Aug. 5, 1924. 1,503,882

F. M. CASTLEMAN

BRAKING APPARATUS

Filed March 17, 1920 5 Sheets-Sheet 1

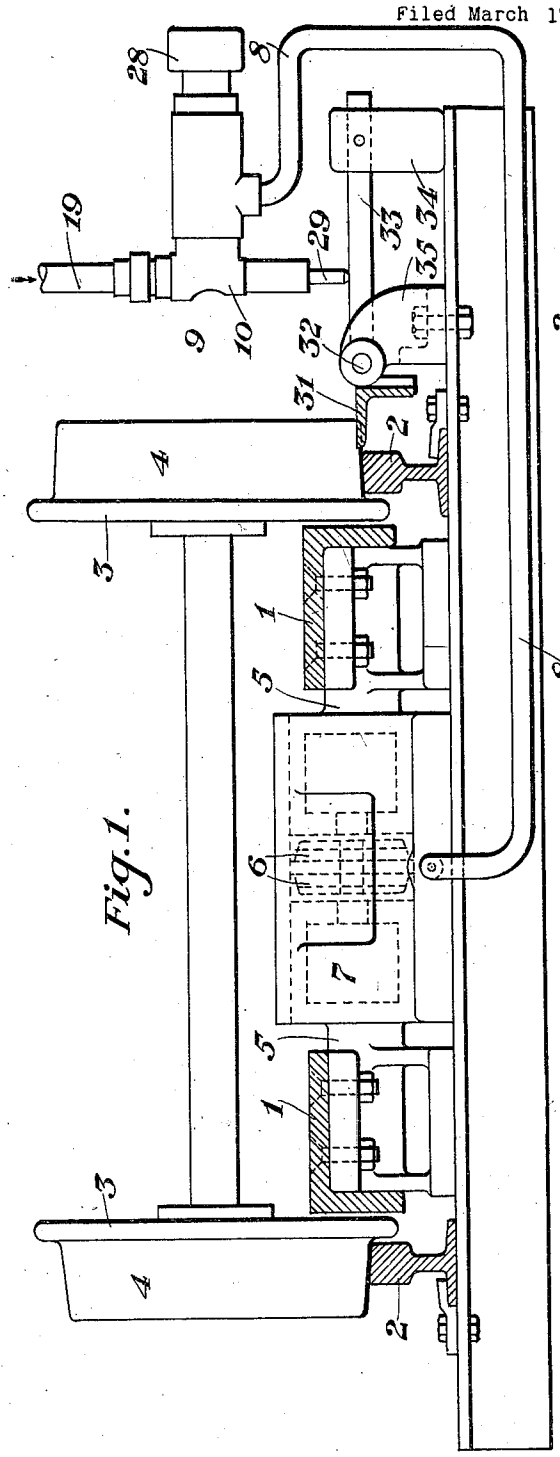


Fig. 1.

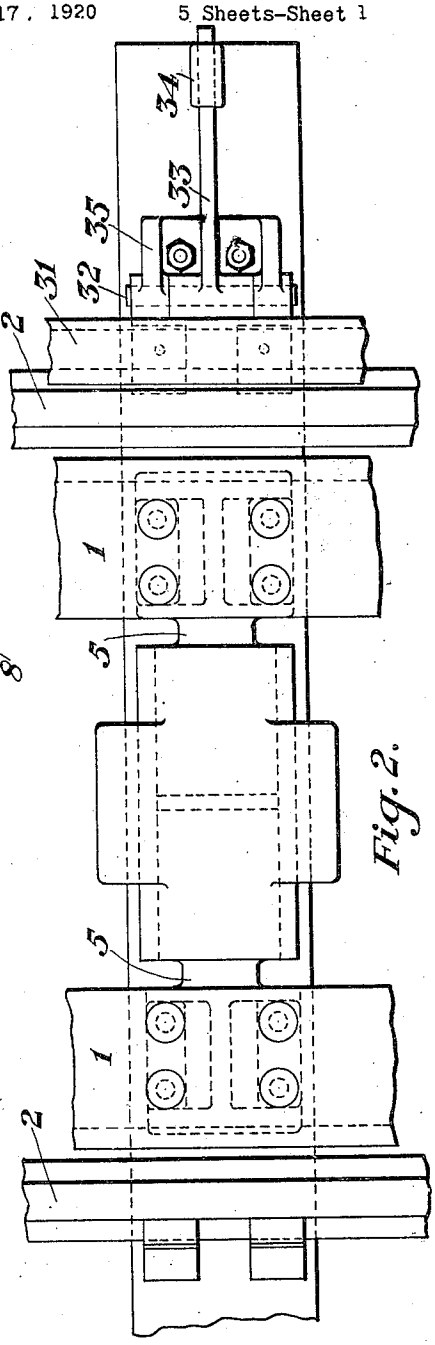


Fig. 2.

