(No Model.)

E. FIRTH.

VEHICLE AXLE.

No. 365,376. Patented June 28, 1887.

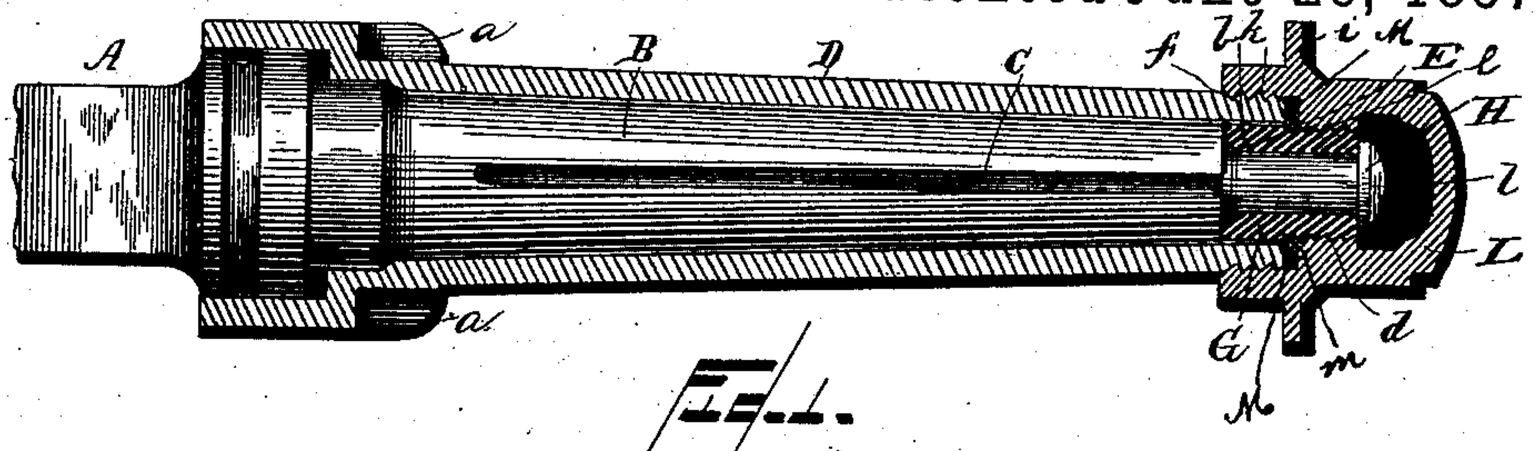


Fig. 1.

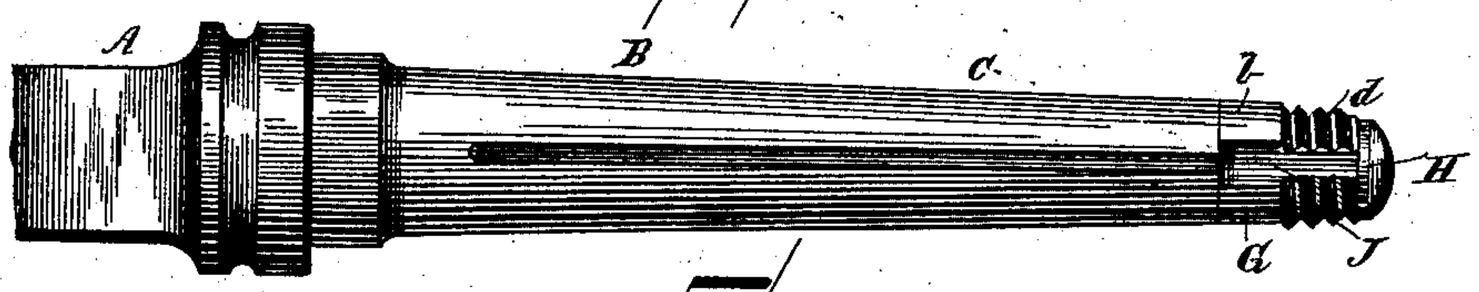


Fig. 2.

