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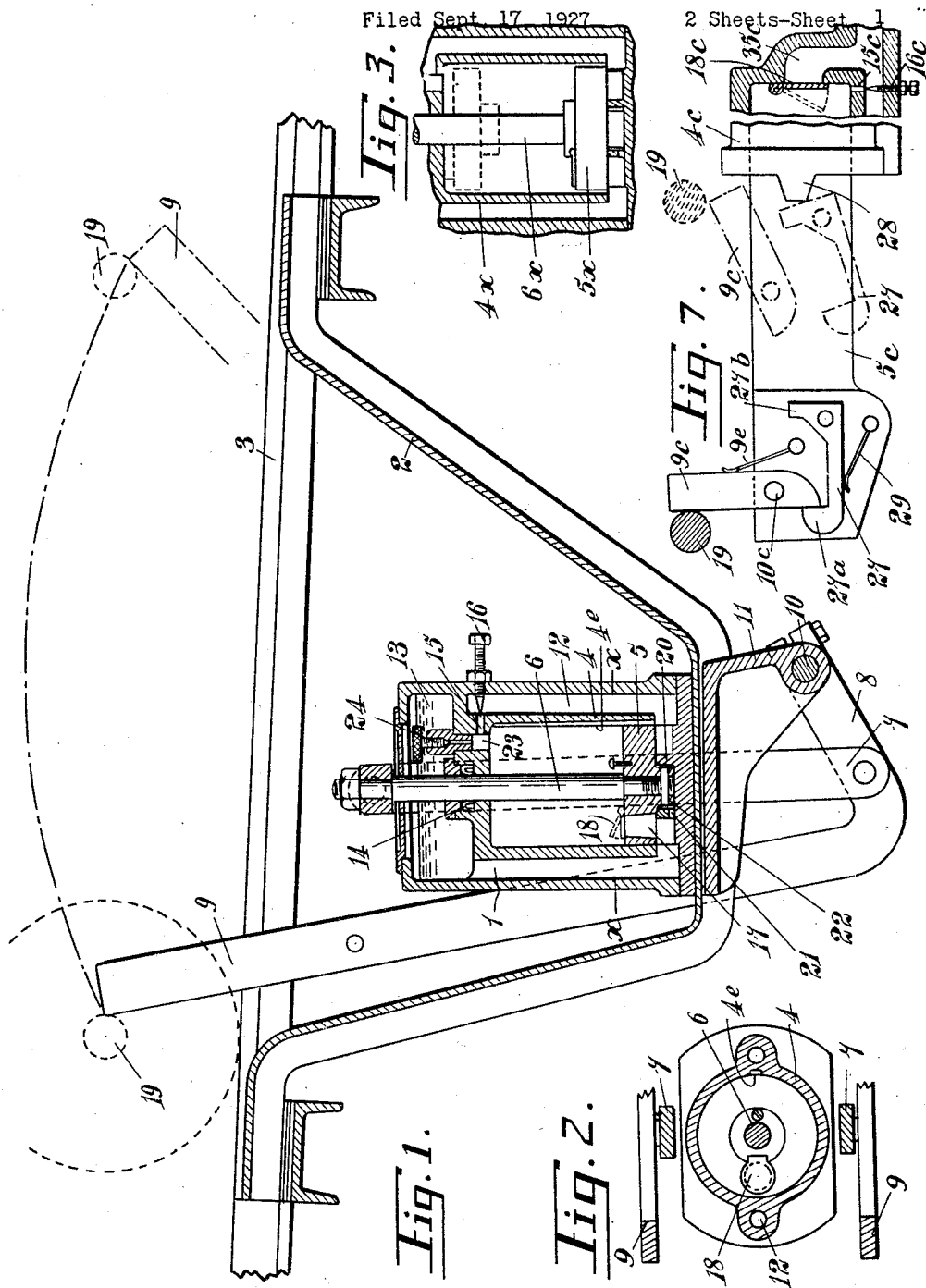
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APPARATUS FOR RETARDING WAGONS, TUBS, AND THE LIKE

