fig. 2.

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UNITED STATES PATENT OFFICE.

EDWARD G. SHORTT, OF CARTHAGE, NEW YORK, ASSIGNOR TO CHARLES GOODWIN EMERY, OF CLAYTON, NEW YORK.

DIFFERENTIAL BUFFER.

SPECIFICATION forming part of Letters Patent No. 741,558, dated October 13, 1903.

Application filed December 22, 1902. Serial No. 136,196. (No model.)

To all whom it may concern:

Be it known that I, EDWARD G. SHORTT, a citizen of the United States of America, and a resident of Carthage, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Differential Buffers, of which the following is a specification.

My invention relates to certain new and useful improvements in buffers for railway or tram cars or other vehicles, as well as for parts of machinery and other constructions where shocks or collisions incident to the more or less violent impact of the parts upon each other during mechanical movements or operations are experienced.

In the use of buffers it is found that the shocks or concussions vary widely in degree and character, being sometimes quite light and easy—perhaps generally so in the case of the coupling together of railway-cars—but being at other times large and severe, so as to tend to seriously damage and strain the cars being coupled or the operative parts of the mechanism that are being brought together.

The object of my invention is to provide a buffing means that will accommodate itself with great elasticity to severe as well as to light blows, so that the coupling of cars, for example, may be effected without a violent and rude shaking of the cars or carriages to which couplers are attached. I accomplish this object by providing a buffer that will afford a yielding resistance to the shocks encountered in coupling the cars, said resistance differing in degree at different times or being variable, so as to suit the needs of different cases.

The buffer consists, essentially, in a liquid or fluid containing chamber wherein is a piston and combined with the latter springs or other yielding means, the liquid being non-compressible and being displaced by the piston during reciprocations of the latter, and thus having the volume or quantity varying at opposite ends of the piston during the movements of the latter; and the invention also consists, essentially, in the construction, arrangement, and combination of the various mechanical parts and the relations that they sustain to each other in respect of operation and purpose, substantially as will be more fully hereinafter described and claimed.

In the drawings illustrating my invention, Figure 1 is a longitudinal section of my improved variable buffer with the draw-head extended. Fig. 2 is a similar partial sectional view with the draw-head retracted, showing the position of the parts when the yielding mechanism of the buffer is compressed. Fig. 3 is a cross-section on the lines *x x* of Fig. 1.

Like numerals of reference denote like parts in all the figures.

1 denotes the draw-head of a car-coupler, the said draw-head being of a common type, having the usual pivoted knuckle, as shown, or being constructed in any other desired manner. Draw-head 1 is carried by the draw-bar 2, and attached to the inner end of draw-bar 2 is a rod 3, constituting a continuation of the draw-bar and being preferably screw-threaded to engage the inner end of said draw-bar, as shown in Fig. 1, the inner end of said rod 3 passing through the piston 4 and being provided on its extreme end with a nut, between which and a shoulder on the rod 3 said piston 4 is securely clamped, so that in this way the piston 4 may be firmly connected to the draw-rod 3.

7 indicates the general structure of a car, vehicle, or other carriage, being offered simply as an outline form by way of example only, and this structure 7 carries the coupling and buffing mechanism. Attached to frame 7 in a secure and rigid manner is the buffer body or casing 5, having numerous internal cavities for the accommodation of mechanical devices and also a quantity of oil or other suitable non-freezing and non-compressible fluid or liquid, said internal cavities being communicable with each other in the manner and through the ports or passages to be presently described. In the end of the body 5 nearest the draw-head 1 is screwed a packing-block 18, containing packing 25, through which packing and block passes the draw-rod 3, a plate 26, secured by bolts 27, being employed to cover the outer end of packing-block 18.

The inner end of rod 3, as already stated,

is fastened to the main piston or ram 4, which reciprocates closely within a main cylindrical chamber 6. At one end of piston 4 is a spiral spring 11, tensioned between the piston and the opposite end of the cylindrical chamber 6, while at the other end of the piston 4 is another spiral spring 12, tensioned between this end of the piston 4 and the end of the cylindrical chamber 6. Obviously a pulling or pushing action on the draw-head will move the main piston 4 in one direction or the other and cause the springs to be compressed. These springs are of much greater strength and tension than is necessary to allow the car when empty to be drawn without causing compression thereof, though of course compression will take place with a loaded car. At each end of the main piston 4, moreover, the cylinder 6 is filled with a suitable fluid or liquid—as oil, for example.

