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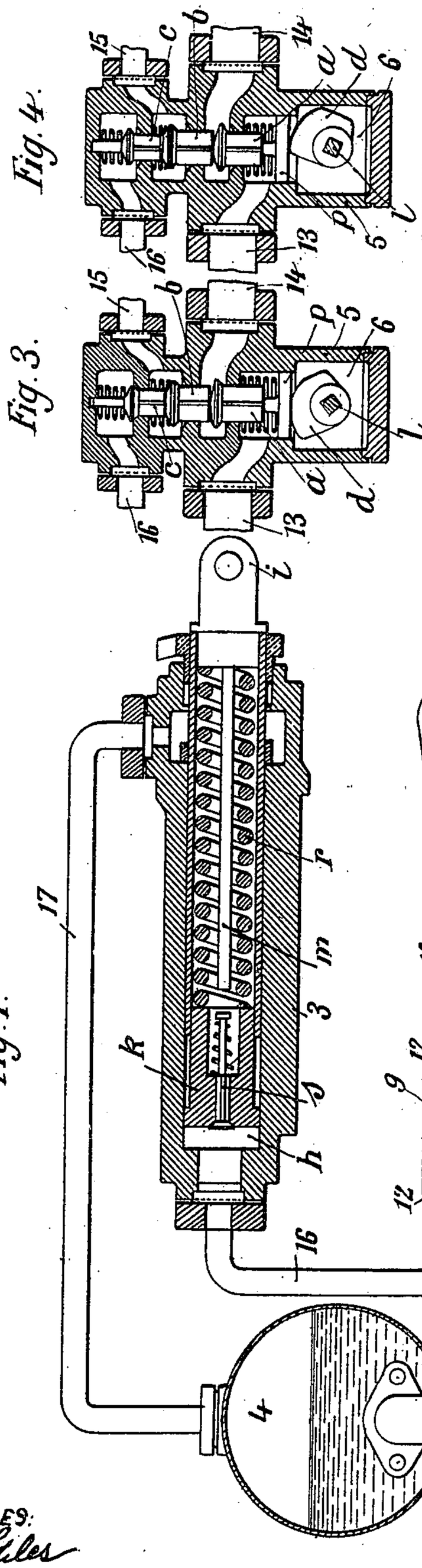
C. DUREY.

HYDRAULIC BRAKE FOR RAILWAY OR TRAMWAY VEHICLES.

(Application filed July 10, 1900.)

(No Model.)



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HYDRAULIC BRAKE FOR RAILWAY OR TRAMWAY VEHICLES.

SPECIFICATION forming part of Letters Patent No. 667,819, dated February 12, 1901.

Application filed July 10, 1900. Serial No. 23,085. (No model.)

To all whom it may concern:

Be it known that I, CAMILLE DUREY, of Paris, France, have invented certain new and useful Improvements in Hydraulic Brakes for Railway or Tramway Vehicles, of which the following is a full, clear, and exact description.

The present invention has for its object certain improvements in the hydraulic brake described in my Patent No. 659,517, dated October 9, 1900. These improvements relate more particularly to the apparatus for operating the brake.

The operating apparatus hereinafter described, and which is more particularly intended for separate automobile vehicles, allows of the brake being taken off or applied fully or of a moderate predetermined braking being maintained on the tires of the wheels by means of a single lever operating a cam which works in a chamber in constant communication with the open air-reservoir. As may be easily seen, this simple means of operating has not only the advantage of dispensing with all kinds of taps under pressure and the leakages due to such taps, but it also allows of an easy change from a hard or strong application of the brake to the *statu quo* with a moderate application of the brake without its being necessary to pass through the intermediate position of an unbraked condition.

The invention is shown in detail in the accompanying drawings, in which—

Figure 1 is a longitudinal section of the whole of the brake, showing the parts of the operating mechanism in position for applying the brake. Fig. 2 is a sectional side elevation in detail, showing the lever and the operating-cam in the position in which the brake is applied. Fig. 3 is a section of a detail of the operating apparatus, the parts being in a position of *statu quo;* and Fig. 4 is a similar section showing the parts in the position of applying and taking off the brake.

The brake is composed of the following parts: a pump 1, single-acting as regards suction and double-acting when forcing, such as described in application Serial No. 736,417, of 1899, set in movement by an eccentric 2, mounted on the axle of the vehicle, a brake-cylinder 3, liquid-reservoir 4, and special chest 5, having superimposed valves, which will be hereinafter described. A pipe 17 connects the reservoir with the rear of the brake-cylinder.