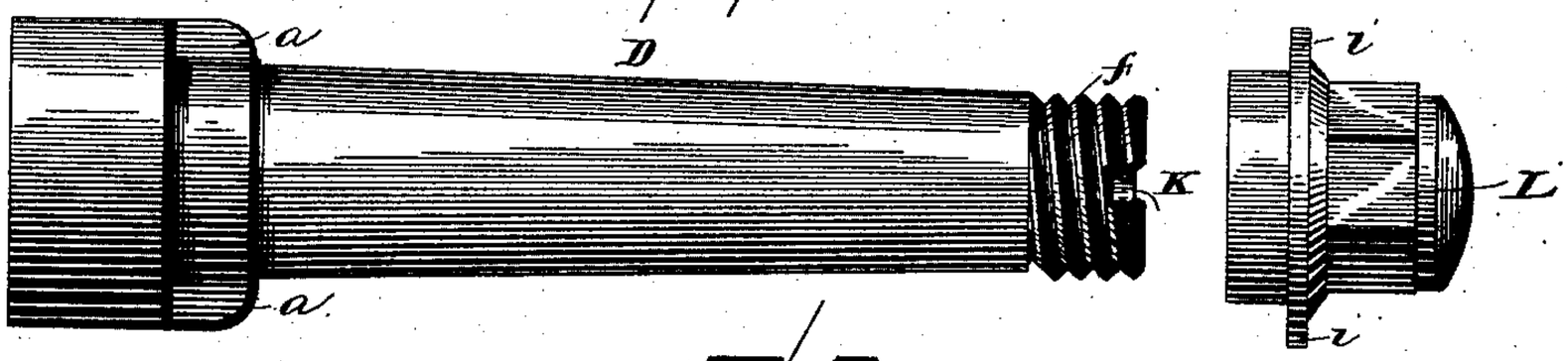


Fig. 3.

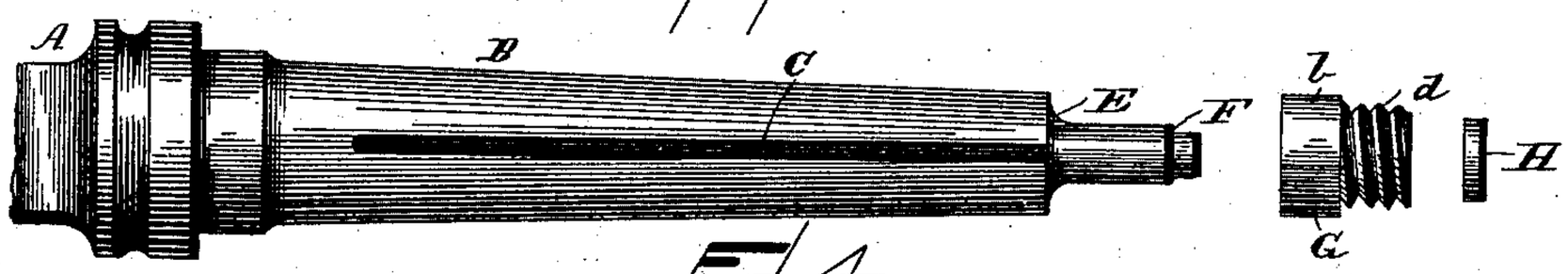


Fig. 4.

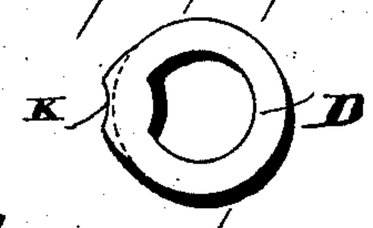


Fig. 5.