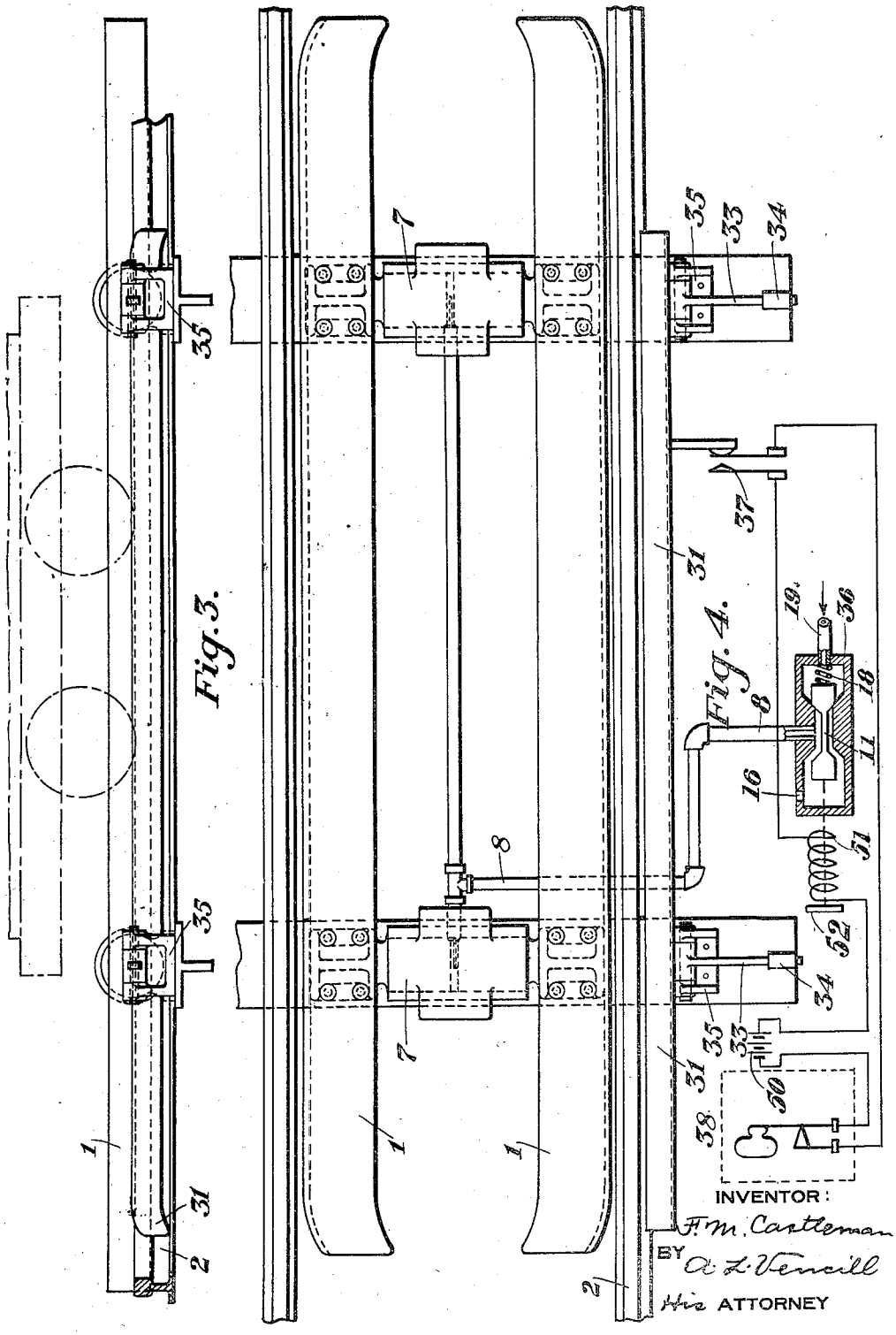
INVENTOR:
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BRAKING APPARATUS

