

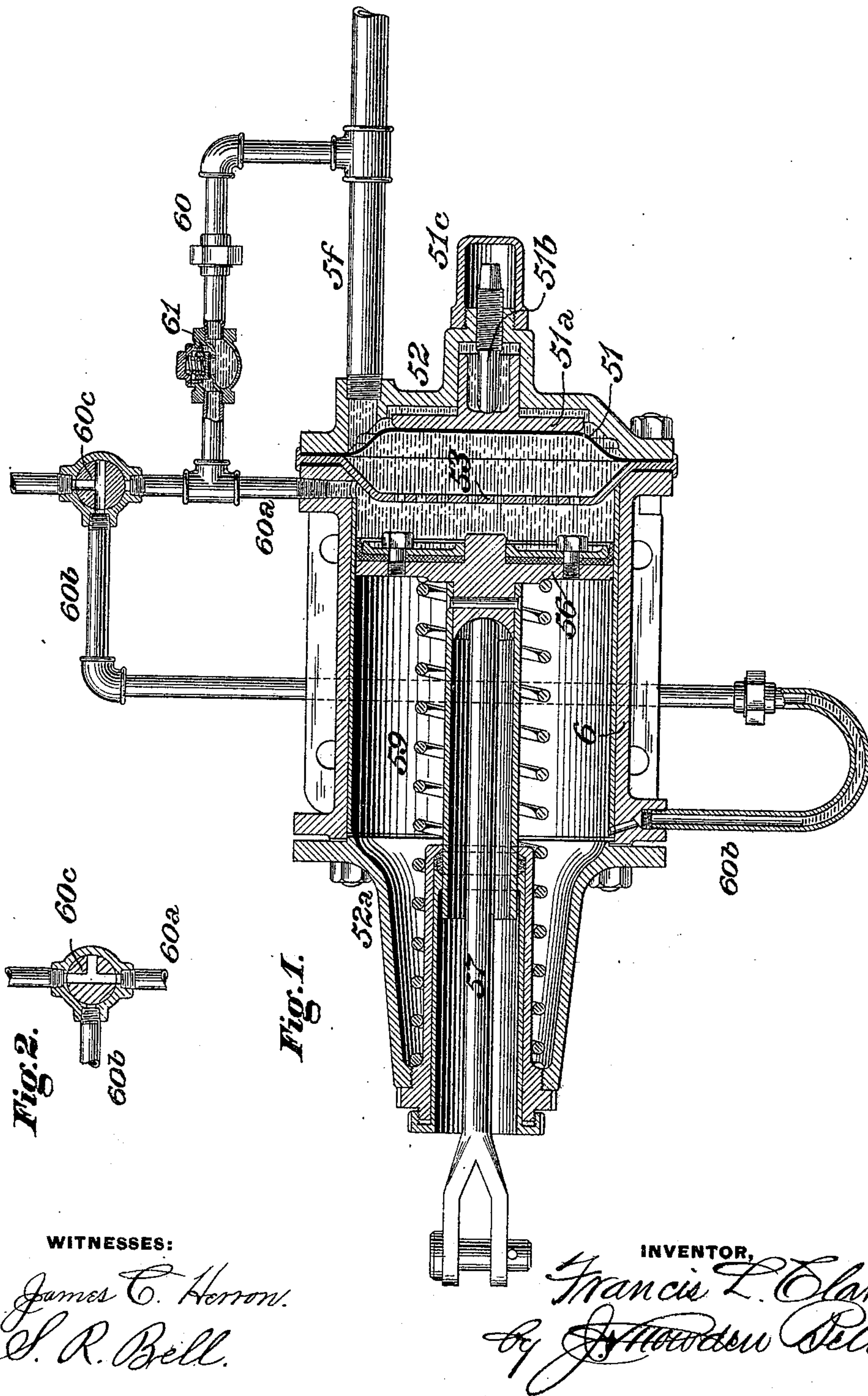
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Patented Jan. 16, 1900.

F. L. CLARK.  
HYDRAULIC BRAKE.

(Application filed June 2, 1899.)

(No Model.)



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## HYDRAULIC BRAKE.

SPECIFICATION forming part of Letters Patent No. 641,625, dated January 16, 1900.

Application filed June 2, 1899. Serial No. 719,050. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS L. CLARK, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Hydraulic Brakes, of which improvement the following is a specification.

My present invention is an improvement upon certain features of that for which Letters Patent of the United States No. 574,663 were granted and issued to me under date of January 5, 1897; and its object is to provide a simplification of structure and attain a more effective and desirable operation in a hydraulic brake applying and releasing mechanism adapted for application in the practice of the invention which is set forth in said Letters Patent.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section through a brake-cylinder and its accessories embodying my invention, and Fig. 2 a transverse section through the release-cock when in position to discharge liquid from the space between the movable abutments.

