H. E. BROWN.

BRAKE MECHANISM FOR RAILWAY AND OTHER VEHICLES.

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WITNESSES:

Inventor

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To all whom it may concern:

Be it known that Harvey Ezra Brown, a citizen of the United States of America, residing at Beechcroft, London Road, Norbury, in the county of Surrey, England, consulting engineer, has invented certain new and useful Improvements in or Relating to Brake Mechanism for Railway and other Vehicles, of which the following is a specification.

This invention relates to brake mechanism for railway and other vehicles of the kind referred to in the specification of my British Patent No. 2023 dated 1st February, 1905, and has for its object to raise the efficiency of the apparatus and to compensate for the friction incidental to that mode of working, described in my aforesaid prior specification. According to the arrangement proposed in my said prior specification for carrying my invention into effect, the tangential pull or upward or downward movement of the brake blocks—dependent upon the direction of travel of the vehicle—was utilized either by means directly connected with the brake cylinder or by means of intermediate connections therewith to oppose more or less the force exerted by the brake cylinder and so govern the pressure of the brake blocks upon the wheels by reducing or increasing the effective pressure exerted upon them by the cylinder. This mode of working although capable of yielding satisfactory results is found in practice to entail a certain loss of power in transmission from the brake blocks to the brake cylinder due to the friction in the connections. With a view to minimizing this effect of friction and facilitating the working of the system it is proposed to arrange that the aforesaid tangential pull or upward or downward movement of the brake blocks shall in the first place directly and positively arrest the movement of the brake cylinder or other motive power and that in the second place any further tangential movement, instead of tending to retard or push back the brake cylinder, shall bring into operation a device which moves, or permits the blocks to move, to a greater or less degree away from or towards the wheels, and as the cylinder is held in check and is prevented from following up this movement, the pressure of the brake blocks upon the wheels is reduced or increased by an increase or reduction respectively of the movement already made by the blocks. Thus the tangential pull on the brake blocks is maintained uniform notwithstanding the varying coefficient of friction between the brake blocks and the wheels; the uniform tangential pull producing a uniform retarding effect.

In order that the said invention may be clearly understood and readily carried into effect I will proceed to describe the same more fully with reference to the accompanying drawings in which I have illustrated several examples of the manner of effecting the mode of working above described.

Figure 1 represents an arrangement in which the tangential pull of the brake blocks is adapted as hereinbefore described, to, in the first place, definitely and positively arrest the movement of the brake cylinder or other motive force and in the second place to bring into operation a device, which, in the example illustrated, consists of a cam, whereby the blocks are permitted to move to a greater or less degree away from or towards the wheels. Figs. 2 and 3 are, respectively, a side view and a plan (detached) of means for definitely and positively arresting the movement of the brake cylinder. Figs. 4 and 5 are, respectively, a side view and a plan of another arrangement of a kind similar to that illustrated in Figs. 1 to 3. Figs. 6 to 10, inclusive, illustrate a further arrangement whereby the above described effect is obtained by allowing the brake blocks to move by an arc away from or towards the wheels, Fig. 6 being a side view and Fig. 7 a corresponding plan of the device, while Figs. 8, 9 and 10 are respectively a face view, a side view and a plan of another means of holding the cylinder in check; in each and all cases the method employed consists in suspending one or more of the brake blocks by a flexible arrangement, fixed or adjustable so as to give only the desired amount of static energy to the blocks so suspended.

The amount of this static energy is prearranged or adjusted so that the tangential pull of the wheels upon the brake blocks is less than the adhesion of the wheels to the rails. The factors which produce this tangential pull are the pressure of the brake blocks on the wheels and the friction between them. When the product of these two factors is sufficient to produce a tangential force equal to the prearranged static energy, the limit of permissible retardation is reached and the brake blocks move; the first and immediate effect of this movement is to arrest the movement of the brake cylinder or motive force, the blocks at and from this time being held in a state of equilibrium out of their normal position by the balanced forces of the tangential pull of the wheel and the flexible hangers (preferably constructed of levers and springs). At this stage, the further movement of the cylinder is already arrested and the two forces—the tangential pull on the brake blocks and their flexible resisting supports are in equilibrium; any change in the coefficient of friction between the blocks and the wheels (this generally increases as the velocity reduces) will destroy this equilibrium. A reduction of this friction has the effect of allowing the blocks to retract and resume their normal positions and allow of the release of the previously arrested cylinder, rendering it free to again exert its full force upon the brake blocks. An increase of friction however has the effect of destroying the aforementioned equilibrium by moving the blocks further from their normal positions. Now this increased movement of the blocks is suitably arranged to produce a proportional movement of the brake blocks away or from the wheels (which the a-
ready arrested cylinder cannot follow up and compensate for and this movement of the blocks results in a reduction of the pressure of the latter on the wheels, producing at all times and in all positions a pressure varying inversely with the co-efficient of friction and producing a uniform tangential pull and thereby a constant retardation.