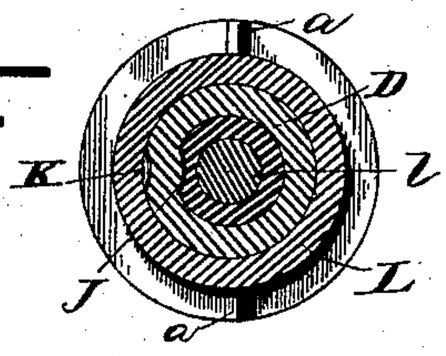


Fig. 6.

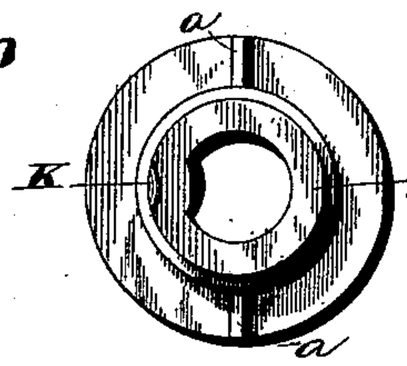


Fig. 7.

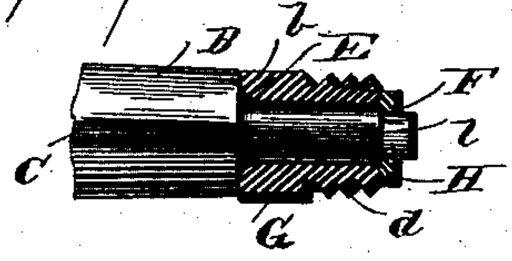


Fig. 8.

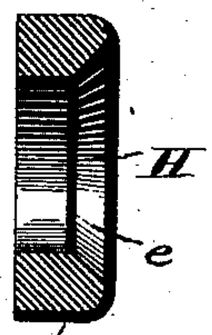
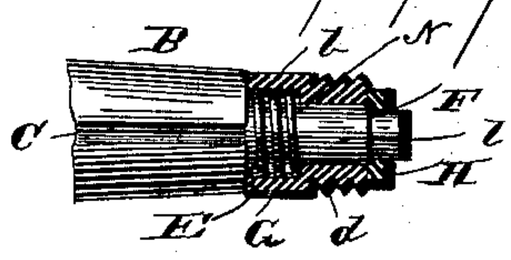


Fig. 9.



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By his Attorneys
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UNITED STATES PATENT OFFICE.

EDWIN FIRTH, OF TROY, NEW YORK.

VEHICLE-AXLE.

SPECIFICATION forming part of Letters Patent No. 365,376, dated June 28, 1887.

Application filed December 8, 1886. Serial No. 221,002. (No model.)

To all whom it may concern:

Be it known that I, EDWIN FIRTH, a citizen of the United States, residing at Troy, in the county of Rensselaer and State of New York, have invented a new and useful Improvement in Axles, of which the following is a specification.

This invention relates to a self-lubricating and self-adjusting axle for vehicles; and the object of the present improvement is to revolutionize inventions in this class by providing a device of this character possessing superior advantages over all other axles in point of simplicity, durability, cheapness, and general efficiency.

The invention consists in the novel construction, combination, and arrangement of parts, as will be hereinafter set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a longitudinal sectional view through a vehicle-axle, showing the axle box and nut in section and the spindle in elevation. Fig. 2 is a side elevation of the axle spindle with the box detached. Fig. 3 is a side elevation of the axle-box and nut detached from the spindle. Fig. 4 is a side elevation of the axle-spindle similar to Fig. 2, but with the revolving thimble and its retaining-washer removed. Fig. 5 is a transverse section through Fig. 1, showing how the kink or indentation on the axle fits in the groove of the revolving thimble. Fig. 6 is an end elevation of the axle-box, to show more clearly the construction of the kink or indentation at the threaded end thereof. Fig. 7 is an enlarged sectional view showing the revolving thimble and washer fitted on the reduced diameter end of the spindle before said end is swaged or riveted down to hold the washer in place. Fig. 8 is a detail sectional view of the washer, showing the beveled front edge. Fig. 9 is a sectional view of a modification. Fig. 10 is an end view of the axle-box, showing a preferred mode of forming the indentation.

