

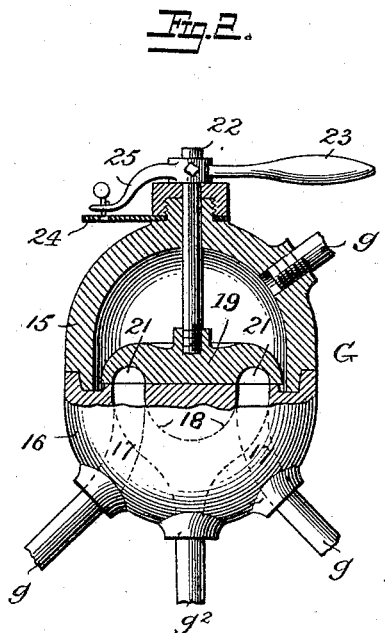
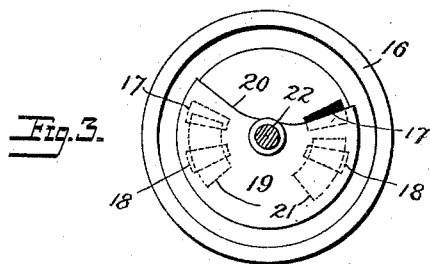
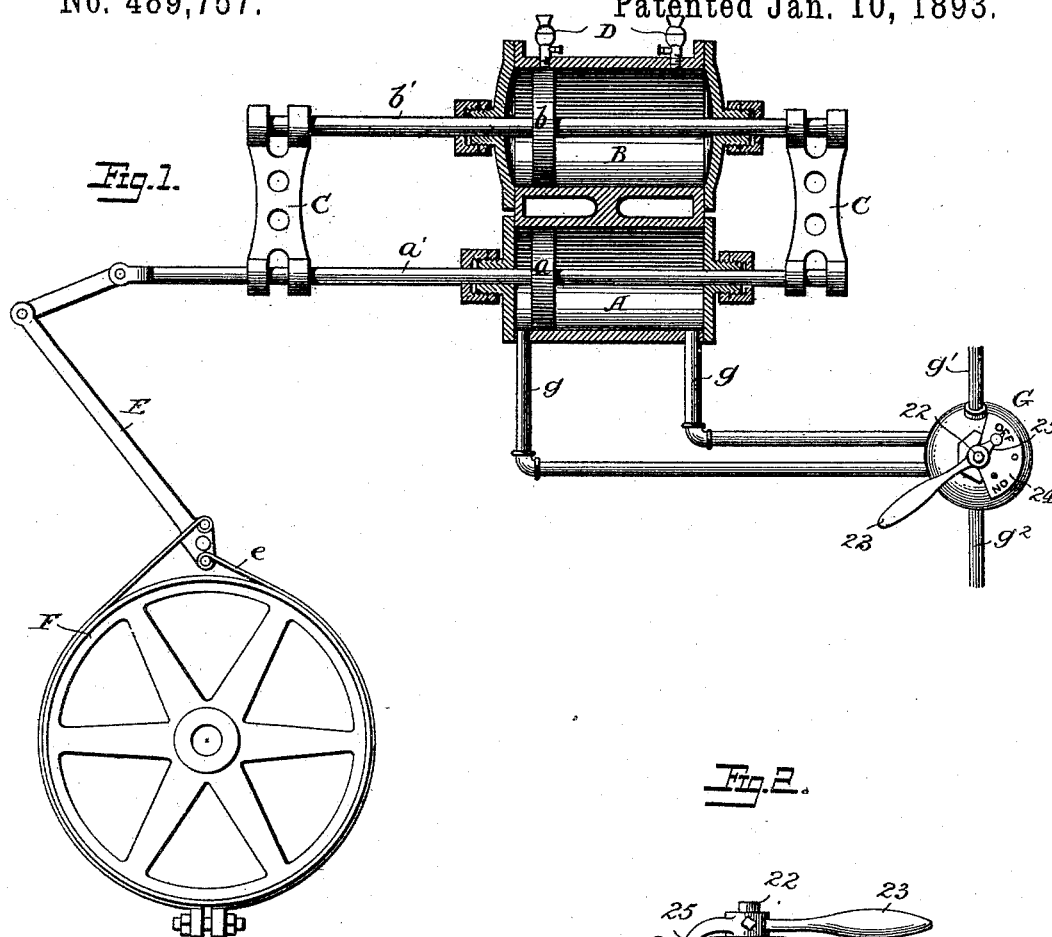
(No Model.)