It will therefore be seen that the essential features of the herein described brake consist, first, in a flexibly supported block or blocks providing a given amount of static energy, secondly, a condition which, upon this energy being overcome by the tangential pull of the block or blocks, the further movement of the cylinder or motive force is arrested, and, thirdly, the arrangement that any further movement of the brake blocks, due to the tangential pull of the wheel, is adapted to move the blocks or allow them to move away proportionately from the wheels and proportionately reduce the pressure between them and the wheels, or that any retraction of the movement already made by the blocks brings about an increase of the pressure on the wheels until the said retractive movement brings the parts into the position which effected the arresting of the cylinder when the latter will be released, thus providing a varying governed pressure which shall at each and every instant of time be of just such an amount as will when multiplied by the inversely varying friction produce a constant tangential force and thereby a uniform and equal retardation of the vehicle regardless of the variation of the friction between the blocks and the wheels.

Referring now to Figs. 1 to 8, the desired static energy is given to one pair only of the brake blocks by compression of the springs b by the bolts b pulling the double bell crank levers e against the vertical surfaces of the brackets d and the blocks e being connected thereto by the links j j. In Figs. 4 and 5, the method is similar.

In Fig. 6, the blocks are arranged so as to move radially; the blocks are therefore suspended in this instance by the two single bell crank lever g, g, the respective centers g, g of which are arranged in a line tangential to the wheel. At the outer ends g, g of each of these levers, g, g arc the springs g, g each of which is compressed to an amount sufficient to produce the desired stability or static energy of the brake block, and is held so compressed by the bolts g, g. If the block is moved downwards the spring g is compressed; if the block is moved upwards the spring g is compressed. When one spring is compressed, the opposite one is held in check by its bolt and cannot follow up the movement of the lever at that side. There are many ways in which this stability or static energy may be given to the blocks and the two methods shown are given as examples of the means of accomplishing the object.

Referring again to Figs. 1 to 3, the second essential feature of the present improvements, viz: arresting the movement of the brake cylinder or motive force, may be brought about in the following manner:—When the brake block e is moved by the tangential pull of the wheel, it carries with it the bell crank lever e which rotates about either center c, or c, depending upon the direction in which it is moved; however, in whichever direction it is moved, it causes the shaft h (preferably square) to move away from the pawl trip h’ (Fig. 2) and allows the pawl h to drop or be forced into engagement with the ratchet h which is in turn connected directly or indirectly to the brake cylinder or motive power and positively arrests its further movement.

In Figs. 4 and 5 the method employed is similar to that just described with reference to Figs. 1 to 3.

In Figs. 6 to 10, inclusive, it is desired to have the arresting device in a different position on the vehicle and a cord, cable, wire or chain i is attached to the block e through a bar v in such a manner that the movement of the block in either direction has the effect of pulling the same; the other end of the cable is run to the point where it is desired to fix the pawl and ratchet or other suitable arresting device. In the example shown, it is attached to a cam shaped bar v which when pulled allows the pawl h to come into engagement with the ratchet h, the said ratchet being connected directly or indirectly with the motive force or brake cylinder, the further movement of which it arrests when so engaged. This arresting of the cylinder or motive force may be effected in various other ways but I have shown the above methods by way of example, as illustrating means capable of being used for the purpose.

With further reference to Fig. 1 and, assuming that the first and second conditions or essentials have been fulfilled, viz, that the tangential pull of the wheels has forced the blocks to move a small amount and that this movement has, as described, arrested the further movement of the brake cylinder, the next condition to be effected is that the then existing tangential pull of the brake blocks will be maintained notwithstanding any variations of the friction between the brake blocks and the wheels; two examples of means of bringing this about are shown.