Like letters are used to designate corresponding parts in the several figures of the drawings.

Referring to the drawings, A designates an axle of the usual pattern, to which I apply my improvement. The axle shown has its spindle B provided with the usual oil groove or channel, C, designed to convey and diffuse oil over the surface of the axle-box and the spindle. At the junction of the axle proper with the spindle are the usual flanges and shoulders, against which shoulders the axle-box abuts, and which flanges the box passes over and covers to provide intermediate spaces for the reception of packing material that serves to exclude sand, dust, and other foreign matter from obtaining access to the spindles, as is well known. The axle-box D is provided with feathers *a* at or about this point, to engage with the hub and cause the axle-box to revolve with the hub.

To the construction set forth above I lay no claim, since such features are common in all axles. My invention relates to more important parts of the axle where improvements are most needed, as will more fully appear hereinafter.

The outer end of the axle-spindle B is turned down and reduced in diameter at two points to form two shoulders, E F, the diameter of the spindle at the space between the shoulders E F being greater than the diameter at the point between the shoulder F and the extreme outer end of the axle spindle. The shoulder F is abrupt, while the shoulder E, though deeper than shoulder F, is beveled or inclined, as clearly shown in Fig. 4.

G designates a revolving thimble, bored centrally to fit over the reduced diameter of the spindle in the space between the shoulders E F, the inner end of the bore being beveled or flared to fit the beveled or inclined portion of the shoulder E. The diameter of the thimble G is such that when placed upon the reduced end of the spindle the outer face of the thimble will come flush with the normal diameter of the spindle. The thimble G on its exterior face is formed with a plain portion, *b*, and a threaded portion, *d*, the diameter of the latter being somewhat less than the diameter of the plain portion.

Over the second reduced portion of the axle-spindle is slipped a plain washer, H, (see Fig. 8,) that is caused to fit in the space on the spindle between the shoulder F and the extreme outer end of the spindle. This washer bears against the thimble G to hold it from coming off. In order to lock the washer in place, I proceed as follows: When the washer is fitted on, (see Fig. 7,) it will appear that a slight portion of the axle-spindle projects beyond the washer. I utilize this projecting portion to lock the washer in place by swaging

or turning the edge of this end over, so as to occupy the beveled or flaring portion *e* of the bore or opening in the washer. Fig. 8 shows clearly the beveled or flaring portion *e* in the washer. Fig. 7 illustrates the position of the parts before the washer is riveted in place, while Figs. 1 and 2 show how the washer is retained on the spindle by turning down or rounding off the edge of the projecting spindle end. Though the washer is riveted in place, still it does not press against the thimble to such an extent as to keep it from turning. The thimble is allowed free movement at all times.

A channel, J, is cut from one side of the exterior face of the thimble, and this channel is wider at the plain portion *b* of the thimble than at the threaded portion, as shown clearly in Fig. 2.

The axle-box D has its outer end threaded at *f*, and on one side of this threaded portion at the extreme end is formed a nib, kink, or indentation, K. This kink or indentation is formed by a suitable machine, and is made by swaging or punching the threaded end *f* of the axle-box at the point stated, this swaging or punching serving to force the metal of the box bodily inward beyond the plane of the inner bore of the box. (See Fig. 6.)

In some cases I prefer to make the kink or indentation on the axle-box as follows: Before the outer end of the box is threaded I form on said end a swell or enlargement at the point where it is intended to make the indentation. This enlargement is shown in the end view, Fig. 10. This swell or enlarged portion is forced or swaged in to form the indentation, and thus when the threads are cut over the swell or enlargement, after the kink has been formed, it will be apparent that no groove or recess will show on the outside face of the axle-box. The cutting of the threads will shear off any surplus metal left by the enlargement and leave the box as seen by the dotted lines, Fig. 10. Thus the kink or indentation will not be seen from the outside, and cannot mar the appearance of the axle-box.

