(No Model.)

J. JAMES.

HOLLOW AXLE.

No. 458,056. Patented Aug. 18, 1891.

Fig. 1.

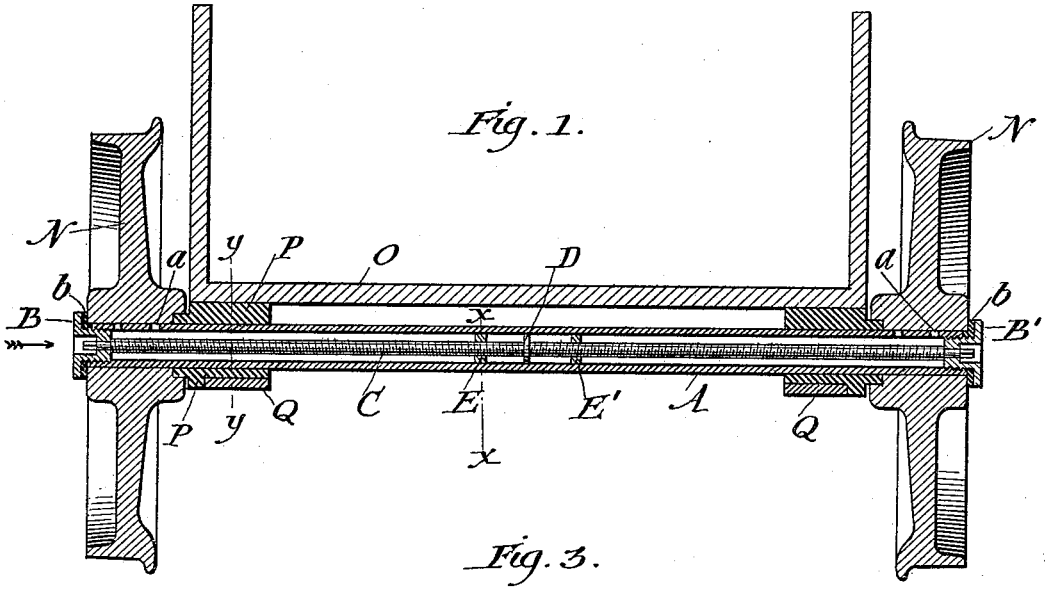
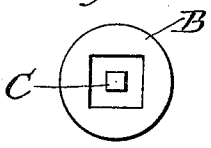


Fig. 3.

Fig. 2.



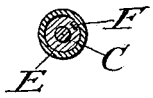


Fig. 4.

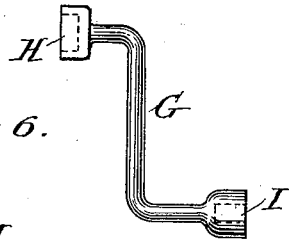


Fig. 5.

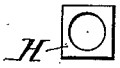


Fig. 6.

Fig. 7.

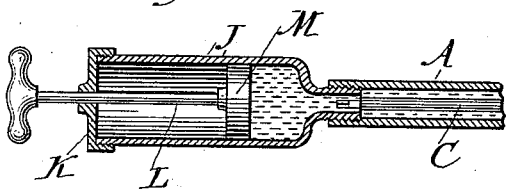
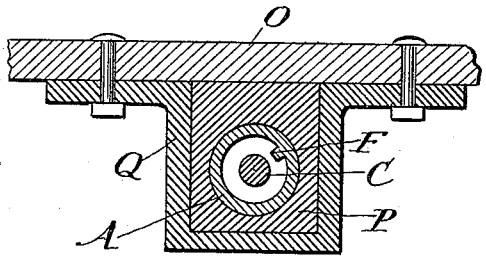


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOHN JAMES, OF ROCK VALE, COLORADO.

HOLLOW AXLE.

SPECIFICATION forming part of Letters Patent No. 458,056, dated August 18, 1891.

Application filed December 1, 1890. Serial No. 373,164. (No model.)

To all whom it may concern:

Be it known that I, JOHN JAMES, a citizen of the United States, residing at Rock Vale, Fremont county, Colorado, have invented certain new and useful Improvements in Hollow Axles, of which the following is a specification.

