2 Sheets—Sheet 1.

B. F. RICHARDSON.

VEHICLE AXLE.

No. 183,706 Patented Oct. 24, 1876.

Fig. 1

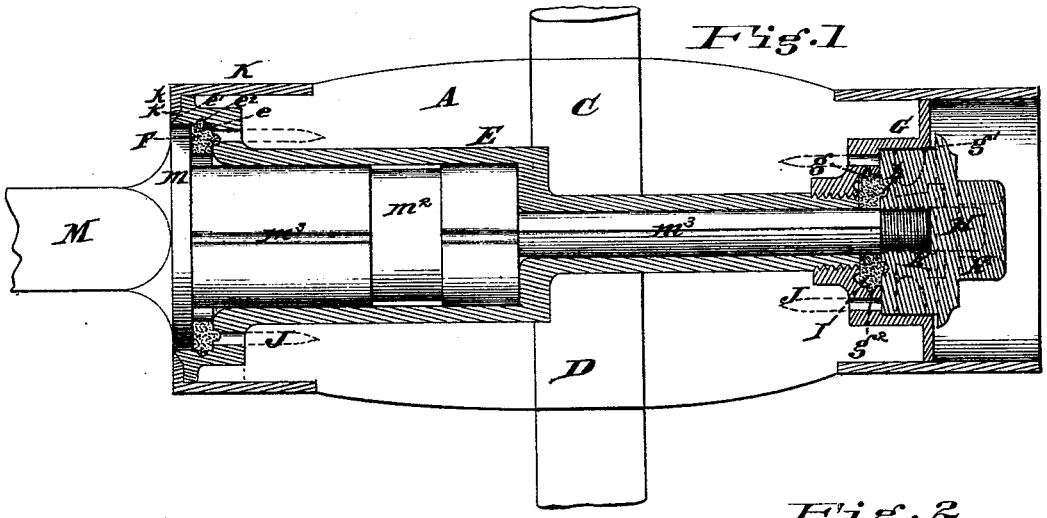


Fig. 3

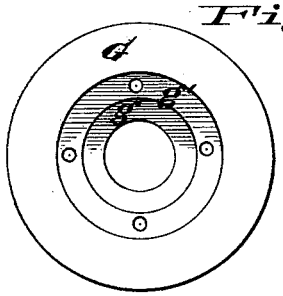


Fig. 2

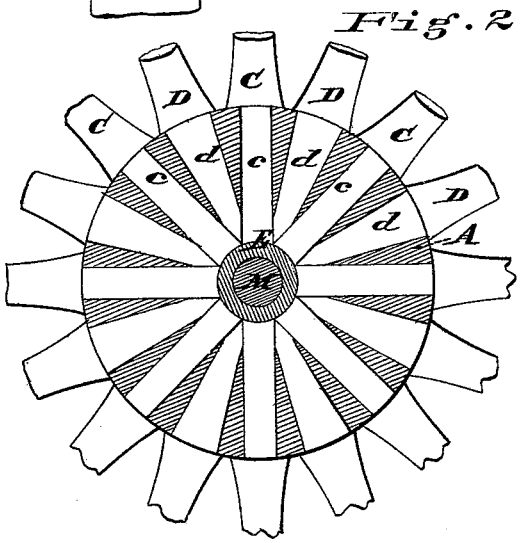


Fig. 4

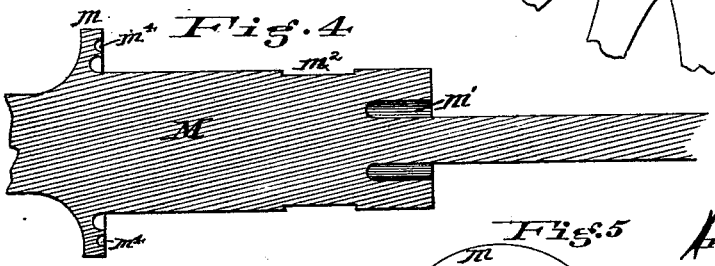
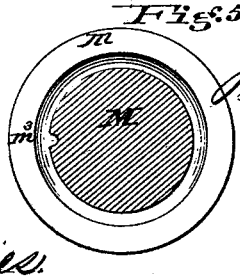


Fig. 5



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2 Sheets—Sheet 2.

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VEHICLE AXLE.

No. 183,706. Patented Oct. 24, 1876.