2 Sheets—Sheet 1.

B. T. REILLY.  
GOVERNOR FOR STEAM BRAKES.

No. 489,757.

Patented Jan. 10, 1893.



Witnesses  
*Prof. G. Hinkel*  
*W. E. Neff*

Inventor  
*Bernard T. Reilly*  
By *J. M. Watson*  
Attorney

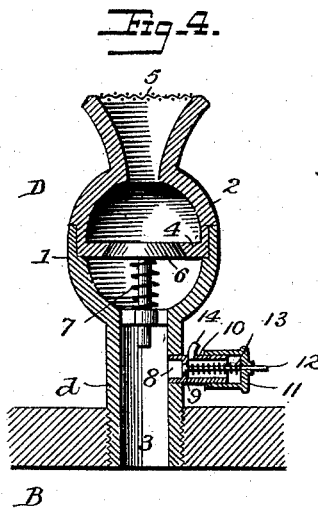
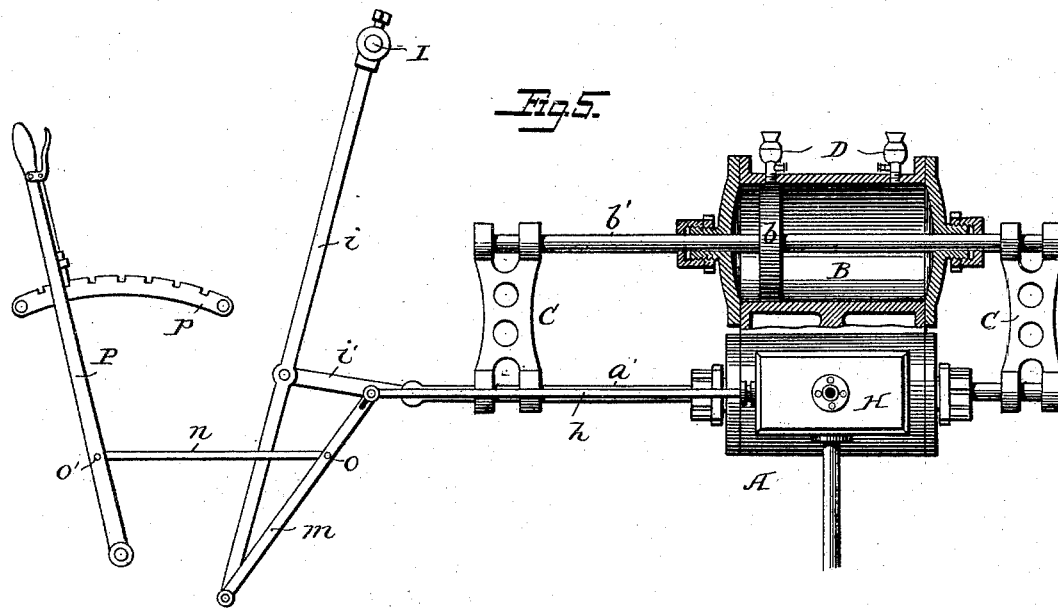
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*Jno. G. Hinkel*  
*A. E. Neff*

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by *J. A. Watson*  
Attorney

# UNITED STATES PATENT OFFICE.

BERNARD T. REILLY, OF ASHLEY, PENNSYLVANIA, ASSIGNOR OF ONE-HALF  
TO MORRIS R. ZEHNDER, OF SAME PLACE.

## GOVERNOR FOR STEAM-BRAKES.

SPECIFICATION forming part of Letters Patent No. 489,757, dated January 10, 1893.

Application filed September 26, 1892. Serial No. 446,936. (No model.)