Filed Sept. 17, 1927

2 Sheets-Sheet 1



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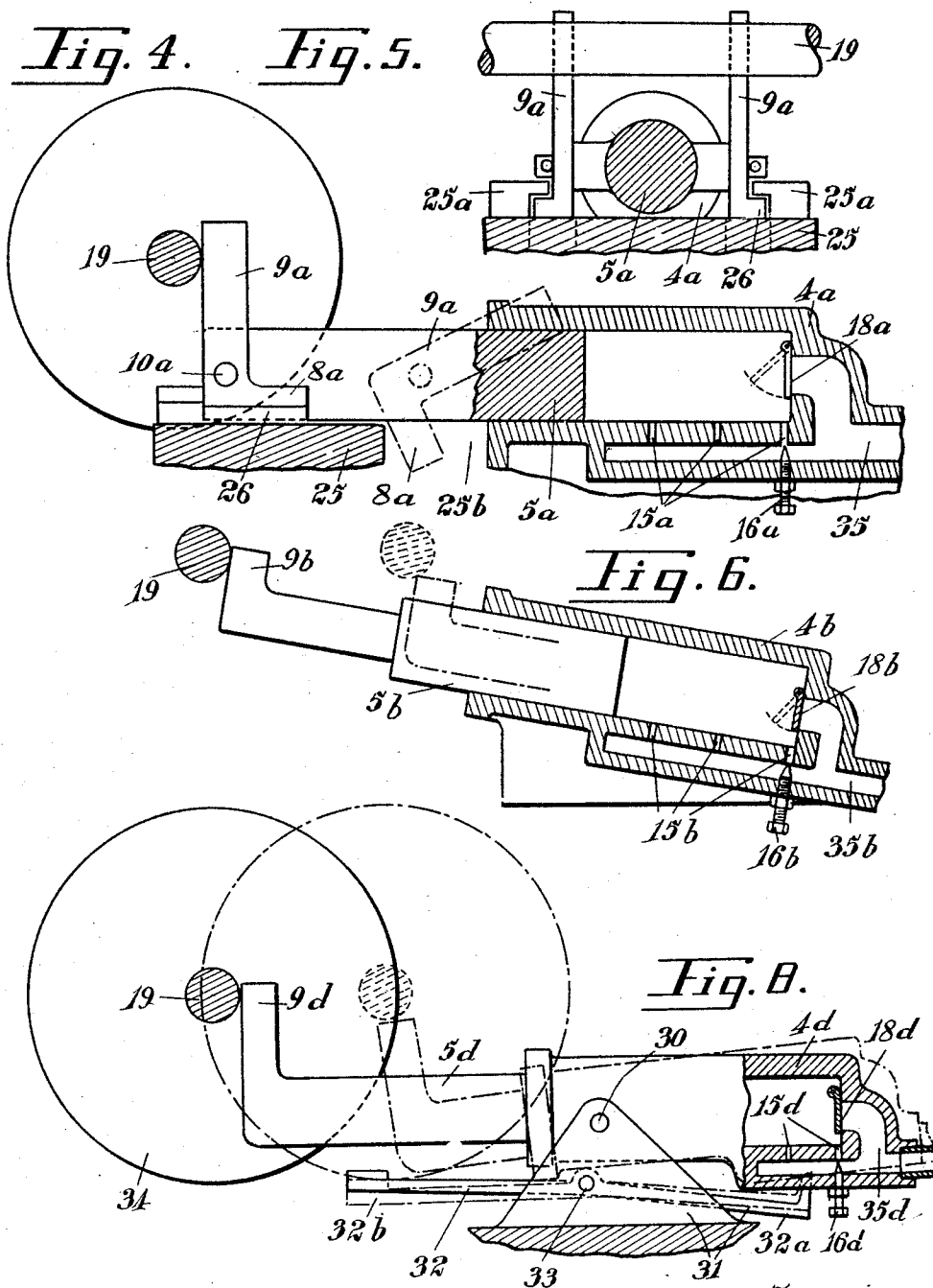
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APPARATUS FOR RETARDING WAGONS, TUBS, AND THE LIKE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR RETARDING WAGONS, TUBS, AND THE LIKE.

Application filed September 17, 1927, Serial No. 220,239, and in Great Britain January 29, 1927.

This invention relates to apparatus for retarding wagons, tubs, and the like, more especially for use in mining systems and similar purposes, when such wagons or tubs are travelling down inclined ways, and has for its object effectually to control or regulate the speed at any desired position.

In the accompanying drawings

Fig. 1 is a sectional elevation of the improved retarding apparatus having a tapered groove along the wall of the cylinder constructed according to this invention.

Fig. 2 is a sectional plan on line $x-x$ of Fig. 1.

Fig. 3 is a modification wherein the cylinder bore is tapered.

Fig. 4 is a sectional elevation of a modified form of retarding apparatus wherein the cataract is arranged horizontally and operates through an arm pivotally connected to the plunger.

Fig. 5 is an end elevation in part section of the apparatus shown in Fig. 3.