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BRAKING APPARATUS

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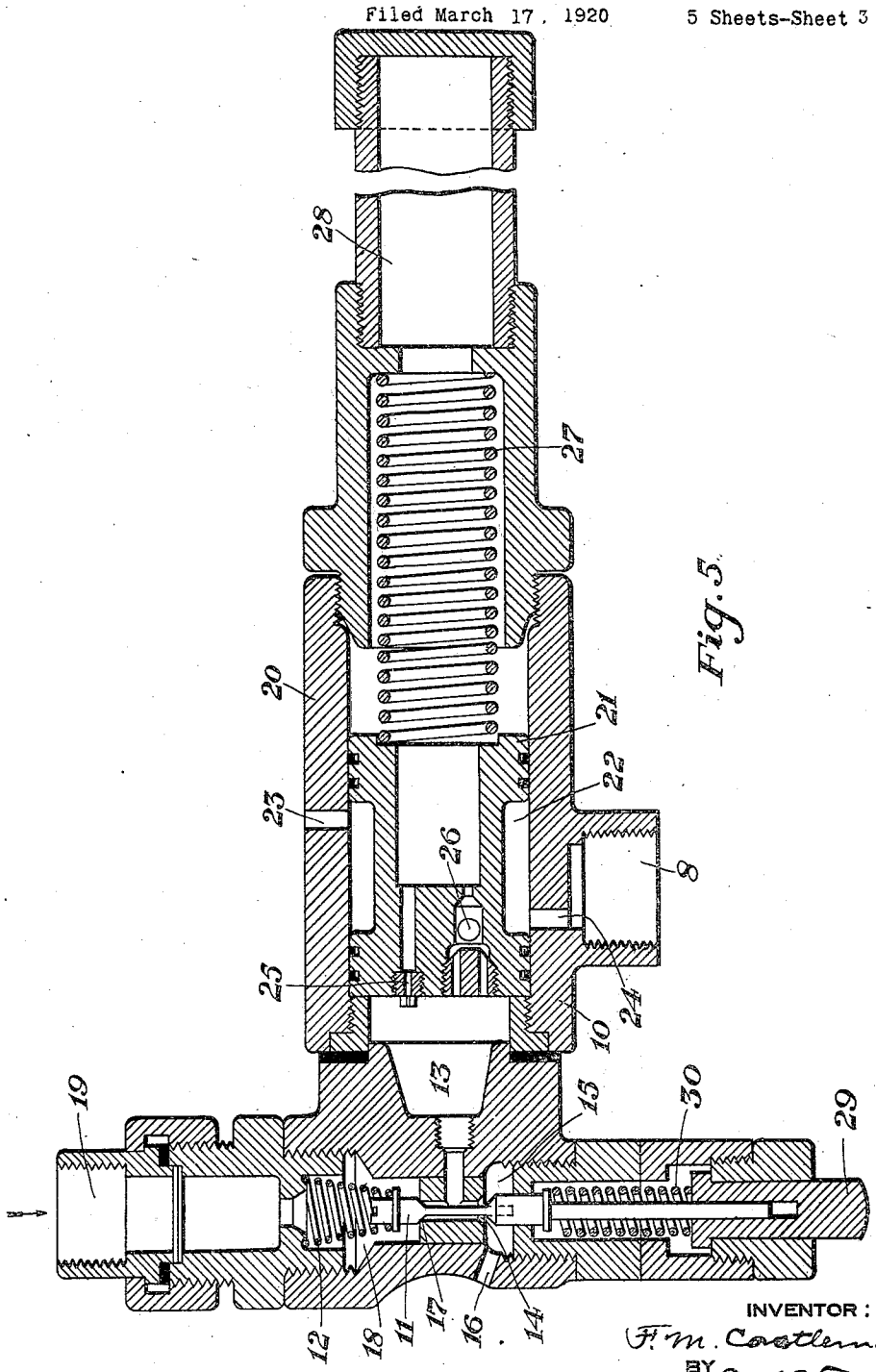


Fig. 5.