L designates a hollow steel drop-forged cap-nut, flanged at *i* to bear against the end of the hub of the wheel when applied in position. The interior of the nut is formed with a double set of screw-threads, the outer threads, *k*, engaging the threads *f* of the axle-box, while the inner threads, *l*, engage the threaded portion *d* of the thimble G. Beyond the threads *l* the interior of the cap-nut is hollow, and forms a reservoir to contain oil to supply it to the surface of the axle spindle and box.

As shown in Fig. 1, I fit a rubber washer-ring, M, within the cap at the shouldered or drop portion *m* of the nut. The end of the axle-box bears against this washer-ring, which fits around the interior shoulder of the nut. Usually the outer ends of the axle-box are chipped or slightly uneven, so that this washer-ring, being made of rubber and elastic, fills these uneven places in the outer end of the axle-box, and thus makes the axle perfectly liquid-tight. Oil cannot possibly escape from the cap-nut and ooze out into the axle-box. I have found in practice that a leather washer will not answer. Only a rubber ring will answer for the purpose since it is elastic. Thus constructed the parts are applied by slipping the axle-box over the spindle and turning it therein until the kink or indentation *k* of the box is caused to drop into the channel J of the thimble, as shown clearly in the cross-sectional view, Fig. 5. The cap-nut L, being supplied with the proper quantity of oil, is then screwed over the threaded end of the thimble G and the threaded part *f* of the axle-box until the parts are caused to assume the position shown in Fig. 1.

The operation of my invention will be readily understood. When in use, the contact of the hub with the flange *i* of the cap-nut and the feathers *a* of the axle-box causes the said axle-box and the nut to revolve with the wheel, and since both the axle-box and the nut are connected with the thimble it will be understood that all three parts are thus caused to revolve together. By this arrangement it will be understood that in my axle no nut can casually turn off, as they revolve with the wheel, and, furthermore, there is no friction generated between the axle-nut and the hub of the wheel. Oil cannot escape from the bearing, as it is always contained in the cap-nut. I have no plugs or stoppers to lose, such as are often found in self-lubricating axles. The axle-box cannot possibly pull through the hub. Sand or grit is excluded from the box, and the necessity of providing a washer at the nut end is obviated. The wheels need not rattle, as my improvement makes them self-adjusting.

In my axle there will be no necessity of oiling two or three times a week, as once every four weeks is found sufficient. Notwithstanding these advantages, and the fact that the axle is equally adapted to light or heavy loads, the cost of the axle is moderate and will well repay for the slight advance over the common axles. The cap-nuts are interchangeable, as all threads are right-handed, and should be nickel-plated, so that they can be kept clean and neat.

In practice I case-harden the thimble and its washer in oil. In order to overcome any tendency of the thimble to wear by the endwise play of the thimble, I propose to counterbore the thimble, as shown in Fig. 9, and fit over the reduced end of the spindle, between shoulders E F, a spiral spring, N, which spring is received within the counterbored portion of the thimble and bears against the shoulder formed therein, to push the thimble against the outer end of the axle-spindle. By this arrangement the nut will take hold of the thimble and screw down a certain distance before the nut catches the box. The beveled or inclined portion of the shoulder E of the spindle

serves to give strength to the thimble-journal. It will be understood that the channel J in the thimble serves two purposes. It forms a bearing for the kink or indentation *k* of the axle-box, and prevents the thimble from turning during the withdrawal or replacing of the cap-nut. It also allows the oil to pass from the reservoir of the nut to the axle spindle, the oil from the channel J passing up the groove C and diffusing itself over the surface of the spindle. By this means the expense of cutting grooves in the nut is dispensed with. The cap-nut thus forms a double-nut all in one, which acts as a lock-nut, oil cup, and axle-nut.

I confine myself to the use of rubber in constructing the washer M for the cap-nut, as by practical test I have found that no other material will so well answer the purpose and effect an oil-tight joint between the axle-nut and the axle-box.