Fig. 6 is a side elevation of a further form of retarding apparatus wherein the cataract is inclined to the horizontal with its plunger engaging the axle.

Fig. 7 is a further modification of retarding apparatus wherein the cataract has its plunger provided with a pivoted arm retained in retard position by a pivoted catch.

Fig. 8 is another modification of retarding apparatus wherein the cataract is pivoted and turned ensemble out of engagement with the wagon axle or body by an under acting lever.

In a convenient embodiment of the invention as represented in Figs. 1 and 2, a cataract 1 is vertically disposed and carried by a frame 2 at a position below the rails 3. Along the wall of the cylinder 4 of the cataract is an upwardly tapering groove 4^e which gradually diminishes as it approaches the upper part of the cylinder, and in the latter moves a piston 5 having a piston rod 6 to the upper end of which are pivotally connected links 7 depending one at each side of the cataract. The lower ends of these links are pivotally connected to a cranked or elbowed extension 8 of an upstanding or jutting impact arm or member 9, which is shown in the normal position for acting as a retard. The latter is pivotally mounted upon a fulcrum pin 10 carried by a bracket 11 projecting from the frame 2. In the upward stroke of the piston 5, the liquid above same on its

high pressure side is forced to pass through the groove 4^e to the low pressure side, said groove presenting a larger section to the liquid when the piston is at the commencement of its stroke, so that the passage in said groove becoming more restricted, an increasing resistance is offered to the piston and transmitted to the impact arm 9. The cylinder 4 is open at the lower end to an external chamber 12 which at one side of said cylinder is open to an upper chamber 13 which is disposed above the head end of the cylinder and contains or surrounds a gland 14. When the cylinder 4 and chambers 12 and 13 are filled with oil or other liquid, the gland 14 is immersed. It is preferable that no air be allowed to enter the cylinder, and the provision of the chamber 13 situated around the gland 14 and adapted to contain a filling of oil or other liquid, ensures that the gland shall always be immersed and a liquid seal provided against air leakage between the piston rod 6 and the gland 14 of the cylinder 4. In the upper end of the cylinder above the piston 5 is a port 15 which is more or less obturated or regulated by an adjustable pin 16 for varying the resistance to the transfer of liquid from the high pressure side of the piston to the low pressure side thereof. The piston 5 is provided with an aperture 17 covered by a hinge flap valve 18.

In practice, the axle 19 of the wagon engages with the impact arm or member 9 and swings it over to the right from its fulcrum pin 10, thereby raising the piston 5 under restraint, regulated by the tapering groove 4^e, and an increasing resistance is thus presented to the passage of a wagon. Upon the axle 19 passing clear of the impact arm 9, the latter swings back by gravity into the initial position of a succeeding wagon due to the dead weight of the piston transmitted through the links 7 to the cranked or elbowed extension 8 of the impact arm or member 9, since the centre of gravity of the moving parts still lies to the rear or left of the fulcrum pin. The piston 5 in this movement is brought to the bottom of the cylinder 4 with the flap valve 18 lifting and allowing oil or other liquid at the lower side of the piston to pass through the aperture 17 to the upper side of same.

The lower end of the cataract 1 is formed centrally with a cup 20 having through one or more of its walls an aperture or apertures 21, and the lower side of the piston 5 is provided with a projecting boss 22 to engage with

the cup 20 whereby the piston is provided with a dash pot to give a cushioning effect to the piston at the lower end of its stroke. The head of the cylinder is provided with a vent aperture 23 controlled by a vent pin 24 to permit the initial filling of the cylinder 4 and chamber 12.

Referring to the modification shown in Fig. 3, the cylinder 4^a is made with an upwardly tapering bore having its larger diameter at the commencing part of the piston stroke so that there is a gradually reducing passage between the walls of the cylinder and the piston 5^a. Consequently, a gradually increasing resistance is presented to the said piston by virtue of the liquid on the high pressure side above the piston having to pass through a more restricted passage between the piston and the cylinder walls as the piston approaches the end of its stroke. The piston rod 6^a may be connected through links with an impact arm, as aforesaid.

