No. 609,776. Patented Aug. 30, 1898.

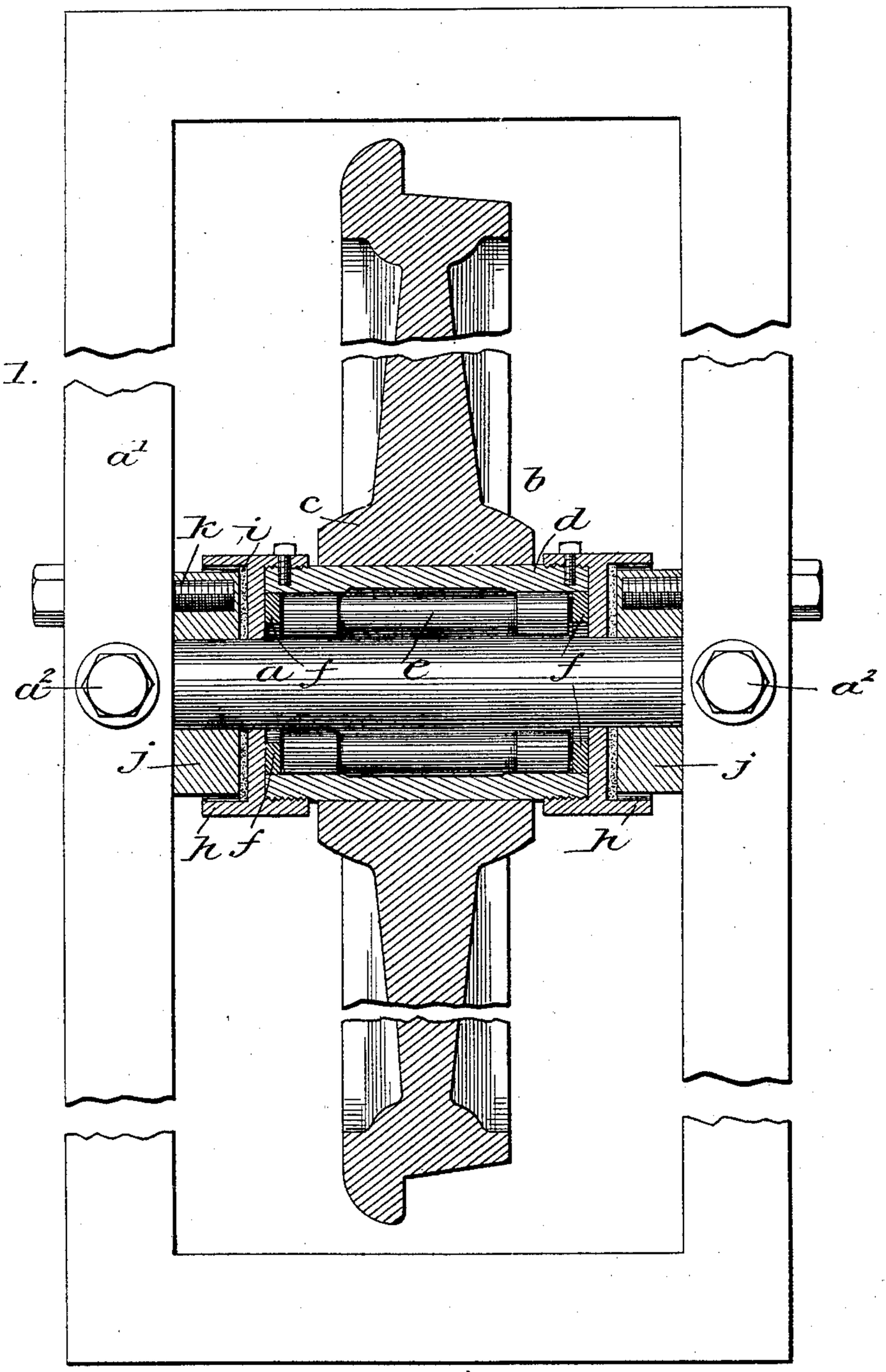
G. J. CAPEWELL.

ROLLER BEARING.

(Application filed Feb. 11, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



Witnesses.
Harris E. Hart.
Arthur B. Jenkins.

Inventor:
George J. Capewell.
by Chas. L. Burdett,
Attorney.

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Fig. 2.

