W. NAYLOR.

Improvement in Steam and Air Brakes.

No. 130,064. Patented July 30, 1872.

FIG. 1.

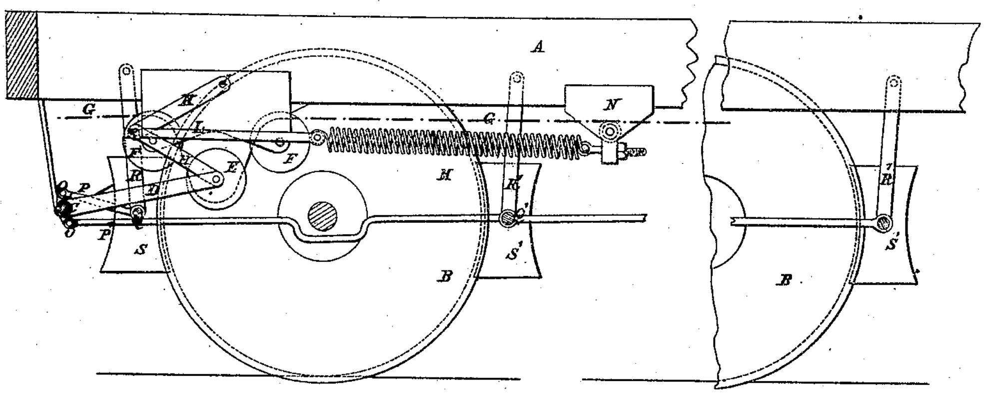


FIG. 2.

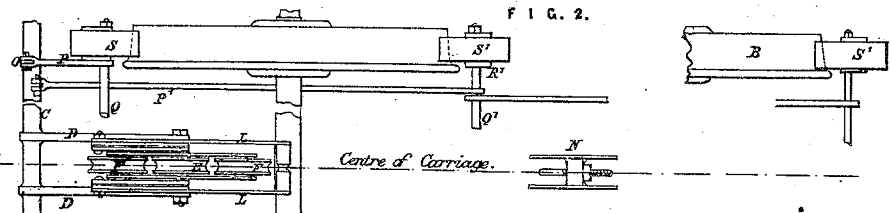


FIG. 3.

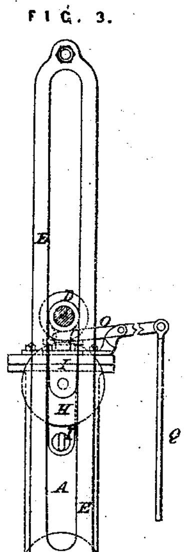


FIG. 4.

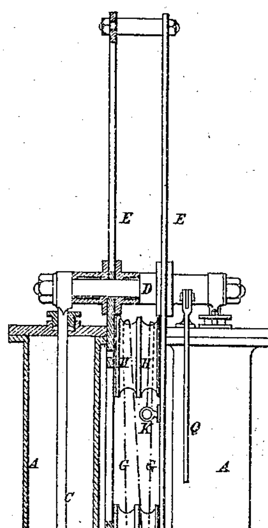


FIG. 5.

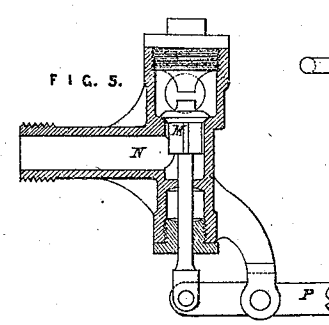


FIG. 8.

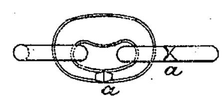


FIG. 7.

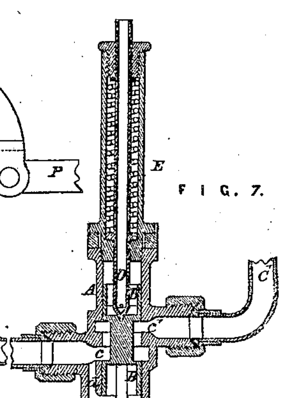


FIG. 6.