Adjacent to the cylindrical chamber 6 the body or casing 5 is provided with a constricted longitudinal passage 8, parallel to the cylindrical chamber 6, which passage communicates with the chamber 6 through certain ports, there being a port 9 between passage 8 and that part of chamber 6 containing spring 11 and there being a port 10 between passage 8 and that part of chamber 6 containing spring 12. Access is had to the interior chamber of the body or casing 5 whenever required through lateral apertures closed and filled by small screw-plugs 32. A port 19 leads from passage 8 to an annular groove 17 in the packing-block 18, which groove communicates with the working surface of the rod 3 through small orifices, as shown, the object of said groove 17 being to collect any fluid leakage that may pass out of the chamber 6 along the rod 3 during the reciprocatory movements of the latter and cause a return of this leakage to the passage 8 and the chamber 6. Thus it will be seen that I provide a confined quantity of liquid or fluid which is displaced during the movements of the piston 4, being transferred from one end of the piston to the other and back again as the piston moves back and forth. Passage 8 communicates with a second interior chamber 22, having the function of a spring-containing chamber and which for the sake of compactness of the construction is preferably located at right angles to the piston-chamber 6. In this chamber 22 is a spiral spring 23, engaging at one end the integral boss 24 and at the other end being received into a recess in the end of a close-fitting sliding piston 20. The end of the chamber 22 is closed by a screw-plug 21, against which the piston 20 abuts when the spring 22 is in its extended position, as shown in Fig. 1. The piston 20 is lifted away from its seat against the plug 21 at times by the action against said piston of pressure coming through the port 13 from the main piston-chamber 6, the result of this movement of the piston 20 being to compress the spring 23. It will be understood, therefore, that this spring 23 offers a resistance equal to the tension of the spring to the movement of the piston 20 and to the pressure that acts against said piston. This piston diaphragm or abutment 20 is smaller in diameter and has a face of smaller area than is the case with the main piston or ram 4, and this difference in the size of the two pistons causes the differential action of the device. A long port or passage 13 leads through the wall of the buffer body or casing 5 from the chamber 22, containing the auxiliary piston, to the main piston-chamber 6 and enters the latter chamber at two points through ports 15 and 16, which are separated from each other for a short distance. The piston 4 is provided with a central annular port 14 of sufficient length to connect the ports 15 and 16 when the piston is in its middle position, as shown in Fig. 1. Midway between the middle point of the piston-chamber and the two ends of said chamber are two lateral recesses or ports 28 and 29. The piston-port 14 when the piston shifts far enough toward the left will connect the chamber-port 29 with the outlet-port 15, and when piston 4 shifts far enough toward the right the piston-port 14 will connect the chamber-port 28 with the pressure-outlet port 16. In Fig. 2 it will be seen that piston-port 14 is connecting the lateral port 29 with the outlet-port 15. When these two ports are thus connected, the liquid contents of the piston-chamber 6 at the left of the piston 4 will be driven out through the passage 13 to a point beneath the piston 20, which latter will slide and compress the spring 23 to a greater or less extent.

Ordinarily during the coupling of cars or the interrelative movements of mechanical parts provided with my improved buffing means the shocks or collisions will be so slight that the piston 4 will have a range of movement slight in extent and there will be only a small amount of compression imparted to the springs 11 and 12, for their resiliency will be competent to resist these smaller shocks; but when a movement of greater strength occurs the effect will be to compress one or the other of the springs and to force the confined body of liquid from one end of the piston-chamber to the other—that is to say, as one end of said chamber is emptied of its contents incident to the action of the piston the other end of the chamber will be correspondingly filled. The spring 23 and auxiliary piston 20 will not be called into play except during very severe shocks. When the pulling or pushing action of the main piston 4 is so great as to force said piston past the transfer-ports 9 or 10 and also to connect port 29 with port 15 or port 28 with port 16, the springs 11 and 12 will be inadequate to resist the shock, as also will be the movement of the confined body of the liquid under the action of the piston; but the pressure in advance of the moving piston will act through the ports just

mentioned and the connecting-port 13 against the supplemental or differential piston 20 and cause it to compress the spring 23, which will furnish an additional yielding resistance to the shock which the device is undergoing. At this time the spring 11 or 12, as the case may be, which is in advance of the moving piston, will be compressed to its extreme limit, as shown in Fig. 2, provided the shock is severe enough, and the liquid contents at this end of the piston will be driven out through the port 13 into the chamber 22 or a part of said contents.

Many changes in the precise construction and embodiment of the various parts and rearrangements and readjustments may be made without varying from the invention so long as the leading features thereof are kept prominently in mind, and I therefore reserve the liberty of making all such changes as the exigencies of different situations may require in order to fully adapt the invention for successful extensive use.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a buffer, the combination of a piston, its chamber, a passage leading from one side of the piston to the other, a confined fluid or liquid in the chamber and passage, and an auxiliary differential device communicating with and receiving pressure at times from the main piston-chamber.

2. In a buffer, the combination of a piston, its chamber, yielding means between the piston and the ends of the chamber, a confined quantity of fluid or liquid circulating between the ends of the piston-chamber, and an auxiliary device of less diameter than the main piston, acted on by pressure from the main piston-chamber in case of extreme shocks.

3. In a buffer, the combination of a piston and its chamber containing fluid or liquid, an auxiliary chamber, a piston therein having yielding means, and means whereby a pressure from the main piston-chamber may act against the auxiliary piston in case of extreme shocks.

4. In a buffer, the combination with a main piston and its chamber the latter containing a body of fluid circulating from one side of the piston to the other, of an auxiliary differential piston acted upon by pressure from the main chamber when the limit of fluid circulation has been reached by the piston.

5. In a buffer, the combination of a main piston and its chamber, the latter containing a circulating fluid, of a supplemental chamber containing a differential device acted upon by pressure from the piston-chamber in extreme cases.

Signed at Carthage this 24th day of November, 1902.

EDWARD G. SHORTT.

Witnesses:
H. G. SHORTT,
W. W. SWEET.