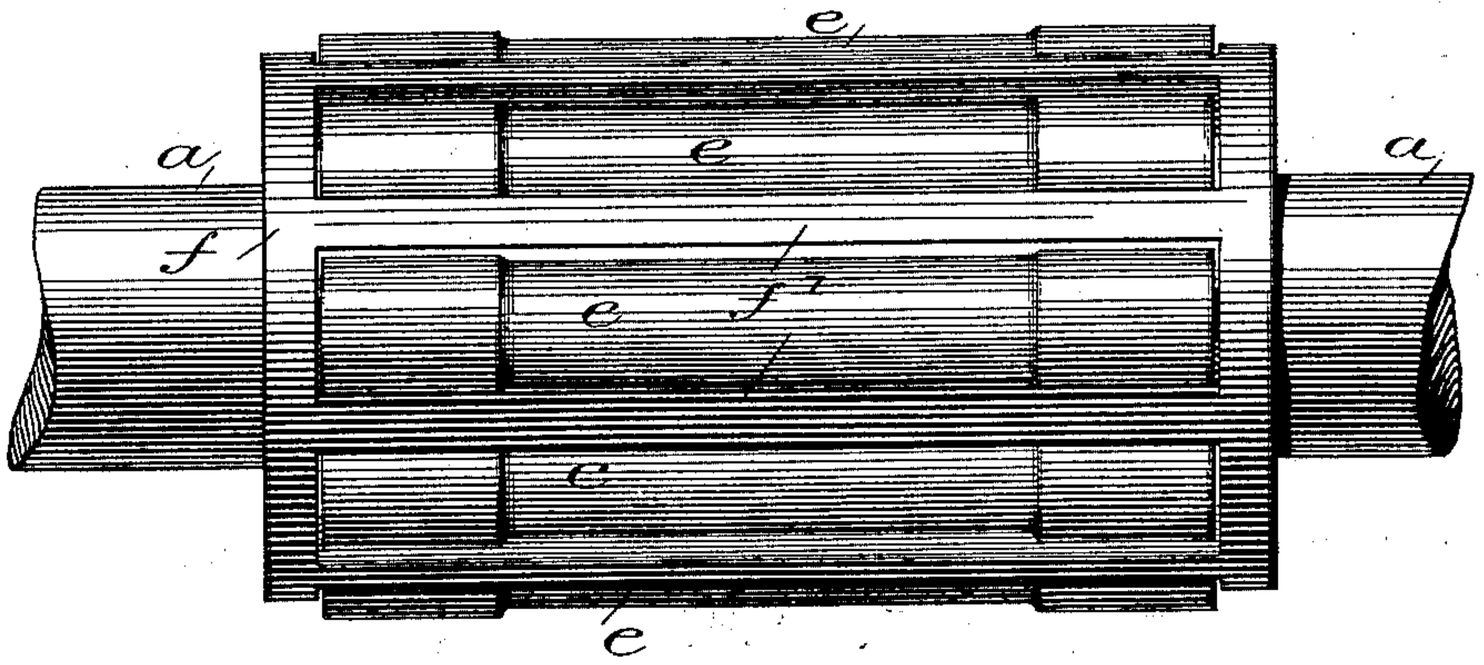


Fig. 3.

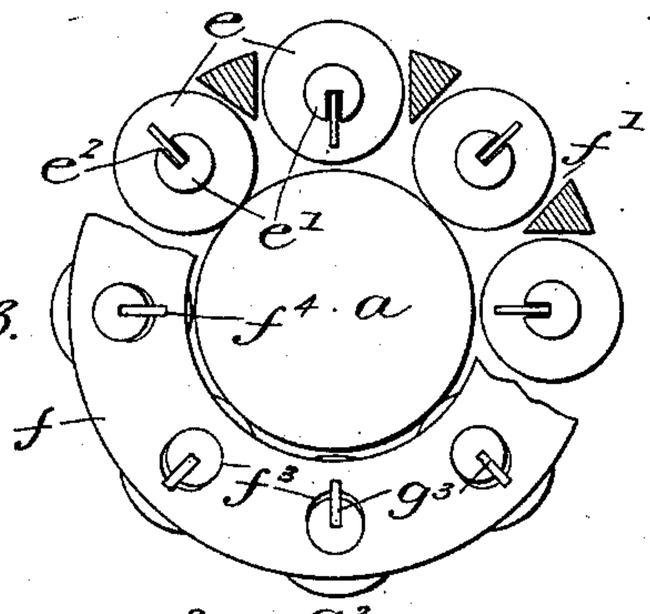


Fig. 4.

