H. F. KNAPP.

RAILWAY-BRAKE APPARATUS.

No. 186,257. Patented Jan. 16, 1877.

Fig. 1.

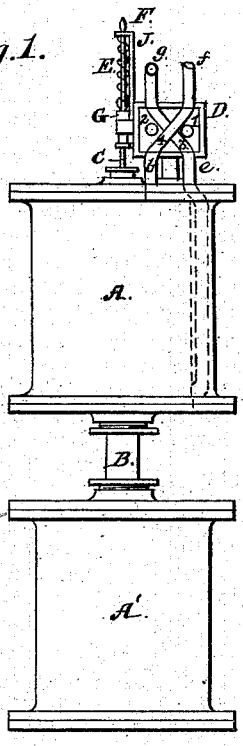


Fig. 3.

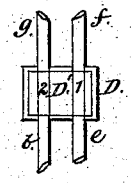
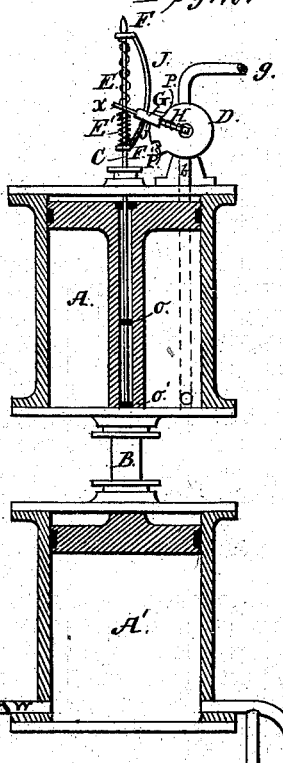


Fig. 2.



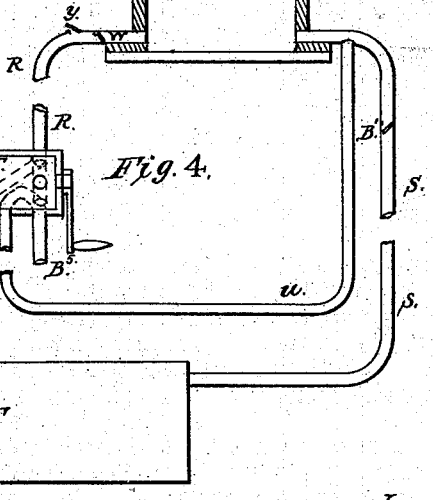


Fig. 5.

Fig. 4.

Witnesses:

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Henry F. Knapp.

UNITED STATES PATENT OFFICE.

HENRY F. KNAPP, OF NEW YORK, N. Y.

IMPROVEMENT IN RAILWAY-BRAKE APPARATUS.

Specification forming part of Letters Patent No. **186,257**, dated January 16, 1877; application filed July 2, 1875.

To all whom it may concern:

Be it known that I, HENRY F. KNAPP, of the city, county, and State of New York, have invented certain new and useful Improvements in Railway-Brake Apparatus, of which the following is a specification:

Figure 1 is an outside view of pump-cylinders, but showing the steam-valve in section. Fig. 2 is a sectional view of the steam and pump cylinders, and showing an end view of steam-valve, with its mechanism for working. Fig. 3 is a sectional view of steam-valve, showing it in a reverse position from that shown in Fig. 1. Fig. 4 shows a view of reservoir, when worked in conjunction with the pump and pipes and valve, for operating the same independent of the continuous action of the pump. Fig. 5 is an end sectional view of operating-valve.

Similar letters refer to like parts in all the figures.

The object of this invention is to produce a direct-acting reciprocating air or water pump, whose steam-valve will be so operated as to always be positive acting without the use of a fly-wheel, so that there will be no dead-point to the valve in any position it can take, and will always be full open to both supply and exhaust steam to and from the cylinder, for which purpose is utilized an arrangement of springs in connection with a valve-stem, together with mechanism for locking and unlocking the valve at each end of the stroke.

The invention also consists in the arrangement of a couple of valves in the inlet-pipe of the compressor-pump, to permit of the escape of compressed air at certain times of operating, and also to help hold the reduced atmospheric pressure or vacuum, and so assist the ordinary pump-valves.

The invention also consists in having two eduction-pipes leading from the pump. Though my arrangement for working the steam-valve is as applicable to a slide-valve as a rotary I herein show it working a rotary valve.