In Fig. 3, the usual truss beam carrying the brake block e is extended and forms the plate e’, the extreme end e” of which is suspended by links e” and which forms a fulcrum about which the truss beam as a whole moves when the blocks are forced upwards or downwards. At any convenient point between the fulcrum end and the end at which the brake blocks are attached, there is formed in this plate extension a crown shaped cam e; against the center of this cam the usual brake lever e, which is hung by links e, is arranged to press (preferably through a roller e mounted thereon); the brake cylinder pull is arranged in the usual manner upon the other end of this lever e through rod e. Now, when this rod is pulled, it causes the blocks in the well known way to be drawn towards and pressed against the wheels; the position of this lever e is fixed vertically by the links e and therefore when the brake blocks e are moved, carrying with them the cam formed in the plate e’, the roller or bearing point e travels off the crown of the cam e and down the incline in a direction to reduce the pressure upon the brake blocks which are already arrested by the brake blocks against the point where the pressure is just sufficient when taken with the existing friction at the brake block to balance the force of the spring a thereby maintaining a constant uniform tangential pull upon the brake blocks.

Referring to Figs. 6 and 7, this last essential of governing the pressure on the brake blocks is effected by the brake blocks moving on the bell crank levers through an arc to or from the wheel, direct, a movement which
in this case also the cylinder cannot follow up because of having been previously stopped and arrested. This condition or essential of the herein described brake mechanism may also be effected in various ways, the means I have illustrated being given as examples of carrying out this part of my invention.

What I claim and desire to secure by Letters Patent of the United States is—

1. In brake mechanism for railway and other vehicles, a brake block applying means, means cooperative therewith and actuated by the tangential pull on the blocks for definitely and positively arresting the application of the brakes, whereby the said brake blocks are caused to move towards or away from the wheels and thereby produce a variation of pressure thereon.

2. In brake mechanism, a brake block applying means, and means cooperative therewith and actuated by the tangential pull on the blocks for definitely and positively arresting the application of the brakes, and then bringing into operation a device which increases or reduces the brake block pressure.

3. In brake mechanism, a brake block applying means, and means cooperative therewith and actuated by the tangential pull on the blocks for definitely and positively arresting the application of the brakes, and then bringing into operation an oscillatory frame which increases or reduces the brake block pressure.

4. In brake mechanism, a brake block applying means, and means cooperative therewith and actuated by the tangential pull on the blocks for definitely and positively arresting the application of the brakes, and then bringing into operation an oscillatory frame attached to the bottom of the vehicle which increases or reduces the brake block pressure.

5. In brake mechanism, a brake block applying means, and means cooperative therewith and actuated by the tangential pull on the blocks for definitely and positively arresting the application of the brakes, and then bringing into operation an oscillatory frame connected to said blocks and a normally vertically disposed lever for actuating said frame and causing an increase or reduction of the brake block pressure.

6. In brake mechanism, a brake block applying means, and means cooperative therewith and actuated by the tangential pull on the blocks for definitely and positively arresting the application of the brakes, and then bringing into operation an oscillatory frame connected to said blocks and a normally vertically disposed slide bar for actuating said frame and causing an increase or reduction of the brake block pressure.

7. In brake mechanism, a brake block applying means, springs adjustable to obtain a given amount of static energy, brake blocks associated with said springs, and means actuated by the tangential pull on said blocks for definitely and positively arresting the application of the brakes and then bringing into operation a device which increases or reduces the brake block pressure.

8. In brake mechanism, a brake block applying means, springs adjustable to obtain a given amount of static energy, brake blocks associated with said springs, and a bolt extending through each of said springs, a rod terminally connected to said bolts, a bell crank lever carried by said rod and rotatable about a plurality of centers, a ratchet connected to the motive power, and means operated by the tangential pull on said brakes for engaging said ratchet and arresting the application of the brakes and then bringing into operation a device which increases or reduces the brake block pressure.

9. In brake mechanism, a brake block applying means, springs adjustable to obtain a given amount of static energy, bell crank levers, and link connections for said springs and brake blocks, cooperative pawls, a ratchet connected to the motive power, said bell crank levers being angular in cross sections and adapted when operated by the tangential pull on said blocks to engage and check the movement of the ratchet through the medium of said pawls, and means for then bringing into operation a device which increases or reduces the brake block pressure.

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

Harvey Ezra Brown.

Witnesses:
Richard Geo. Dunn,
Charles Hale.