The chest 5 comprises four superimposed chambers 6, 7, 8, and 9, separated by partitions 10 11 12, which serve as seats, respectively, for three winged valves *a b c*, the axes of which are thus in the same vertical line. The operating-lever *l*, on which a cam *d* is keyed, penetrates through a stuffing-box into the chamber 6, which communicates by a pipe 13 with the reservoir 4, open to the air. The chamber 7 communicates directly or by means of a pipe 14 with the rear face of the piston *f* of the pump 1, and the chamber 8 communicates by a pipe 15 with an annular space *g* inclosed between the piston-rod *f* and the body of the pump. Finally, the chamber 9 communicates by a pipe 16 with the brake-cylinder.

A piston *p*, guided between the walls of the chest, bears constantly with its lower face upon a cam *d*, while an upper projection on said piston bears against the lower valve *a*. The cam *d* is situated in the plane of the vertical axis of the three valves, and its shape is such that when the lever *l* is given successively the positions I, II, and III, (indicated in Fig. 1,) first, the three valves can move freely and fall back on their seats, Fig. 1; secondly, the valves *a* and *b* are kept raised, while the valve *c* is free and can fall back on its seat, Fig. 3, and, thirdly, the three valves *a*, *b*, and *c* are kept raised from their seats.

Now supposing the piston *f* to be at the end of its course. In its displacement from left to right it will draw liquid from the reservoir 4 through the valve *a*. The size of the piston-rod is arranged so that the cross-sectional area of the annular space or area *g* remaining around this rod shall be half the area of a section of the pump-cylinder. When the piston *f* returns from left to right, it forces behind it the liquid accumulated. Half this liquid passes through the valves *b* and *c* in order to reach the brake-cylinder 3 through the pipe 16, while the other half of the liquid occupies the space communicating with the

right-hand face of the piston and comprising the chamber 8, pipe 15, and space *g*. The piston *f* again moving toward the right, the liquid accumulated in *g* passes into the brake-cylinder through the valve *c*. Thus when the lever *l* is in its position I, which corresponds to the application of the brake, the pump produces a continuous movement of liquid in the pipe 16. The liquid coming into the cylinder 3 drives before it the entire brake-piston until the brake-shoes are in contact with the wheels. At this moment the movement of the head *i* of the piston is stopped, and on the liquid continuing to flow into the space *h* the part *k* continues its movement, pressing in front of it the spring *r*, which transmits its pressure to the head *i*, and consequently to the brake-shoes through the brake-gearing. The pressure continues to increase until the wheels are fully braked.

In order to avoid skidding from full braking while giving the brake its maximum power, I have designed the following arrangement: A rod *m* is formed part of or attached to the head *i* and becomes stationary when the brake-shoes are in contact with the wheels, the length of said rod *m* being so arranged that when skidding is approaching, on the part *k* continuing its movement toward the right the valve *s*, located in said part, will encounter said rod, and is thereby opened, allowing the excess of liquid under pressure to escape.

If, instead of desiring to stop the vehicle, it is simply desired that its speed should be diminished, the lever *l* is brought into the position II—that is to say, the position of *statu quo*—Fig. 3. The cam *d* then lifts the two valves *a* and *b*, and the pump works without effect—that is to say, it returns to the reservoir the liquid which it draws up, the valve *c* remaining pressed on its seat, and the liquid under pressure remains stored up in the brake. If it be desired to further apply the brake, the cam is brought back into the position corresponding to the position I, (braking position,) and the pump again performs work. In order to take off the brake, the lever is brought into the position III, Fig. 4, and the valves *a b c* are lifted, and the brake-cylinder then communicates with the open air-reservoir 4. The spring *r* acts on the piece *k*, and the liquid accumulated in the brake behind said piece is returned to the reservoir through the valve-chest. By more or less rapidly operating in the desired direction the lever *l*, which actuates the cam *d*, the pressure may be increased or diminished to the extent desired. It will be noticed that this arrangement for operating by means of a cam acting directly on three superimposed valves for the suction and forcing by the pump and for maintaining the position of the piston of the brake-cylinder reduces to a minimum the power required for operating the brake. All taps are dispensed with. The cam *d* is in a chamber where the liquid is at the atmospheric pressure, and there is no internal pressure, and consequently no cause for leakage.

I declare that what I claim is—

In a hydraulic brake for railway and tramway vehicles an apparatus for operating the brake consisting of a distributing-chest having four superimposed chambers 6, 7, 8 and 9 separated by three valves *a*, *b* and *c* the axes of which are arranged vertically one above another, and an operating device (such as a cam *d*) moving in the lower chamber 6 adapted to lift successively or simultaneously the two lower valves or all three valves, the said chambers 6, 7, 8 and 9 communicating respectively with an open air-reservoir, the rear face of the pump-piston, the front face of the same piston and the brake-cylinder, substantially as hereinbefore set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

CAMILLE DUREY.

Witnesses:
ANDRÉ MOSTICKER,
EDWARD P. MACLEAN.