Means for preliminarily taking up the slack of the connections and the clearances between the brake-shoes and the wheels and subsequently applying the brake-shoes to the wheels by the action of separate and independent pistons are exemplified in Letters Patent No. 574,663 aforesaid, and my present invention is designed to provide an improved construction for the performance of these functions.

In the practice of my invention the brake-cylinder 6 is provided with main and supplemental movable abutments which as to their relation and manner of operation in taking up slack and applying the brake-shoes accord in substance with the analogous members set forth in Letters Patent No. 574,663. The brake-cylinder is closed at its ends by heads 52 52<sup>a</sup> and is fitted with a supplemental abutment 56 in the form of a properly-packed piston having a tubular socket encircling a piston-rod 57, the inner end of which abuts against the piston 56 and which is connected at its outer end to a brake lever or levers of any suitable and preferred construction.

The piston-rod socket is packed to form a tight joint with the cylinder-head 52<sup>a</sup>, and the piston 56 is retracted to its running position after an application of the brakes by a spring 59, which bears against its outer face in the ordinary manner.

Under my present invention a main movable abutment in the form of a flexible diaphragm 51 and a perforated or grated stop-plate 53 are fitted at and adjoining their peripheries between the cylinder-head 52 and a flange on the adjacent end of the brake-cylinder 6, being clamped and held in this position by the cylinder-head bolts. The inward traverse of the diaphragm 51 is limited by the stop-plate 53, and its traverse in the opposite direction is limited by an adjustable check-plate 51<sup>a</sup>, which abuts against an adjusting-screw 51<sup>b</sup>, engaging an internal thread in the cylinder-head 52 and having its outer end covered by a removable cap 51<sup>c</sup>. A liquid supply and release pipe 5<sup>f</sup>, controlled by a suitable valve or valves and leading from a source of supply of liquid under pressure, as a connection with a pump or accumulator and a connection with a discharge-receptacle, as a tank, is connected to the cylinder-head 52 and opens into the space between the same and the outer side of the diaphragm 51. The pipe 5<sup>f</sup> is connected by a pipe 60, controlled by a check-valve 61, which opens upwardly or inwardly toward the brake-cylinder, with a release-pipe 60<sup>a</sup>, leading from the brake-cylinder 6 on the inner side of the diaphragm to a tank or other suitable discharge-point. The release-pipe 60<sup>a</sup> is connected by a pipe 60<sup>b</sup> with the brake-cylinder 6 on the outer side of the piston 56, and a three-way release cock or valve 60<sup>c</sup> controls, according to the position into which it may be turned, communication between the pipe 60<sup>b</sup> and the delivery end of the release-pipe 60<sup>a</sup> or between the brake-cylinder 6 on the inner side of the piston 56 and said delivery end.

In operation the release-cock 60<sup>c</sup> being in the position shown in Fig. 1 liquid under pressure delivered by the pipe 5<sup>f</sup> passes into the brake-cylinder and fills the space between the head 52 thereof and the diaphragm 51. It thereafter raises the check-valve 61 and fills the space between the supplemental abutment 56 and the diaphragm 51, which latter



is consequently subjected to an equilibrium of pressure on its opposite sides, after which, the pressure in said space being equalized with that in the pipe 5<sup>f</sup>, the check-valve 61  
 5 is seated by the action of gravity and its spring. By this operation the supplemental abutment 56 is moved outwardly sufficiently far to take up the clearances and slack of the brake connections and apply the brake  
 10 fully by the liquid under pressure, which is charged into the space between its inner side and the main abutment 51. Upon the release of pressure in the pipe 5<sup>f</sup> the piston 56 is moved inwardly by the spring 59 and the  
 15 brakes are released without diminution of the volume of liquid between the piston 56 and the diaphragm 51, the same being retained in the space between these members by the downwardly-closed check-valve 61. In the  
 20 succeeding applications of the brake only the space on the outer or right-hand side of the diaphragm 51 is filled with liquid, and the movement of the piston 56 is effected through the intermediate body of liquid by the stroke  
 25 of the diaphragm 51 from the running position shown in Fig. 1 to that of contact with the stop-plate 53.