*To all whom it may concern:*

Be it known that I, BERNARD T. REILLY, a citizen of the United States, residing at Ashley, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Brakes, Reverse-Gear, &c., of which the following is a specification.

My invention relates to steam actuated reverse gear, machine brakes, and other steam actuated mechanisms in which the load or resistance to the movement of the steam piston is light, or light during a portion of the stroke.

In the accompanying drawings, which form a part of this specification, Figure 1 is a sectional view of my invention as applied to operate a hand brake on a hoisting drum. Fig. 2 is a sectional view of the valve for controlling the supply and exhaust of the steam cylinder. Fig. 3 is a plan of the valve and its seat. Fig. 4 is a sectional view of one of the valve devices of the air cylinder, and Fig. 5 is a view showing the invention as applied to reversing gear for steam engines.

Much difficulty has been experienced in operating light mechanisms by direct connection with the pistons of steam cylinders on account of the sudden jumping and irregular movement of the piston and the shock to the cylinder and the connected mechanism at the end of the stroke. It has been attempted to correct this trouble by using a cataract cylinder filled with oil and having a piston connected to the piston of the steam cylinder, but so far as I am aware this arrangement and all other attempts to regulate the movement of the steam piston under light duty have heretofore been unsuccessful.

Referring to the drawings A indicates a steam cylinder having a piston *a* and a piston rod *a'*, and B indicates an air cylinder having a piston *b* and piston rod *b'*. The cylinders may be arranged in any desired positions relatively to each other and their piston rods connected in any desired manner, but I prefer the arrangement shown in the drawings in which the cylinders are side by side and the piston rods *a'* *b'* connected at both ends of the cylinders by bridge pieces C. Near each end of the air cylinders are ports

*d* one or both of which are controlled by valve devices D of peculiar construction. An enlarged sectional view of one of these devices is shown in Fig. 4, in which 1, 2, indicate a two-part valve casing. The part 1 has a hollow stem 3 which communicates with the interior of the cylinder B. The part 2 is screwed into or otherwise connected with the part 1 and is provided at its inner end with a valve seat 4, and preferably at its outer end with a screen 5 to prevent the entrance of cinders or other particles of solid matter. Seated in the valve seat 4 is a valve 6 which is held to its seat by a spring 7 interposed between the valve and a part of the casing. Between the cylinder B and the valve 6 is a port 8 in which is inserted a tube 9 containing a valve 10. The tube 9 is screw-threaded at its outer end and provided with a cap 11 which is internally screw-threaded. The shank 12 of the valve 10 extends through a perforation in the cap and the valve is pressed upon its seat by a spiral spring 13 which encircles the shank and bears upon the valve and the cap. By adjusting the cap out or in the tension of the spring and consequently the pressure necessary to open the valve may be regulated. In the tube 9 is formed an opening 14 for the escape of air. This opening may if desired be formed in the cap instead of the tube.

Steam is admitted to the steam cylinder either through a hand valve director through any ordinary steam valve indirectly controlled by a hand lever or other hand device. In Fig. 1 I have shown the steam piston connected to a lever E for operating a hand upon a drum F. This arrangement of my invention is equally adapted for operating the brakes upon locomotives and cars or brakes upon other kinds of machinery. The steam cylinder is provided with supply and exhaust pipes *g*, *g*, leading from a valve G. The casing of said valve is also connected with a live steam pipe *g'* and an exhaust pipe *g''*.

Referring to Figs. 2 and 3 it will be seen that the brake valve G consists of a casing or steam chest 15 connected to a valve seat 16. In the valve seat are ports 17 communicating with the pipes *g*, *g*, and ports 18 communicating with the exhaust pipe *g''*. The valve proper 19 is circular in outline, with a section

removed at 20 so that when it is turned in either direction from its central position it will obtain one or other of the live steam ports 17. In the face of the valve are channels 21 as shown in dotted lines through which the ports 17 are alternately put in communication with the exhaust ports 18. The valve is provided with a spindle 22 which is turned by a lever handle 23. A dial plate 24 is connected to the valve casing and a pointer 25 adjacent to the dial is connected to the handle 23 for convenience in adjusting the valve.