Referring to the modification of the apparatus shown in Figs. 4 and 5, the cataract is arranged to operate substantially in a horizontal direction and comprises a cylinder 4^a in which works a solid piston 5^a to which is pivotally connected at 10^a an angle abutment lever 9^a having its upper arm adapted to engage with the wagon axle 19 and its cranked extension 8^a adapted to serve as a slipper which has a slidable engagement with a slideway 25 terminating a short distance from the cylinder 4^a so as to provide a slot 25^b. The slideway 25 may be provided with keepers 25^a having lateral intumed flanges and the lower ends of the levers 9^a may be formed or provided with lateral upstanding ribs 26 engaging under the flanges of the keepers 25^a in order to prevent axial deviation of the piston 5^a. The cylinder 4^a is connected by a conduit 35 with an oil or other liquid reservoir and has a return valve 18^a so that said conduit is under a "head" or pressure enabling a return of the piston to the retarding position. The cylinder 4^a has apertures 15^a for the outlet of liquid at the high pressure side of the piston 5^a, one of these openings being engaged by a screw pin 16^a. If desired, an adjustable pin may engage with each of the apertures 15^a.

In practice, the axle 19 of the wagon engages with the upstanding arm of the lever 9^a and by virtue of the force arising from the momentum of the wagon, depresses the piston 5^a into the cylinder 4^a against a pressure which can be regulated by the more or less restricted passages through the apertures 15^a which communicate with said oil or other liquid reservoir until such time as the slipper part 8^a of the lever 9^a passes beyond the slideway 25 above the slot 25^b, whereupon the lever tips over on its centre 10^a so that its upper arm drops below the level of the lever 9^a of the wagon axle 19 and enables release of the wagon, as shown by dotted lines. The lever 9^a

is returned into the retarding position upon the outward stroke of the piston 5^a by abutment of the cranked extension 8^a against the end of the slideway 25.

In the modification of the apparatus shown in Fig. 6, the cataract is arranged inclined to the horizontal and comprises a cylinder 4^b in which works a solid piston 5^b provided at its outward end with an upstanding impact arm 9^b adapted to engage with the wagon axle 19 or body, when extended from the cylinder on the outward stroke of the piston. The cylinder 4^b is connected by a conduit 35^b with an oil or other liquid reservoir, as aforesaid, and has a return valve 18^b. In the cylinder 4^b are apertures 15^b open to the reservoir, one or more of which apertures is or are regulated by a screw pin 16^b. As the wagon moves forward and depresses the cataract piston 5^b, the projecting head of the piston is brought below the level of the wagon axle, as indicated by the dotted lines, whereupon the wagon is free to pass over. The wagon is retarded by regulating the passages through the apertures 15^b.

In the modification of the apparatus shown in Fig. 7, the cataract is arranged horizontally consisting of a cylinder 4^c in which are apertures 15^c, the passages through which are regulated by screw pins 16^c to a reservoir under a suitable head. In the cylinder works a piston 5^c on which is pivotally mounted a catch 27 having upstanding projections 27^a, 27^b, the projections 27^a engaging with the lower arm of the lever 9^c which is pivoted at 10^c to said plunger, and the upper arm of the lever engaging with the wagon axle 19 or body. A spring 9^c engages with the impact arm 9^c to return it to retard position. A projection 28 is provided at the end of the cylinder 4^c or other convenient part for engagement with the projection 27^b and the catch 27. The cylinder 4^c is connected by a conduit 35^c with an oil or other liquid reservoir, as aforesaid, and has a return valve 18^c. As the piston 5^c is moved into the cylinder 4^c by the force of the wagon axle 19 against the arm or member, the projection 27^b of the catch 27 is brought into collision with the projection 28 on the cylinder 4^c and the catch 27 dropped out of engagement with the lever 9^c against the action of a spring 29.

Referring to the modification of the apparatus shown in Fig. 8, the cataract is arranged to rock on trunnions 30 provided on the sides of the cylinder 4^d in side brackets 31 and the piston 5^d provided with an upstanding impact arm or member 9^d adapted to engage with the wagon axle 19. A double armed rocking lever 32 is pivoted at 33 in the bracket 31 and is arranged with one arm 32^a engaging underneath the cylinder 4^d and its other arm 32^b adapted for engagement with the wagon wheels 34. The cyl-

inder 4^d is connected by a conduit 35^d with an oil or other liquid reservoir, as aforesaid, and has a return valve 18^d. Apertures 15^d are formed in the cylinder and more or less obturated by screw pins 16^d. In action, as the piston 5^d is forced by the wagon axle 19 into the cylinder 4^d, the wagon wheels 34 engage and depress the arm 32^b of the lever 32 and turn said lever about the centre 33 so as to exert an upward pressure from the arm 32^a against the underside of the cylinder 4^d, whereby the rear end of the cataract is swung upwards about its trunnions 30 and consequently lowering the outward end of the piston to a position below the level of the wagon axle, thereby allowing the wagon to proceed. The return of the cataract cylinder to its initial position is a gravitational one.