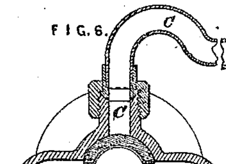
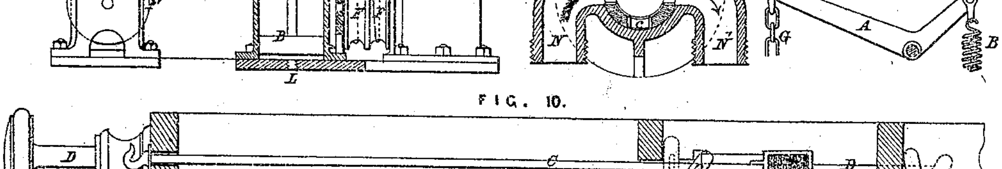


FIG. 9.

FIG. 10.



WITNESSES { Chas. Foster, John Parker

W. Naylor by his attys Howson and Son

UNITED STATES PATENT OFFICE.

WILLIAM NAYLOR, OF MILDMAY PARK, ENGLAND.

IMPROVEMENT IN STEAM AND AIR BRAKES.

Specification forming part of Letters Patent No. **130,064**, dated July 30, 1872.

SPECIFICATION.

I, WILLIAM NAYLOR, of Mildmay Park, in the county of Middlesex, England, engineer, have invented Improvements in Railway Brakes and in apparatus connected therewith, of which the following is a specification:

This invention relates to that class of continuous-action brakes for railway carriages wherein the power of a spring, in combination with toggle-links, is employed for applying the brakes, and the direct force of steam, air, or water is employed for taking off the brakes; and consists of certain improvements, hereinafter described, in the construction and arrangement of such brakes, and of the mechanical appliances requisite for working the same.

Figure 1 of my drawing represents a longitudinal sectional elevation of my improved arrangement of continuous brake for railway carriages, wherein the spring acts by its contractile strain; and Fig. 2 is a corresponding plan of the same.

A represents the carriage-frame, and B B the wheels. C is the weigh-shaft, supported at each end in brackets bolted to the framing, and having keyed or otherwise secured to the center thereof, so as to be in the longitudinal center line of the carriage, the double or parallel brake-lever D. This lever D carries a grooved pulley, E, at its extremity, under which and over two other fixed pulleys, F F, passes the continuous rope or chain G, which extends throughout the train, and whose function is to maintain the several brake-levers D elevated and the brakes "off." To the free end of the brake-lever there are jointed the pair of toggle-joint links H, one end working on a fixed center at I in the main framing. To the center joint K of these links H there are connected the side links L L and central helical spring M, the extremity of the latter being adjustably connected to a bracket, N, secured to the main framing. This spring operates by its contraction to put on the brakes, the pull upon the center joint at K tending to straighten the toggle-joint links and force down the brake-lever in connection therewith, thereby applying the brakes so soon as the continuous rope or chain G is released or slackened sufficiently; the same operation takes place simultaneously, or nearly so, throughout the whole of the brakes of the series. The brake-levers act upon the brakes through the weigh-shaft C, short lever-arms O O′, and rods P P′, which latter are connected to the transverse tie-rods Q Q′, suspended in the links R R′, and carrying the pairs of brake-blocks S S′. These blocks are by preference composed of cast-iron, and are made reversible—that is to say, they are free to turn on the rods Q Q′, so that when one face of a brake-block becomes worn the other can be brought into operation.