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Aug. 5, 1924. 1,503,882

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BRAKING APPARATUS

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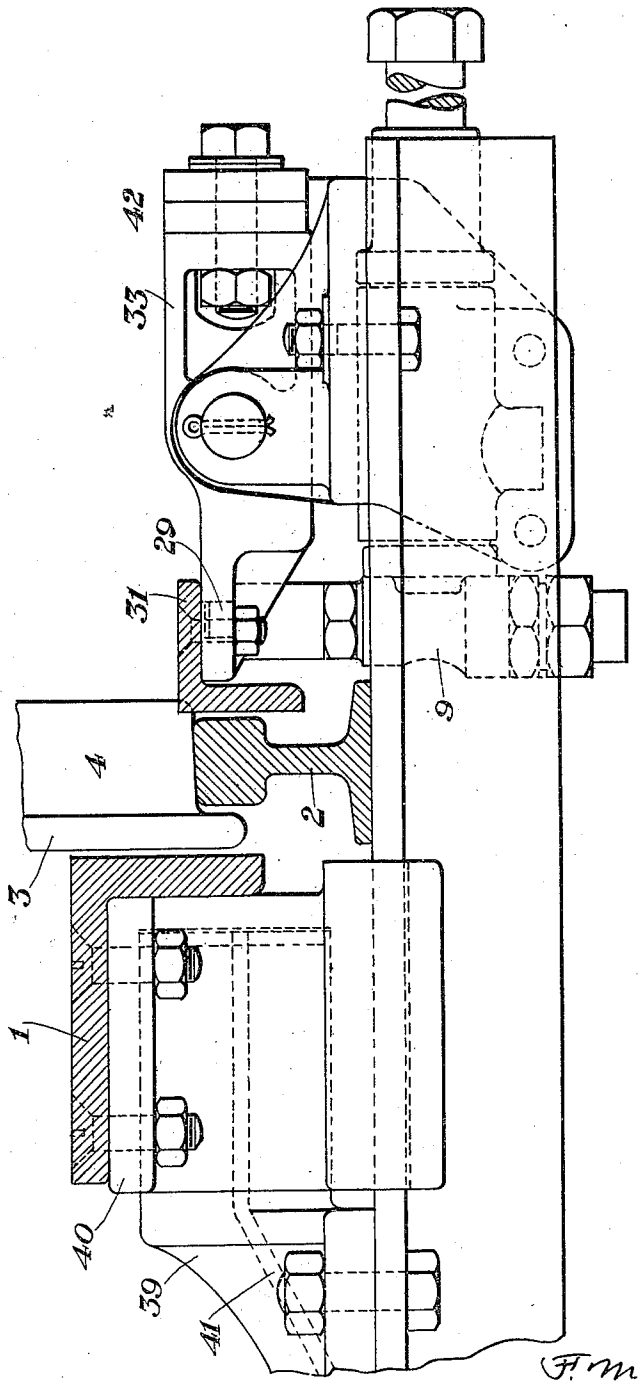


Fig. 6.

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Aug. 5, 1924. 1,503,882

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BRAKING APPARATUS

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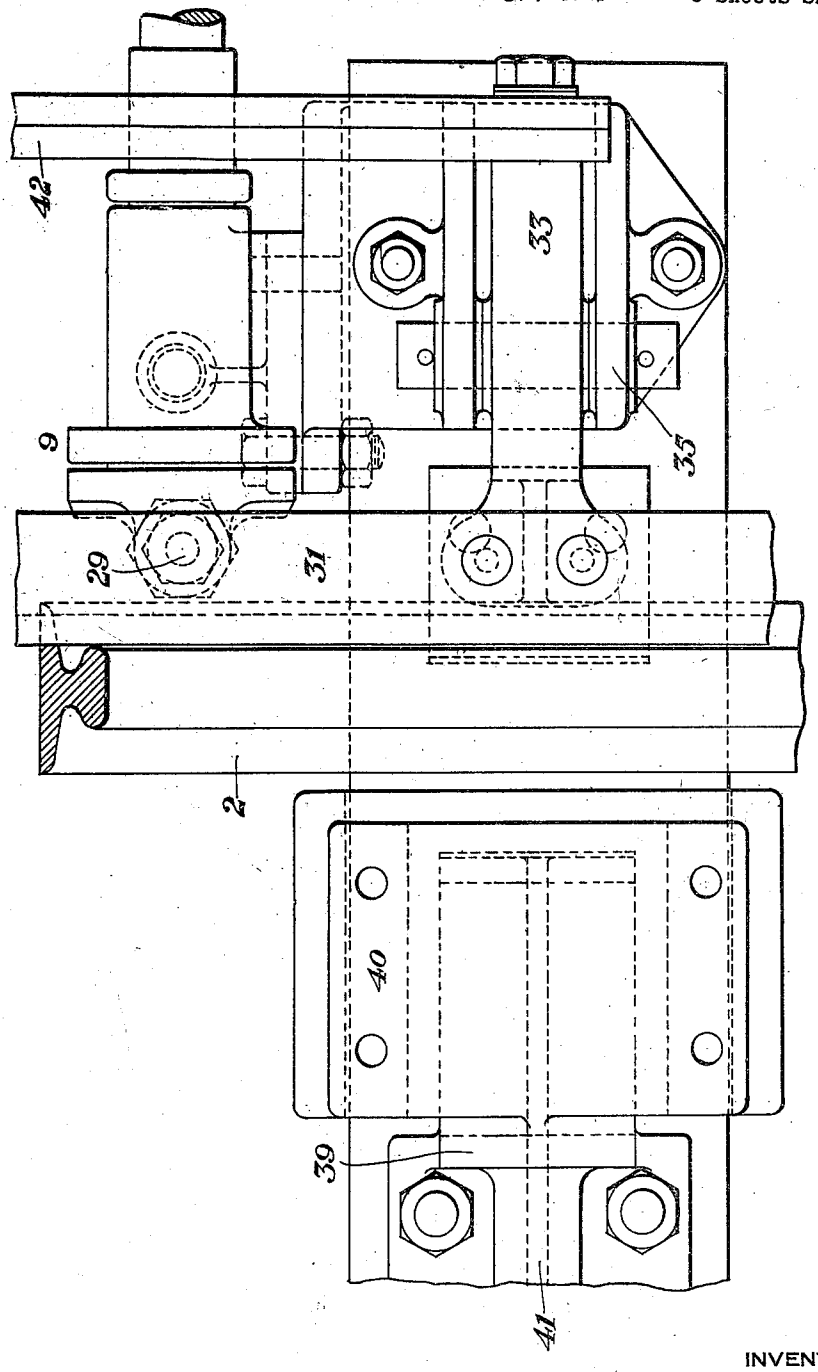