Wear of the brake-shoes and lost motion or slackness of the connections is, as in the construction of Patent No. 574,663, progressively and automatically taken up by the pressure in the pipe 5<sup>f</sup>, which in correspondence therewith raises the check-valve 61 and admits liquid to the space between the diaphragm 51  
 30 and piston 56, by which the latter is from time to time moved the proper distance outwardly (the check-valve closing after each adjustment) until it has advanced so far in the brake-cylinder as to prevent it from making as great a traverse as the diaphragm 51.  
 40 The release-cock 60<sup>c</sup> is then turned into the position shown in Fig. 2, and liquid is released from the space between the diaphragm 51 and piston 56 until the latter is moved by  
 45 the spring 59 to its normal initial position, which is such that its right side is in or nearly in contact with the stop-plate 53, after which proper renewal of the brake-shoes or adjustment of the connections, or both, as may be  
 50 required, is made, and the further operation of the apparatus is as above described. Any liquid which may leak past the piston 56 is discharged from the brake-cylinder through the pipe 60<sup>b</sup>, in the lower end of which it  
 55 forms a seal, and thence passes, when the release-cock 60<sup>c</sup> is in the position shown in Fig. 1, into the pipe 60<sup>a</sup> and through said pipe to the tank or other place of delivery, being forced upwardly through the pipe 60<sup>a</sup> by the  
 60 pressure of the air confined in front of the piston on the outward stroke thereof.

I claim as my invention and desire to secure by Letters Patent—

1. In a brake apparatus, the combination, 65 substantially as set forth, of a brake-cylinder, a flexible diaphragm fixed peripherally thereto at one of its ends, a fluid-supply pipe

leading to the outer side of said diaphragm, a piston fitted to traverse in the cylinder on the inner side of said diaphragm, a piston-rod fixed to said piston and having its outer end adapted for connection with a brake-lever, a retracting-spring bearing on the piston, a connecting-pipe leading from the fluid-supply pipe into the cylinder, on the inner 75 side of the diaphragm, and an inwardly-opening check-valve controlling said connecting-pipe.

2. In a brake apparatus, the combination, substantially as set forth, of a brake-cylinder, 80 a piston fitted to traverse therein, a piston-rod fixed to said piston and having its outer end adapted for connection with a brake-lever, a retracting-spring bearing on the piston, a flexible diaphragm fixed peripherally 85 to the brake-cylinder on the opposite side of the piston from the retracting-spring, a perforated stop-plate fixed in the cylinder between the diaphragm and piston, a fluid-supply pipe leading into the cylinder on the outer 90 side of the diaphragm, a connecting-pipe leading from the fluid-supply pipe into the cylinder, on the inner side of the diaphragm, and an inwardly-opening check-valve controlling said connecting-pipe. 95

3. In a brake apparatus, the combination, substantially as set forth, of a brake-cylinder, a piston fitted to traverse therein, a piston-rod fixed to said piston and having its outer end adapted for connection with a brake-lever, a retracting-spring bearing on the piston, a flexible diaphragm extending across the cylinder on the opposite side of the piston from the retracting-spring, a perforated stop-plate located between the diaphragm and 105 piston, a cylinder-head by which the diaphragm and stop-plate are connected peripherally to the cylinder, a check-plate connected to the cylinder-head and adjustable toward and from the diaphragm, a fluid-supply pipe leading into the cylinder on the outer side of the diaphragm, a connecting-pipe leading from the fluid-supply pipe into the cylinder, on the inner side of the diaphragm, and an inwardly-opening check-valve controlling said connecting-pipe. 115

4. In a brake apparatus, the combination, substantially as set forth, of a brake-cylinder, a flexible diaphragm fixed peripherally thereto at one of its ends, a fluid-supply pipe 120 leading to the outer side of said diaphragm, a piston fitted to traverse in the cylinder on the inner side of said diaphragm, a piston-rod fixed to said piston and having its outer end adapted for connection with a brake-lever, a retracting-spring bearing on the piston, a connecting-pipe leading from the fluid-supply pipe into the cylinder, on the inner side of the diaphragm, an inwardly-opening check-valve controlling said connecting-pipe, and 125 a valve-controlled release-pipe leading from the cylinder, on the inner side of the piston to a point of discharge.

5. In a brake apparatus, the combination,



substantially as set forth, of a brake-cylinder, a flexible diaphragm fixed peripherally thereto at one of its ends, a fluid-supply pipe leading to the outer side of said diaphragm, 5 a piston fitted to traverse in the cylinder on the inner side of said diaphragm, a piston-rod fixed to said piston and having its outer end adapted for connection with a brake-lever, a retracting-spring bearing on the piston, a connecting-pipe leading from the fluid- 10 supply pipe into the cylinder, on the inner side of the diaphragm, an inwardly-opening check-valve controlling said connecting-pipe, a release-pipe connected with the cylinder end of the connecting-pipe, a leakage-dis- 15 charge pipe leading from the cylinder, on the outer side of the piston, to the release-pipe, and a cock controlling communication between said pipe and the release-pipe, and between the connecting-pipe and the release- 20 pipe.

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Witnesses:

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