When the brakes are to be taken off the rope or chain is hauled upon either by the direct action of steam, compressed-air, or water pressure, as hereinafter fully described, whereupon the several brake-applying springs will be again brought to a state of tension or compression, as the case may be, and the brake-levers elevated and maintained in that condition by the tension of the continuous rope or chain until the brakes are required to be again applied. If preferred, the weigh-shaft C, in lieu of being situate near the end of the framing, as shown in Fig. 1, may be placed between the wheels, and transmit motion to the brakes by an arrangement of links and push-rods, similar to that shown in my specification No. 1. Figs. 3 and 4 represent two sectional elevations, taken at right angles, the one to the other, of an improved arrangement of direct-acting steam, compressed-air, or hydraulic lifter for hauling in the continuous rope or chain, with a view to lifting or taking off the brakes of railway trains, and maintaining or supporting such brakes out of action until required for application. A lifter similar to this is intended to be placed at one or both ends of the train—namely, in the brake-van or in the brake-van and on the engine. A A are two steam-cylinders, B B are pistons working therein, connected by their rods C C to the common cross-head D, which works between the stationary slotted guides E E. To one end of these guides there are fitted one or more stationary pulleys, F F, corresponding traversing-pulleys H H being connected by the links I I with the cross-head D. G is the continuous rope or chain already referred to, and illustrated in Figs. 1 and 2, which is intended for lifting off the brakes and maintaining these clear of the wheels. This chain G has

one end secured to a fixed point, K, and is passed round the pulleys H and F, and thence passes underneath the carriages along the center of the train, so as to be connected with the several brake-levers in the manner shown in Figs. 1 and 2. So long as steam from the boiler is admitted underneath the pistons of the lifter by the orifice L the cross-head carrying the pulleys H will be elevated or moved to the extremity of its guides, and will thereby maintain the rope or chain G hauled taut and the brakes lifted off. On allowing the steam to escape from the cylinders of the lifter the several helical springs and toggle-joint levers hereinbefore referred to are permitted to come into action and apply the brakes, the piston of the lifter being left free to be drawn, by the rope or chain G, to the opposite end of the cylinders as the said chain is run out by the descent of the several brake-levers. As it would be objectionable to allow the pistons to strike the end of the cylinders I propose to leave a sufficient quantity of steam confined within the cylinder to form a cushion which shall arrest the motion of the pistons gradually and gently during the putting on of the brakes. To accomplish this I have a valve, M, Fig. 5, in the pipe or passage N, through which the steam enters the lifter and escapes therefrom as required, as I shall presently explain. This valve allows free ingress of steam to the lifter, and is also kept open against the current of exhaust steam when the communication with the boiler is shut off; but just before the pistons reach the end of their cylinders the valve is closed, so as to check all further escape, by means of the levers O P and rod Q, the lever O being struck by the cross-head D, transmitting its motion to the lever P, which closes the valve M. Fig. 6 represents an improved arrangement of three-way cock which I employ for the purpose of taking off and putting on the brakes, as above described. N N′ are two branches, either one of which leads to the lifter and corresponds to the branch N containing the cushion-valve shown in Fig. 5, while the other opens direct to the atmosphere. This cock is situated on the engine, and communicates, by the branch-pipe C, with the boiler through an improved pressure-regulator, which I shall presently describe. If the engine be changed from one end of the train to the other the respective functions of the two branches N and N′ of the cock will also be reversed—that is to say, the one which was previously connected by a pipe extending along the train to the lifter will be left open to the atmosphere as an escape or exhaust, while the other branch, which previously served as an escape, will form the connection with the lifter. D is the plug of the cock, made hollow and provided with three openings, *n*, *n′*, and *c*. In Fig. 6 the plug is shown in the position in which it is to be turned when the brakes are to be applied—that is to say, with the branch C closed and the steam from the boiler shut off, while the escape from the lifter cylinder or cylinders is fully open through the openings *n n′* and branches N N′, as shown by the arrow. Now, by a mere quarter of a turn of the plug D the steam can be admitted again into the lifter through the branch N or N′, as the case may be, while the opposite escape-aperture is simultaneously closed, thereby causing all the brakes to be lifted off. As it is not expedient to employ the full boiler-pressure for working the lifter, I propose to reduce the said pressure to the desired amount by causing the steam to pass through the peculiar pressure-regulator, of which Fig. 7 is a sectional elevation. This improved pressure-regulator consists of a cylinder, A, of uniform bore, having two equal-sized pistons, B B, working steam-tight therein, and being provided with two lateral openings, *c c′*, situate between the two pistons. The opening *c′* communicates with the pipe C′ leading direct from the boiler, and the other opening, *c*, communicates with the pipe C leading to the branch C of the three-way cock, Fig. 6, last described. From the opening or branch *c* a lateral branch passage, *d*, leads to the under side of the bottom piston. On the top piston rests a spindle, D, which is pressed down by a helical spring, E. The steam, on its first entering between the pistons, exerts an equal pressure on both; but, as a portion of the steam finds its way by the passage *d* underneath the bottom piston, the equilibrium is destroyed and the pistons are elevated more or less against the pressure of the spring. This elevation of the pistons closes more or less the orifice *c*, and, by wire-drawing the steam at that point reduces its pressure before it enters the three-way cock, Fig. 6, which directs it to the lifter. Should the pressure in the boiler increase, then the pistons will be still further raised against the pressure of the spring and the orifice at *c* still further reduced until the resistance of the spring balances the extra pressure of the steam under the bottom of the lower piston. Should the pressure in the boiler fall, then the spring will depress the pistons and increase the opening at *c*, thus maintaining in the cylinders of the lifter a nearly uniform pressure, which never exceeds that which is necessary for the efficient working of the apparatus. The continuous rope or chain G is composed of several lengths coupled together, each carriage containing its own portion. Fig. 8 represents a peculiar construction of links for facilitating the coupling and uncoupling of the several lengths of rope or chain in each carriage when making up a train, the several lengths when coupled up constituting the continuous rope or chain before referred to. These links are cut through on one side, and have their adjoining ends beveled to a knife or V edge, as shown at *a*, and as both the links are precisely the same it is simply necessary, in order to couple or uncouple them, to bring the cut or divided portion of one link at right angles or crosswise to the other, so that the V-ends of one link will fit into the V-recesses on the opposite sides of the other