Fig. 7.

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Patented Aug. 5, 1924. 1,503,882

UNITED STATES PATENT OFFICE.

FRANK M. CASTLEMAN, OF ROTHERHAM, ENGLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

BRAKING APPARATUS.

Application filed March 17, 1920. Serial No. 366,712.

To all whom it may concern:

Be it known that I, FRANK MASTERS CASTLEMAN, a subject of the King of Great Britain, residing at Rotherham, in the county of Yorkshire, England, have invented a certain new and useful Improvement in Braking Apparatus, of which the following is a specification.

This invention relates to braking apparatus, and more particularly to apparatus of this character for use in connection with light railway track systems for mining tubs or trucks and the like.

The invention comprises an improved braking apparatus for systems of this description which shall enable the vehicles to be brought to rest or their speed retarded over any desired section of the track.

With this end in view, the track rails at the point, or throughout the section where speed control is desired, may be provided with brake bars or plates adapted to be operated preferably by fluid under pressure in such a manner as to engage the flanges or other portions of the vehicle wheels, the friction resulting from such engagement serving to retard the speed of the tub or truck so long as the engagement is continued.

The invention is illustrated in the accompanying drawings of which:

Figure 1 is a view in transverse elevation of a light railway track provided with braking apparatus constructed in accordance with one form of the invention.

Figure 2 being a plan view of the same.

Figures 3 and 4 are views in side elevation and plan respectively, illustrating on a smaller scale the general arrangement of the complete braking equipment of which the operating portion is illustrated in the preceding figures. Figures 3 and 4 also illustrate a modified system of control differing somewhat from that shown in Figures 1 and 2.

Figure 5 is a view in sectional side elevation of a portion of the apparatus illustrated in Figure 1, but on an enlarged scale.

Figures 6 and 7 illustrate a modification of the construction shown in Figures 1 and 2, Figure 6 being a view in transverse elevation of the portion of the braking apparatus associated with one track rail, Figure 7 being a plan view of the same.