In the accompanying drawings, B represents a piston-rod, connecting the engine and pump pistons in cylinders A and A′. The piston-rod in the engine is hollow, into which works a valve-stem, C, extending out through the cylinder-head, and so arranged as regards lost motion, as to get any proportionate part of the whole throw of the piston—an arrangement well understood by those skilled in this branch of mechanism. The movement of this valve-stem is caused to work the valve by imparting to it a reciprocating motion, as follows: The stem C is arranged to pass through a slot, X, in valve-lever H, against which lever impinges the coiled springs E and E′, carried on stem and confined by collars F. This stem C also carries a double cam, J, for raising lock G on lever H out of stop P and P′, arranged on the circumference of the valve-casing, so that at each end of the stroke the valve-lever H may be shifted by the accumulated pressure of the springs, which pressure is stored up by the movement of stem C before cam J unlocks lever H. Tube or passage *b* connects the steam-valve D with one end of the steam-cylinder, and passage *e* with the other end of it. These two passages alternate one with the other, for supplying steam and furnishing exhaust-exit to engine, according to position of valve-plug D′ in casing D. Tube *g* is the supply-pipe for carrying steam to this valve from the boiler, and tube *f* is the exhaust-pipe.

By alternately changing the position of the plug D′ of the valve, its direct passages 1 and 2, or its diagonal passages 3 and 4, are made to connect pipes *g* and *b* or *g* and *e*, and thus steam is admitted above or below the piston, and the same move of the valve also connects the exhaust-pipe *f* with *b* or *e*, thus furnishing exit for exhaust, the movement of the valve being communicated by means of its lever H and stem C.

To describe its working more fully, as piston B moves upward it strikes the lower end of stem C, which is thereby moved outward, and compresses spring E′, and moves forward the cam J. As its forward movement is continued the cam unlocks lever H by impinging on a projection on slide-lock G, which, as soon as unlocked from stop P′, allows the compressed spring E′ to throw the lever over to stop P, where it again becomes locked, a spring always bearing down the lock as against the cam raising it, by which operation the valve-plug is reversed, and the supply of steam is conducted to the other end of the engine-cyl-

inder, while at the same time the opposite end is open to exhaust, as previously described.

By thus hanging the connection between the pipes *g*, *b*, *e*, and *f*, the movement of the piston is reversed till cam J relieves the lever H from stop P, and spring E throws the lever over, thus again reversing the valve-plug D′, &c., and imparting a reciprocating motion to the pump-stem, &c.

It will thus be seen that a supply and exhaust passage to the engine is always full open, so there is no dead-point to the valve, while the gentle yet positive action of the springs is superior, for many reasons, to operating a main valve by a secondary or auxiliary piston and cylinder. This pump will be mainly used for operating railway-brakes by putting them on by compressed air, and taking them off by suction or exhaust, which reverse powers will be got by utilizing a valve, T, in working this apparatus, the description of which is more fully explained in my patent of August 25, 1875. Valve T is connected to the reservoir F by pipe B^3. The reservoir is connected to the pump by eduction-pipe S, in which is a check-valve, B^1. The compressor part of the pump is also connected by means of a separate or branch pipe, U, to the valve T, so that when air is being drawn from the brake cylinders it may be ejected into the atmosphere through pipe U being made to connect with pipe B^5, which opens into the atmosphere, said connection being made by valve T at the same time induction-pipe R of the pump is connected by means of passage of valve T to pipe B^4, which leads to the brake-cylinders under the cars. By thus ejecting the air drawn from the brake-cylinders into the atmosphere through pipe U, instead of into the reservoir through pipe S, the pump has no head or pressure to work against, and is thereby enabled to take the brakes off quicker—a most important matter in such apparatus. Passage 2 of valve T connects the reservoir F with pipe B^4, so as to put on the brakes. When induction-pipe R of the pump is connected by means of the valve T to pipe B^4, leading to the brake-cylinders, for the purpose of taking off the brakes, it is desirable, in order to make quick work, to avoid passing all the compressed air from the brake-cylinders through the pump, for which reason is placed an escape-valve, Y, opening outward, in the induction-pipe R of the pump, so that all the air above atmospheric pressure readily escapes when the valve closes under the effect of suction, or as a vacuum is produced by the action of the pump; and for the purpose of making this vacuum more effective and steady, and also to assist the regular valve of the pump, (not shown,) a check-valve, W, is also placed in this induction-pipe R. This valve is important, as it is difficult to work a vacuum effectively and speedily with the ordinary pump-valve.

Valve T is under the immediate manipulation of the engineer, who, by moving the handle back or forth, is enabled to connect and disconnect the various pipes leading to and from the pump and brakes.

What I claim as new and my own invention is—

1. The valve D′, in combination with lever H, lock G, and stem C, working in the hollow piston-rod.

2. The valves Y and W, when placed in the induction-pipe of a pump, in combination with the valve T, for the purpose specified.

HENRY F. KNAPP.

Witnesses:

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