link, when the two may be readily engaged or disengaged.

In applying this system of continuous brakes to rolling stock having buffers and draw-bars of long range some difficulty may be experienced from the slackening of the continuous rope or chain or from the subjecting of the same to an undue strain, but both these objections may be obviated by either of the following contrivances. A bell-crank lever, A, (see Fig. 9,) may be fixed to the end of the last carriage, having a spring, B, attached to the shorter arm, while the continuous rope or chain G, after passing round a guide-pulley, is connected to the larger arm. Owing to the action of the bent lever the spring will exert a uniform or nearly uniform tension on the chain in whatever position the lever may be drawn; or a weight slightly exceeding the force required on the continuous rope or chain may be suspended at the end thereof; or bell-crank or other levers, A and B, Fig. 10, may be connected by one arm to the draw-bars C, or to the buffer-rods D, while the other arm carries a pulley, E, which, by diverting more or less the continuous chain G from a right line, will cause it to vary in length, as may be required; or a spring may be employed, fixed at one end and at the other connected to a pulley pressing on the chain or rope, the normal position of which being slightly out of a right line any undue strain will cause the pulley to push back the spring and thus relieve the chain.

Although I have had occasion herein to describe several distinct mechanical contrivances, each embodying its own improvements, yet they are all intended to be employed in combination and constitute one system of brake mechanism.

Having now described my invention, I would observe that what I claim is—

1. The combination of spring M, toggle-links H, and brake-lever D with the pulley E, continuous rope or chain G, and brakes S S′, all arranged and operating together substantially in the manner and for the purpose hereinbefore described.

2. The peculiar combination of cylinders A, pistons B, cross-head D, pulleys F and H, and cushion-valve M, arranged and operating together substantially in the manner and for the purpose hereinbefore described.

3. The peculiar construction and arrangement of pressure-regulator, consisting of the cylinder A, of uniform bore throughout, the equal-sized pistons B, spring E, lateral passage *d*, and apertures *c* and *c′*, operating substantially as and for the purpose hereinbefore described.

4. The peculiar construction of coupling-links, as hereinbefore described, and illustrated by Fig. 8 of my drawing.

5. The peculiar arrangements for taking up the slack of the continuous rope or chain, and for preventing the same from being subjected to undue strains, as hereinbefore described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM NAYLOR.

Witnesses:

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