Fig. 6

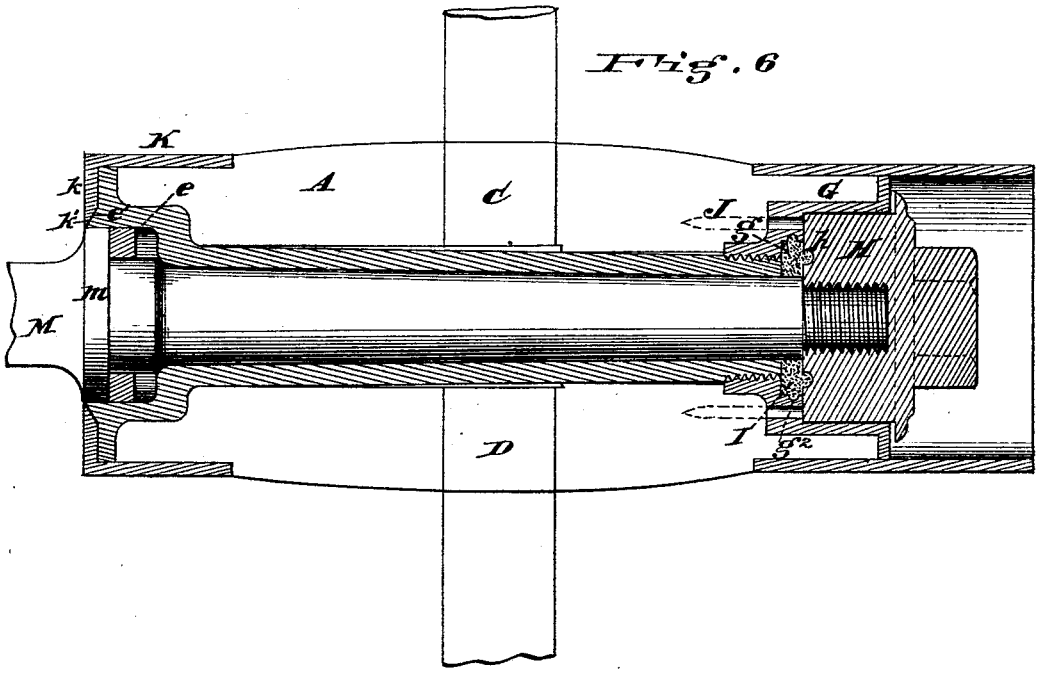


Fig. 7

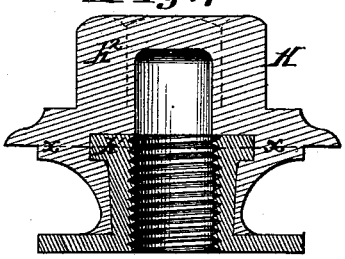
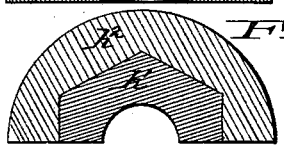


Fig. 8



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UNITED STATES PATENT OFFICE.

BENJAMIN F. RICHARDSON, OF CINCINNATI, OHIO.

IMPROVEMENT IN VEHICLE-AXLES.

Specification forming part of Letters Patent No. **183,706**, dated October 24, 1876; application filed July 25, 1876.

To all whom it may concern:

Be it known that I, BENJAMIN F. RICHARDSON, of Cincinnati, Hamilton county, State of Ohio, have invented an Improvement in Axles and Wheels of Vehicles, of which the following is a specification:

My invention has for its object, first, the protection of the hub endwise by devices of a configuration adapted to contain and shoulder the nut, and protect the soft washer from wearing-pressure; second, the protection from fracture of the small part of the offsetted axle in its junction with the larger part; third, a construction of the inner hub-band, which will, with a single face, form a joint, both upon the end of the box and the periphery of the axle-collar; fourth, to provide additional devices for the more complete retention of the lubricant within the box, and the exclusion of dust and dirt therefrom; and, lastly, to provide for durable finish for the exterior surface of the retaining-nut.

My invention consists in forming the plate or flange which secures the outer end of the axle-box with two chambers, one for containing the lubricating-washer, and the other for the axle-nut, the inner shoulder of the axle-nut bearing against the face of its chamber, serving to protect the lubricating washer from compression and wear; the formation and location of certain grooves for the more effectual retention of the lubricant within the box, and the exclusion of dust and dirt therefrom; lastly, such a construction and composition of retaining-nut as will insure durability of its external finish.

Figure 1 is an axial section, illustrating my improvements applied to the axle and wheel for which Letters Patent No. 174,091 were granted to me February 29, 1876. Fig. 2 is a cross-section through the hub, box, and axle. Fig. 3 is an end view of the double-chambered plate or flange for the outer end of the hub. Fig. 4 is a section of the axle-arm, showing the deep annular chamber at the offset thereof. Fig. 5 is a cross-section of the large part of the axle, showing the side lubricating-groove. Fig. 6 is an axial section of a wheel with an ordinary axle with some of my present improvements applied thereto. Fig. 7 is an axial view of my improved retaining-nut. Fig. 8 is a half-section taken on the line *x x* in Fig. 7.