The operation of the invention so far as described is as follows: The air cylinder is always supplied with air through the check valves 6 which permit the air to enter more or less freely but prevent its escape. The valves 10 are adjusted so that the air cannot escape from the cylinder until a certain predetermined pressure has been attained. If now it is desired to put on the brakes with a certain degree of force steam is admitted in the proper end of the cylinder, as indicated by the dial of the brake valve, and the pistons of the two cylinders are simultaneously forced in the same direction. The air does not immediately escape from the valve device D but is retained and compressed until it attains a certain pressure which is regulated by the spring 13. Therefore if the steam is shut off when the desired force has been exerted upon the brake, whether the force be light or great, the pistons will remain stationary, being held in equilibrium by the pressure of the confined steam on one side of the piston *a* and the resistance of the compressed air upon the opposite side of the piston *b*. When the brake valve is again set to release the brake the expansion of the compressed air in the cylinder B will aid the steam cylinder in the release movement. The valve devices D of the air cylinder are set a short distance from the ends of said cylinder, and the cylinder heads are concave on their inner sides thus forming a considerable chamber at each end of the air cylinder to serve as an air cushion and prevent damage to the machinery should the brakes be put on or off under full head of steam. It will be evident that for brakes and some other purposes I may dispense with the valve device D upon the end of the cylinder toward which the piston moves in applying the brake, and substitute a simple port without valves.

In Fig. 5 the air and the steam cylinders are constructed the same as shown in Fig. 1. The valve of the steam cylinder is an ordinary slide valve confined in a steam chest H. In this figure the steam power is applied to shift a rock shaft I to which may be connected the links or other reversing gear of a locomotive. Upon the rock shaft is mounted a lever *i* which is connected by a link *l'* to the piston rod *a'*. The valve stem *h* is connected to one end of a lever *m*, the other end of said lever being pivotally connected to the free end of the lever *i*. A rod *n* is connected at *o* to the

lever *m* and at *o'* to a hand lever P such as is ordinarily used for reversing purposes in a locomotive cab.

The operation of the mechanism shown in Fig. 5 is as follows: When it is desired to reverse the engine or to adjust the cut-off the lever P is set at the proper point upon the quadrant *p*. The lever *i* and piston rod *a'* being at the same time stationary, the lever *m* will be moved about its connection with the lever *i*, thus shifting the valve in the steam chest H. The steam thus admitted to the cylinder A will shift the piston and rock the lever *i* which in turn will move the lever *m* upon its fulcrum *o* and automatically shut off the steam from the cylinder A when the shaft I and the reversing mechanism has been brought to the proper point. The parts will be held in the position thus obtained by the equilibrium between the steam in the cylinder A and the compressed air in the cylinder B the same as above described in connection with Fig. 1.

It will be evident that the application of my invention need not be confined to the specific forms and mechanisms shown and described and therefore I do not wish to be understood as limiting myself to such specific applications.

What I claim and desire to secure by Letters Patent is:

1. The combination with a steam cylinder and its piston and piston rod, of an air cylinder, a piston in the air cylinder connected with the piston rod of the steam cylinder, inlet valves for the air cylinder communicating with the atmosphere, spring pressed outlet valves for said cylinder also communicating with the atmosphere and means for varying the tension upon one or both of the outlet valve springs, substantially as described.

2. The valve device for air cylinders consisting of the casing attached to the cylinder and communicating with the cylinder and with the atmosphere, the spring pressed inlet valve, the branch tube provided with a seat for the outlet valve, an outlet opening and a screw threaded cap, the valve having a stem extending through the cap, and the spiral spring surrounding the stem between the valve and cap, substantially as described.

3. The combination with a brake of a steam cylinder having a piston connected with the brake, a hand valve for regulating the supply and exhaust of said cylinder, an air cylinder having its piston also connected with the brake, inlet and outlet ports for the air cylinder communicating with the atmosphere, spring-pressed valves for said ports—, and means for varying the pressure upon the outlet valves, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

BERNARD T. REILLY.

Witnesses:

J. A. WATSON,  
WILL E. NEFF.