In the construction and operation of mining cars, trucks, &c., I have experienced considerable difficulty with the devices heretofore employed for lubricating the journals of axles, whether the axles were stationary and the wheels journaled on them, or the wheels were attached rigidly to the axles and the latter were journaled in ordinary bearings. Owing to the continual presence of dust and dirt it is necessary to inclose as tightly as possible all oil-receptacles, and because of the limited space in which oiling devices can be attached to the running-gear two general methods of lubrication have been adopted, one consisting in providing the hub of the wheel with an oil-chamber connected with the journal by suitable feed-openings in the inside of the hub and the other consisting in making the axle hollow for the same purpose and adapting it to supply oil to the journals in a substantially similar manner. Some of the defects of these plans are that the feed-openings clog up sometimes with sediment from the oil and sometimes with dirt washed in when the wheels run through muddy water, as often occurs in mining work. In fact, water will often work into the oil-chamber itself and injure the oil or replace it, especially when the supply has become somewhat exhausted and there is considerable empty space in the chamber. When the cars are turned over on their sides, as is often necessary both in and out of the mine, the oil runs out at the lower side and goes to waste. With the use of these plans the natural consequences are poor lubrication, waste of oil, loss of time in frequently refilling the oil-chambers and cleaning out the feed-openings, rapid wear of the working parts, frequent and expensive repairs, break-downs, &c. The use of a semi-solid grease properly applied would largely overcome the trouble, but the grease will not feed itself from the chambers to the journals except when the former are full, for after the comparatively small quantity adjoining the feed-openings has been used up there is no means of pushing toward these openings any of the remaining mass of grease contained in the chamber. I propose to overcome these difficulties by furnishing what may be called a "forced feed," adopting the hollow axle as a reservoir and providing it with means for decreasing the size of the oil-chamber at will, thus giving it the effect of being always full without the necessity for frequent refilling and making it possible to employ and secure the advantages of a semi-solid grease.

My invention may be said to consist, primarily, in providing a hollow axle with a sort of piston-head adapted to be moved longitudinally of the axle under the control of a screw-thread, all being capable of convenient manipulation from one or either end of the axle. Secondarily, the invention consists in certain details of construction, more fully described hereinafter, and more specifically defined in the claims.

To enable those skilled in the art to which my improvements relate to understand and practice the same, I will now proceed to describe my invention more fully, referring to the accompanying drawings, which form part of this specification, and in which similar parts are designated by similar letters of reference throughout the several views.

Figure 1 is a lateral vertical cross-section of a car fitted with one of my axles, the section being taken longitudinally through the middle of the axle. Fig. 2 is a view on a larger scale, looking in the direction of the arrow at the left of Fig. 1, showing the cap which closes the axle and the end of the screw-rod projecting into the cap. Fig. 3 is a cross-section of the axle on the line $x\ x$ of Fig. 1, drawn on the same scale as Fig. 1 and illustrating the relations of the piston-head to the axle and the screw-rod. Fig. 4 shows the crank or key used for turning either the cap or the screw-rod at will, as more fully explained hereinafter. Fig. 5 is an end view of the portion of the crank used for turning the cap. Fig. 6 is an end view of the portion of the crank used for turning the screw-rod. Fig. 7 is a side view showing the filler attached to one end of the axle. Fig. 8 is a cross-section on the line $y\ y$ of Fig. 1, but shown on a larger scale.

A is a hollow or chambered axle closed at

the ends by caps B B′ and provided at the journals with feed-openings, as at *a*. Extending through the axle longitudinally is the screw shaft or rod C, preferably provided with a collar or partition D at the middle of its length and with right-hand thread extending from the partition to one end and left hand thread from the partition to the other end. Engaging with these right and left hand threads are the piston heads or nuts E and E′, fitted snugly within the axle and adapted to slide back and forth in their respective divisions or sections of the axle under the control of the screw-rod. To keep the piston-heads completely under the control of the rods, I prevent their turning around in the axle by the use of feather F, with which they engage and which is fastened to the inside of the axle or forms a part of it, as may be desired. The crank or key, Fig. 4, is marked G. The end of it used for turning the cap is H and that used for turning the screw-rod is I. The filler, Fig. 7, is preferably a tube J, fitted at one end for connection with the end of the axle and at the other supplied with a cap K, conveniently removable for recharging the filler. Through the cap runs piston-rod L, provided with piston-head M. In Fig. 1 the wheel N is shown as journaled on the axle and the axle is shown as attached rigidly to the car-body O by means of the sleeve P and clamp or bracket Q. The sleeve is preferably shrunk onto the axle and provided with squared sides for rigid engagement with the car-body and the clamp. The wheel is shown counterbored to match the necked end of the sleeve. To prevent the possibility of the motion of wheel N unscrewing cap B, I interpose a washer or collar *b*, against which the wheel runs. The cap holds the washer firmly against the end of the axle, and the contact-surfaces of washer and axle are prevented from rotating relatively to each other by any convenient stud and recess engagement.