A is the hub, and C D the spokes. The spokes C have the ordinary straight tenons *c* driven into parallel-sided mortises after the insertion of the spokes D. The spokes D have tapering tenons *d*, fitting corresponding tapering-sided mortises, the inner ends of the tenons being shaved off to a V shape, as shown, to permit the tenons *c* to pass in full thickness and rest on the box E. This construction, the alternating disposition shown, gives one set of spokes, having a safe anchorage in the hub, full length and uniform thickness, to prevent withdrawal, and another set with the same depth of tenons, but with increased thickness of tenons at the periphery of the hub, giving a degree of strength to the spoke-connection with the hub unattainable with all straight tenons, where a like number of spokes are used. I am also enabled to increase the stiffness of the rim of the wheel by the employment of a greater number of spokes than is possible with any other construction of wheel with tenons all of full depth. The box E has a projecting collar at the large end and a chamber, *e*, for containing the lubricating washer F, and a screw-thread at the outer or small end for receiving the tightening-plate G, the screwing on of which draws the shouldered box in place, and laterally protects the tenons and mortises from the effects of side strains by clamping the hub endwise. The plate G has a chamber, *g*, for the occupancy of the lubricating-washer, (of leather or other suitable material,) and a larger chamber, *g'*, for containing the axle-nut H. This nut abuts against the inner face of this chamber and prevents end pressure from affecting or wearing away the lubricating-washer I.

Both the box and plate G, after adjustment to place, may be prevented from rotating in use by the insertion of spikes or screws J. The box may also be provided with the usual cleats or wings to prevent rotation within the hub.

The axle-box is constructed with a beveled face, *e*, and the hub-band K has a flange, *k*, with a beveled inner face, *k'*, arranged, as shown, to meet the beveled face of the box,

and also form a circular joint (to exclude dust) with the periphery of the axle-collar *m* of the axle M.

When the form of axle-arm is used, patented by me aforesaid, I make a deep annular chamber, *m'*, formed within the large part of the axle-arm at its offset, for the purpose of locating the base or root of the small part of the arm considerably inside of said offset, and thus elasticity and flexibility of the small part is allowed under excessive shocks or strains, enabling it (the small part) to move out of its concentric position at the offset, thereby avoiding fracture.

The capacity for the lubricant may be increased by forming an annular recess, m^2, the longitudinal groove m^3 being located in the rear side of the axle, and not in the top or bottom, as ordinarily. This location of the longitudinal groove prevents its borders from becoming sharpened by wear, thereby avoiding cutting of the box; providing, also, for the free circulation of the lubricant. The chamber *e* of the box E, which contains the lubricating-washer F, has a groove, e^2, formed in its exterior surface, into which the washer is embedded, as shown, this feature serving to prevent the lubricating material from escaping past the washer, and serving also to prevent the entrance of dust, and the displacement of the washer. I also provide a groove, m^4, in the collar *m* of the axle, into which the washer, in part, may be embedded for the purpose also of preventing the ingress of dust or egress of the lubricant. At the other end of the axle-box I also provide in the recess or chamber *g* a groove, *g''*, into which the edge of the washer I embeds itself, the groove and the part of the washer therein serving to obstruct the escape of the lubricant and prevent the ingress of dust and the displacement of the washer. For the same purpose I provide a groove, *h*, in the nut H, which, after the entrance of a portion of the side of the washer I, prevents, on that face, the passage of dust inwardly, or passage of oil outwardly. The nut H is formed of two parts, one of which (the part *h'*) is of hard metal to endure the wear and tear of frequent removals, and the other, *h''*, of soft metal, capable of receiving and retaining a high polish without perceptible disfigurement under the use of the wrench. I prefer that the inside part shall have a hexagonal, or other suitable shape, which, when the outer part is cast or otherwise formed thereon, shall serve to prevent movement of the parts, one upon the other.

I claim—

1. The tightening-plate G, with two chambers, *g g'*, substantially as and for the purpose specified.

2. The deep annular chamber m^1 of the axle-arm M, substantially as and for the purpose specified.

3. The box E and flanged band K *k*, having beveled faces e^1 *k'*, substantially as and for the purpose specified.

4. The collar *m*, having the groove m^4, substantially as and for the purpose specified.

5. The nut H, having on its inner face the groove *h*, substantially as and for the purpose specified.

6. The two-part nut H *h' h''*, constructed substantially as and for the purpose specified.

In testimony of which invention I hereunto set my hand.

BENJAMIN F. RICHARDSON.

Witnesses:

JOHN E. JONES,

EDGAR J. GROSS.