In all cases, the cataract plunger instead of engaging with the wagon axle, may engage with the wagon body or any part of the underframe, to effect a retardation of the wagon, as will be understood.

What I claim is:—

1. Apparatus for retarding wagons or tubs comprising in combination a cataract having a cylinder containing oil or other liquid, a piston working in the cylinder, means for restricting the passage of the liquid from the high pressure side of the piston whereby the liquid is permitted to escape under restraint, and a jutting impact arm or member connected to the piston and adapted to project into retarding position in the path of a vehicle passing thereover and to move forwardly clear of the vehicle to non-retarding position subject to a reluctant movement of the cataract apparatus upon a propellant force acting against the impact arm or member, and means for causing the impact arm or member to return to retarding position.

2. Apparatus for retarding wagons or tubs comprising in combination a cataract having a cylinder containing oil or other liquid, a piston working in the cylinder whereby the liquid is permitted to escape under restraint, a reservoir communicating with the cylinder at one end thereof, and impact arms or members connected with the piston, said arms or members being adapted to jut upwardly to a retarding position and to move forwardly clear of the vehicle to non-retarding position subject to a reluctant movement of the cataract upon a propellant force acting against the arms or members, and means for causing the impact arms or members to return to retarding position.

3. Apparatus for retarding wagons or tubs comprising in combination a cataract having a cylinder containing oil or other liquid, a piston working in the cylinder, a tapering groove in the cylinder walls for the passage

of liquid from the low pressure side of the piston to the high pressure side thereof to permit said liquid to escape under restraint, said cylinder being open at one end to a reservoir providing a "head" therefor, and an upwardly extending impact arm connected with the piston and pivotally movable into retarding or non-retarding position.

4. Apparatus for retarding wagons or tubs comprising in combination a cataract having a cylinder containing oil or other liquid, a piston working in the cylinder whereby the liquid is permitted to escape under restraint, said cylinder being open at one end to a reservoir, upwardly extending impact arms with cranked extension members through which they are pivotally mounted, links connected to the extension members of the impact arms immediately of their fulcrum and the upstanding parts of said arms, and the upper ends of the links connected to the piston rod.

5. Apparatus for retarding wagons or tubs comprising in combination a cataract having a cylinder containing oil or other liquid, a piston working in the cylinder whereby the liquid is permitted to escape under restraint, said cylinder being open at the lower end to a reservoir, a piston provided with a central boss at its lower side, a cup on the inner side of the cylinder end with which cup the piston boss engages, a port in the piston for the passage of the liquid on the non-working stroke, means in the cylinder at the high pressure side of the piston for regulating the escape of liquid on the working stroke, and pivoted impact arms connected with the piston adapted to project in the path of the vehicle.

6. Apparatus for retarding wagons or tubs comprising in combination a cataract having a cylinder containing oil or other liquid, a piston working within the cylinder, an outlet for the cylinder through which the liquid is permitted to escape under restraint and gradually increasing resistance on the high pressure side of the piston, an upstanding impact arm pivotally connected with the cataract piston and adapted to project in the path of a vehicle passing thereover, a port in the piston for the passage of the liquid on the return stroke, a port in the cylinder walls at the high pressure side of the piston, and an adjustable pin obstructing said port.

7. Apparatus for retarding wagons or tubs comprising in combination a cataract having a cylinder containing oil or other liquid, a piston working within the cylinder, means for permitting the liquid to escape under restraint from the high pressure side of the piston, a frame carrying the cataract beneath inclined rails, an upstanding impact arm having a cranked lower end pivotally connected to the frame, and pivotally connected to the piston, means in the cylinder at the high pressure side of the piston for regulating the escape of liquid on the working stroke,

and the cylinder at the low pressure side open to a reservoir under a "head" or pressure.

8. Apparatus for retarding wagons or tubs comprising in combination a cataract having
5 a cylinder containing oil or other liquid, a piston working in the cylinder, a tapering groove in the cylinder walls for the passage of liquid from the low pressure side of the
10 piston to the high pressure side thereof to permit said liquid to escape under restraint, said cylinder being open at the low pressure end to a reservoir providing a head or pressure therefor and upwardly extending so as

to encompass the upper end of the cylinder, a stuffing box and gland at the cylinder head
15 within the said reservoir so as to effect an immersion of the gland, and an upwardly extending impact arm having a cranked lower extension whereby it is pivotally mounted, and links connecting the said extension with
20 the piston rod.

In testimony whereof, I have signed my name to this specification at Birmingham, England, this 22nd day of August, 1927.

BERTRAM NORTON.