In a former patent, No. 256,664, I obtained a broad claim for a swiveled thimble connected to the axle-box; but in said patent the thimble was threaded on its outer face from end to end, the axle box and cap-nut being threaded to screw over the thimble. In the present invention the cap-nut, which also forms a reservoir for oil, screws over the outer face of the thimble, and also over the outer end of the axle-box. Again, an improved connection is employed between the axle-box and the thimble, and the latter is grooved to convey the oil from the cap-nut to the spindle of the axle. Furthermore, the washer for holding the thimble in place is not fitted within the hollow thimble, as in my former patent, but rests against the outer end thereof, the thimble in the present case not being counterbored, except when using a spring, as in Fig. 9.

Having thus fully described my invention, and set forth the important advantages derived therefrom, I claim as new and desire to secure by Letters Patent—

1. In an axle, the spindle having the revolving thimble provided with the groove or channel, combined with the axle-box having a nib, kink, or indentation to fit in the channel of the thimble, as set forth.

2. In an axle, the spindle provided with the spring-actuated revolving thimble, combined with the axle-box to engage the thimble and the axle-nut to engage both the thimble and the axle-box, as set forth.

3. In an axle, the spindle having the revolving thimble provided with the threaded portion, combined with the axle-box threaded at the outer end and the cap-nut screwed over the threaded portion of the thimble and also upon the threaded end of the axle-box, as set forth.

4. In an axle, the spindle having the revolving thimble provided with the groove or channel and the threaded portion, combined with the axle-box having the threaded outer end, and the nib, kink, or indentation to fit in the channel of the thimble, and the cap-nut forming the reservoir for oil, said nut screwing upon the thimble and also upon the threaded outer end of the axle-box, as set forth.

5. In an axle, the spindle having the reduced outer end, forming the two shoulders E F, combined with the thimble G, bored to fit over the reduced end of the spindle between the shoulders E F, and a washer, H, to fit the spindle between the shoulder F and the extreme outer end, said washer being arranged outside the thimble, so as to bear against the outer end of the thimble, and held in place by riveting, as set forth.

6. The axle having the revolving thimble G on the spindle, provided with a channel, J, and an oil-conducting groove, B, on the spindle, combined with the axle-box and a cap-nut screwed upon the axle-box and hollowed out beyond the end of the thimble to form a reservoir for oil, as set forth.

7. The axle having the revolving thimble G, combined with the axle-box having the nib, kink, or indentation to bear against or engage the thimble, as set forth.

8. The axle having the revolving thimble G, provided with the groove or channel J, as set forth.

9. The axle having the revolving thimble and the locking-washer H therefor, the latter being provided with the flaring or beveled portion *e* at the outer edge, for the purpose set forth.

10. In an axle, the spindle having the revolving thimble having the threaded portion, in combination with the axle-box threaded at its outer end, and a cap-nut screwed upon the threaded portion of the thimble and also upon the threaded portion of the axle-box, and having an internal shoulder or drop portion, *m*, to bear against the end of the axle-box, and a rubber ring, M, fitted within the nut against the shoulder *m*, so that the end of the axle-box abuts against the ring, as set forth.

11. In an axle, the spindle having the revolving thimble, combined with the axle-box having a connection with the thimble to cause the latter to turn with the axle-box, said axle-box having a threaded outer end, and the cap-nut screwed over the outer end of the axle-box, so as to turn with the same, whereby the axle-box, thimble, and cap nut will all turn together, as set forth.

12. In an axle, the spindle having the revolving thimble, in combination with the axle-box provided with a threaded outer end and having a connection with the thimble, whereby the latter will turn with the axle-box, and the cap-nut, also having a connection with the thimble and screwing over the threaded end of the axle-box, as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

EDWIN FIRTH.

Witnesses:
WILLIAM ISENBURGH,
JOHN P. KELLY.