Referring now first to the arrangements shown in Figures 1 to 4 inclusive, it will be seen that the improved braking apparatus comprises a pair of brake bars 1 of L-section arranged substantially parallel to the track rails 2 and extending along the portion of these track rails over which speed control is desired. The horizontal portion of the brake bars 1 is at a somewhat higher level than the heads of the track rails 2, the vertical portion of these brake bars extending downwards from the horizontal portion adjacent to the rails 2 which are separated from the vertical portion of the brake bars 1 by a space sufficient to admit the flange 3 of the wheel 4 of a tub or other vehicle mounted on the track. The brake bars 1 are arranged to be moved outwards when desired towards the track rails 2 so as to engage frictionally with the inner surfaces of the flanges 3 of the tub wheels 4, thus tending to grip the flanges 3 between the brake bars 1 and the track rails 2. In order to effect the outward movement above described, the brake bars 1 are bolted or otherwise secured to the stems or rods 5 of a pair of movable pistons or abutments 6 mounted within a common cylinder or casing 7. When it is desired to actuate the brake bars 1, fluid under pressure is arranged to be supplied to the portion of the cylinder 7 between the plungers 6 through a pipe 8 communicating with a controlling valve 9, the construction of which is illustrated in Figure 5 of the drawings.

Referring now to Figure 5, the controlling valve 9 is indicated as comprising a valve casing 10 containing a double beat valve 11 adapted normally to be maintained in the position shown in Figure 5 by means of a controlling spring 12. In this position the double beat valve 11 establishes communication between a chamber 13 formed in the valve casing past the lower valve seating 14 of the valve 11 to a chamber 15 communicating with the atmosphere through a port 16. The valve 11 is arranged to be moved to an upper position from the position shown, thereby cutting off the communication above described between the chamber 13 and the atmosphere and establishing communication between this chamber past the upper valve seating 17 of the valve 11 to a chamber 18 which is in communication

through an inlet pipe 19 with a source of fluid under pressure. The control valve 9 shown in Fig. 5 also comprises a cylindrical extension 20 of the chamber 13 containing a piston 21 provided with an annular groove or cavity 22 which when the piston 21 is in the position shown in Figure 5, establishes communication between the atmosphere through a port 23 and a port 24 leading to the pipe 8 shown in Figure 1.

Communication between the opposite ends of the piston valve 21 is also provided by a restricted port 25 and a ball valve 26. The port 25 affords a constant restricted communication between the opposite faces of the piston valve 21, the ball valve 26 permitting the unrestricted passage of fluid under pressure through the piston valve 21 to the chamber 13 but preventing the escape of fluid from this chamber in the opposite direction. The piston valve 21 is normally maintained in the position shown in Figure 5 by means of a spring 27 located on the opposite side of the piston 21 of the chamber 13, the spring 27 extending partly within a closed timing chamber 28.

The double beat valve 11 is arranged to be moved into its upper position in which communication between the chamber 13 and the atmosphere through a port 16 is cut off by means of a stem or rod 29, the end of which projects below the lower end of the valve casing 10, the rod 29 being resiliently connected to the stem of the valve 11 by means of a spring 30. The mechanism for operating the controlling valve 9 is illustrated at the right hand side of Figure 1 and comprises a treadle device consisting of an L-shaped treadle bar 31 pivotally mounted on brackets as indicated at 32 in Figures 1 and 2, the treadle bar 31 constituting one arm of a double armed lever, the other arm of which is indicated at 33 and is provided with a counterweight 34. As shown in Figures 3 and 4, the treadle bar 31 is of considerable length and extends parallel to one of the track rails 2, being supported by a pair of brackets 35 each provided with a lever arm 33 and counterweight 34, one only of which is shown in Figures 1 and 2.

The treadle bar 31 is so arranged that its upper surface is engaged by tread of the wheel 4 of a vehicle passing along the track rails, the treadle bar 31 being thereby depressed and raising to a corresponding extent the lever arm 33 against the action of the counterweight 34. During this upward movement the lever arm 33 engages with the rod or stem 29 of the control valve 9 thereby moving the double beat valve 11 from its lower or release position to its upper or braking position.

The operation of the braking apparatus as above described is as follows:—

A tub or other vehicle passing along the track rails 2 will upon reaching the treadle bar 31 depress the latter thereby raising a corresponding lever arm 33. By this movement the rod 29 of the controlling valve 9 is lifted and moves the double beat valve 11 to its upper or braking position against the action of the spring 12. Communication between the chamber 13 and the atmosphere through the port 16 is thus cut off and communication is established between the source of fluid under pressure through the pipe 19 and the chamber 13. Fluid under pressure thereby enters the chamber 13 and moves the piston valve 21 to the right against the action of the spring 27. The movement of the piston valve 21 to the right causes this valve to uncover the port 24 thereby establishing communication between the chamber 13 and the pipe 8 through the port 24. Fluid under pressure from the chamber 13 is thus permitted to pass through the pipe 8 to the interior of the casing 7 between the pistons or plungers 6 which are thereupon driven outwards from one another carrying with them the brake bars 1. The latter are thereby brought into engagement with the flanges 3 of the wheels 4 of the tub or vehicle and the speed of the latter is correspondingly checked.