The operation of my device is as follows: To fill the axle with the lubricant, the end I of crank G is applied to the squared end of screw-rod C and the rod is turned in such a direction that piston-heads E and E′, engaging with the right and left hand threads, are moved simultaneously to the partition D. The cap B is removed and the end of the previously-charged filler is screwed in where the cap had been. The grease in the filler is forced into the axle by the plunger until the division or chamber to which it is attached is full. The filler is then detached and the cap replaced, and the operation is repeated at the other end of the axle. The lubricant feeds through suitable openings to the journal until that portion of the grease which is in the vicinity of the openings and which will feed itself naturally is exhausted. The operator then applies the crank or key to either end of the screw-rod and gives enough turns in the proper direction to cause the screws to draw the piston-heads toward the ends a sufficient distance to force the grease to the openings again. By thus decreasing the size of the chamber the same effect is produced as if the chamber had been refilled. The frequency with which this simple operation should be performed depends on the severity of the work; but in the case of ordinary mining-cars it has been found that an adjustment about twice a day will keep the journals well supplied with lubricant, and thus prevent the waste of power and material, frequent, vexatious, and expensive delays, repairs, breakdowns, &c., commonly attendant upon the employment of the old methods. The frequency with which the axle has to be refilled will of course depend largely on its inside diameter and length, as well as the severity of the work, speed of wheels, size of journals, quality of grease, &c; but ordinarily a single charge will last for weeks or months, and readjustments and refillings can be performed without the trouble and loss of time required for the removal of the wheels, and the grease can be forced to its work whenever and in whatever quantity the circumstances may require. As there is so much body to the grease, it successfully resists the entrance of foreign substances to clog up the feed-openings, and the forced feed assists still further in keeping these passages clear. The chamber being always practically full of grease, there is no opportunity for water to work in, and the grease being semi-solid will not run out and go to waste when the car is turned on its side.

It is of course evident that my improvements could easily be used with axles which revolve in bearings as well as with those which carry revolving parts and that my device can be applied to all sorts of hollow axles without departing from the spirit of my invention. It is also evident that my device is applicable to the employment of any kind of lubricant, whether liquid or solid; but it is particularly valuable because of its enabling me to employ a semi-solid grease, as set forth hereinbefore.

A modification of my invention, which I may have occasion to adopt in some instances, is the use of a smooth rod, preferably square, in the place of the screw-rod shown in the drawings, the piston-heads being adapted to slide freely on the rod and to be rotated by it and the peripheries of the piston-heads being provided with screw-threads engaging with suitable threads cut in the inner wall of the oil-chamber; but for general use I prefer the arrangement which I have shown and described hereinbefore.

The filler is conveniently made large enough to supply both chambers of one axle. Of course this filler may be of any desired shape and proportions; but it is essential that it be fitted for rigid connection with the end of the axle to prevent the possibility of the escape of the lubricant in the operation of filling the axle.

The caps B B′ are shown as plugs screwed into the ends of the axle; but they can of course be made in any convenient shape and attached in any well-known manner, and the cranks or keys for turning the caps and the rods can be replaced by socket-wrenches or any other suitable means, the drawings showing a convenient form embodying connections or shoulders to suit both the caps and the rods.

The screw-rods are preferably shouldered against the caps at each end to receive the end-thrust of the piston-heads when they happen to vary in their pressure and to prevent escape of the grease at the ends of the axle when in use. The collar or partition D serves conveniently to center and sustain the screw-rod, as well as to separate the chambers or divisions of the axle. This collar is preferably split (for convenience in getting it into place) and engaged with a recess in the screw-rod; but it may be formed and connected in any other suitable manner or attached to the inside of the axle or dispensed with altogether.

The axle is sometimes made in two parts, which may be coupled together, and of course independent screw-rods can be employed when desired without departing from the spirit of my invention. The oil-chambers are usually made of equal diameter and length, and the right and left hand screw-threads are preferably of equal pitch and length; but all such minor details may be varied without departing from my invention, and I do not wish to be limited to the proportions and relative sizes of the various parts shown.

The piston-heads may be made in two parts elastically separated to furnish a prolonged pressure against the grease, if desired; but I have not considered this necessary in ordinary work. If the inside wall of the oil-chamber is of any other cross-section than a circle, the feather can be dispensed with, as the shape of the wall and piston-heads would prevent the rotation of the latter relatively to the former. Where the wall is circular, the feather arrangement can be replaced by the engagement of a projection from the periphery of the piston-head with a groove in the inside of the oil-chamber; but I prefer not to cut into the axle and weaken it, and therefore generally employ a piece of wire rigidly attached at each end inside of the axle, and this has been found to offer sufficient resistance to the rotation of the piston-heads for all practical purposes.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a hollow axle, two piston-heads adapted to be moved simultaneously in opposite directions, said movements being capable of manipulation at one end of the axle, substantially for the purpose set forth.

2. In a hollow axle, two piston-heads provided, respectively, with right and left hand screw-threads and adapted to be moved longitudinally of the axle in engagement with corresponding screw-threads, the movements being capable of manipulation at one end of the axle.

3. In a hollow axle, a screw-rod provided with right and left hand threads, in combination with two piston-heads threaded to match, said rod being capable of rotation by suitable means applied at one end, substantially as and for the purpose set forth.

4. In combination, the hollow axle A, provided with feed-openings for its journals and a forced-feed mechanism, substantially as set forth, and the filler J, suitable for semi-solid grease and furnished with plunger M, one end of said filler being adapted to be rigidly connected with an end of the axle, substantially as shown and described.

5. The combination of a hollow axle adapted to serve as a lubricant reservoir and feeder, a cap attached to the end of the axle, and a collar or washer held in position by said cap and adapted to be rigidly engaged with said axle, substantially as and for the purpose set forth.

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