During the outward movement of the piston valve 21 fluid under pressure in the chamber 13 passes at a reduced rate through the restricted port 25 to the opposite side of the piston valve and enters the timing chamber 28. The pressure obtaining in the chamber 13 tends, however, to close the ball valve 26 so that fluid under pressure can only pass from the chamber 13 to the timing chamber 28 at a rate dependent upon the cross-sectional area of the restricted port 25. The flow of fluid under pressure through this port causes equalization between the pressures in the chambers 13 and 28, after an interval of time dependent upon the capacity of the restricted port 25, and as soon as this occurs, the piston valve 21 returns to its original position under the action of the spring 27.

It will be understood that the interval of time required for effecting the retard movement of the spring valve 21 is dependent upon the restricted port 25 and the capacity of the timing chamber 28. When the piston valve 21 has returned to its normal position shown in Figure 5, the communication between the chamber 13 and the pipe 8 through the port 24 is again cut off and communication is established between the pipe 8 and the atmosphere through the port 23. As a result fluid under pressure is vented from the space between the pistons or plungers 6 which correspondingly no longer cause the brake bars 1

to engage with the flanges 3 of the vehicle wheels 4 and the braking action ceases to be effective.

It will be understood that by adjusting the capacity of the restricted port 25 or timing chamber 28 the controlling valve 9 can be arranged to cause the braking action effected to be continued for any desired interval of time after the vehicle first passes over the treadle bar 31 to initiate the braking action.

Referring now to Figures 3 and 4, the mechanical details therein illustrated are substantially the same as those above described with reference to Figures 1 and 2. Figures 3 and 4 illustrate, however, a different method of controlling the braking action under which the controlling valve 9 is not employed. Referring to Figure 4 it will be seen that the pipe 8 through which fluid under pressure is supplied to the casing 7 containing the plungers or abutments operating the brake bars 1 communicates with an electro-magnetically actuated valve 36, through which the supply of fluid under pressure from a suitable source to the pipe 8 and its release therefrom is controlled. The energizing circuit of the electro-magnetically actuated valve 36 is arranged to be controlled by means of switch contacts shown diagrammatically at 37 as operated by treadle bar 31, the electric circuit containing the switch 37 also including a battery 50, a magnet 51 and a hand-operated switch 38 by means of which the energizing circuit may be broken if desired. The valve 36 may be of any suitable type, and as here shown it is similar to a portion of the valve device shown in Fig. 5 in that it comprises a double beat valve 11 controlling pipes 19, 8 and port 16. When magnet 51 is de-energized, valve 11 is held down by spring 18 so that pipe 8 is open to atmosphere through port 16 and the brake bars are in released positions. When contact 37 is closed by a tub or vehicle passing over the treadle bar 31, magnet 51 becomes energized and its armature 52 then lifts valve 11 against the action of spring 18, thereby supplying air from pipe 19 to pipe 8 so that the brake bars 1 are shifted to braking positions. The operation of this form of control will be obvious from the above description and from inspection of Figure 4, and it will be seen that the braking action comes into operation as soon as the treadle bar 31 is depressed by the wheel of a tub or vehicle passing on to the bar. The operation of the braking action thus initiated may obviously be varied by varying the length of the treadle bar 31 as desired.

Referring now to Figures 6 and 7, a modified construction is illustrated in which the brake bars 1 instead of being mounted on rods connected to abutments operated by fluid under pressure, are secured to cylinders of the abutments, the latter being fixed in position. In Figure 6 one of the two fixed abutments or plungers is indicated at 39 the two abutments being formed integral with one another and secured to the track in any suitable manner. The movable cylinders surrounding these abutments, one of which is indicated at 40, carry the brake bars 1 and so serve to drive these brake bars against the wheel flange 3 when the supply of fluid under pressure to the inner faces of the fixed abutments is effected through a passage 41 formed in the centre of the abutment 39. The operation of this form of braking apparatus is substantially identical with that of the form previously described.

Figure 6 also illustrates an alternative arrangement of the treadle bars 31. According to this arrangement the counterweight 34 illustrated in Figure 1 is replaced by counterweight bars 42 extending from one of the lever arms 33 to the other. The controlling valve 9 is also, according to this construction arranged underneath the treadle bar and is reversed in position so that the rod 29 is uppermost and is arranged to be depressed by the under surface of the treadle bar 31 itself. In other respects and as regards the method of operation the arrangement shown in Figures 6 and 7 is identical with that previously described.

It will be understood that the extent of the braking action may be such as either merely to retard the speed of the vehicles over the section of the track provided with brake bars or may be sufficiently great as to bring the vehicles to rest at this point so long as the brake bars are operated and the tubs or trucks may thus be reduced in speed or held stationary for as long a period as desired or for a period automatically determined by the timing valve mechanism above described.

The general design and construction of the brake bars and the number of pairs of abutments for operating these bars will necessarily depend upon the conditions under which the mechanism is desired to operate, while as regards the control of the braking operation, various arrangements of automatic, semi-automatic or independent control may obviously be adopted without exceeding the scope of the invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. Railway braking apparatus comprising a brake bar located in the trackway, power-operated mechanism for moving said bar into engagement with a part of a railway vehicle, and a treadle located in the track-

way and arranged to be engaged by a wheel of the vehicle for controlling said mechanism.

2. Railway braking apparatus comprising a brake bar located in the trackway, power-operated mechanism for moving said bar into engagement with a wheel of a railway vehicle, and a treadle located in the trackway and arranged to be engaged by a wheel of the vehicle for controlling said mechanism.

3. Railway braking apparatus comprising a brake bar located in the trackway, a fluid pressure motor for moving said bar into engagement with a part of a vehicle, a valve device biased to an initial position wherein said motor is not supplied with fluid pressure and movable to an operated position wherein fluid pressure is supplied to said motor, a piston for moving said valve device, a double beat valve biased to a position wherein said piston is in communication with atmosphere, vehicle-actuated means for causing movement of said double beat valve to a position wherein fluid pressure is supplied to said piston to move said valve device to its operated position, a timing chamber, and an orifice of restricted area in said piston communicating with said timing chamber whereby said valve device returns to its initial position after a given interval of time.

4. Railway braking apparatus comprising a brake bar located in the trackway, a fluid pressure motor for moving said bar into engagement with a part of a vehicle, a valve device biased to an initial position wherein said motor is not supplied with fluid pressure and movable to an operated position wherein fluid pressure is supplied to said motor, a second motor device adapted when supplied with energy to move said valve device to its operated position and to hold it there for a given interval of time, a double beat valve biased to a position wherein energy is not supplied to said motor device, and vehicle-actuated means for causing movement of said double beat valve to a position wherein energy is supplied to said second motor device.

5. Railway braking apparatus comprising a brake bar located in the trackway, a fluid pressure motor for moving said bar into engagement with a part of a vehicle, a valve device biased to an initial position wherein said motor is not supplied with fluid pressure and movable to an operated position wherein fluid pressure is supplied to said motor, a second motor device adapted when supplied with energy to move said valve device to its operated position, a double beat valve biased to a position wherein energy is not supplied to said motor device, and vehicle-actuated means for causing movement of said double beat valve to a position wherein energy is supplied to said second motor device.

6. Railway braking apparatus comprising a brake bar located in the trackway, a fluid pressure motor for moving said bar into engagement with a part of a vehicle, a valve device biased to an initial position wherein said motor is not supplied with fluid pressure and movable to an operated position wherein fluid pressure is supplied to said motor, a second motor device adapted when supplied with energy to move said valve device to its operated position, and vehicle-actuated means for supplying energy to said second motor device.

7. Railway braking apparatus comprising a brake bar located in the trackway, power operated mechanism for moving said bar into engagement with a part of a railway vehicle, means adapted when in its operative position to supply energy to said mechanism, a treadle located in the trackway and arranged to be engaged by said vehicle thereby moving said means to an operative position, and means effective after a given time interval for interrupting said energy supply.

8. Railway braking apparatus comprising a brake bar located in the trackway, power operated mechanism for moving said bar into engagement with a part of a railway vehicle, a treadle located in the trackway and arranged to be engaged by said vehicle, and a circuit controller operated by said treadle for controlling the energy supply to said mechanism.

9. Railway braking apparatus comprising a brake bar located in the trackway, power operated mechanism for moving said bar into engagement with a part of a railway vehicle, a treadle located in the trackway and arranged to be engaged by said vehicle, a circuit controller operated by said treadle, and means controlled by said circuit controller for supplying energy to said mechanism.

In witness whereof I have hereunto set my hand.

F. M. CASTLEMAN.