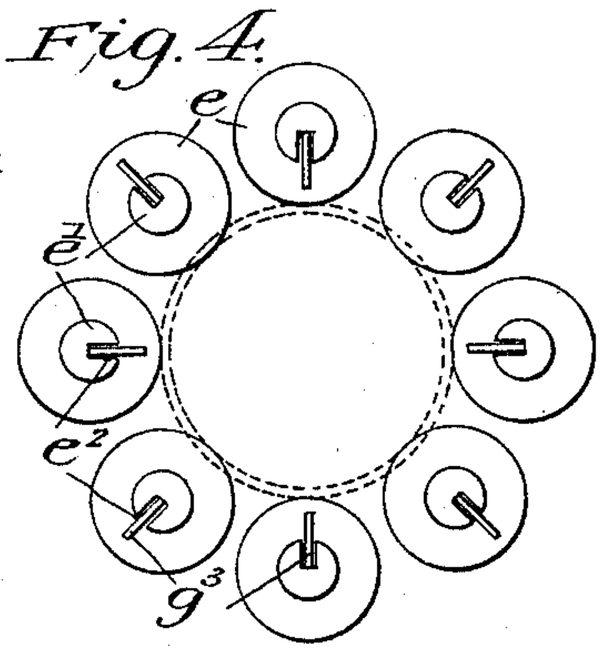


Fig. 5.

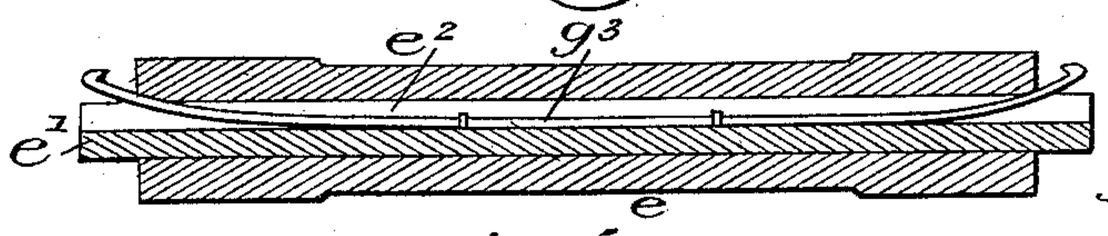
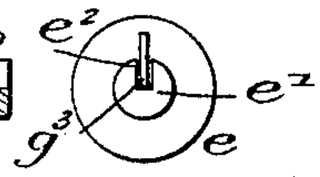


Fig. 6.



Witnesses.
Harrie E. Hart
Arthur B. Jenkins

Inventor.
George J. Capewell,
by Chas. L. Burdett,
Attorney.

UNITED STATES PATENT OFFICE.

GEORGE J. CAPEWELL, OF HARTFORD, CONNECTICUT.

ROLLER-BEARING.

SPECIFICATION forming part of Letters Patent No. 609,776, dated August 30, 1898.

Application filed February 11, 1896. Serial No. 578,862. (No model.)

To all whom it may concern:

Be it known that I, GEORGE J. CAPEWELL, a citizen of the United States, and a resident of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Roller-Bearings, of which the following is a full, clear, and exact description, whereby any one skilled in the art can make and use the same.

My invention relates to the class of devices which include as operative elements rollers or wheels introduced between moving parts to provide for a rolling as compared with a sliding friction between such parts, the object of the construction being to reduce the friction between the moving parts.

The object of my invention is to provide a device of this class that shall be free from the defects which in previous structures having the same general features of construction have prevented the successful operation of the devices in practical use.

To this end my invention consists in the structure as a whole and in the combination of parts making up the device.

It also consists in details of such parts and their combination, as hereinafter described, and more particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a view in central section through a car-wheel, showing the roller-bearing as to part in side view and part in section. Fig. 2 is a side view of the roller-bearing frame in place on an axle. Fig. 3 is an end view of a roller-bearing frame with part cut away to show construction. Fig. 4 is a detail diagram view showing the arrangement of rollers about a central axis. Fig. 5 is a detail view, in central section, through the center of a roller. Fig. 6 is a detail end view of the roller.

In the accompanying drawings the letter *a* denotes an axle or axle-arm on which a wheel *b* or a pulley or like rotary part is adapted to revolve. The hub *c* of such wheel or pulley has a central opening of a diameter sufficient to permit the insertion of a bearing-case *d*, which contains within it and between its inner or running surface and the outer surface of the axle rollers *e*, which provide a rolling friction between the wheel and its axle in place of a sliding friction.

In Fig. 1 of the drawings my improvement is shown with special reference to its application to a car-wheel, the wheel being mounted in an oblong frame a', across which the axle *a* is held, its ends extending into openings in the frame, where they are firmly clamped, as by means of bolts a^2, extending into threaded sockets in the frame and biting into the axle, holding the latter against rotation and against any lengthwise movement.

The bearing-case *d* is preferably formed in a separate piece from the hub of the wheel, the inner surface of the case near its outer ends being hardened, so as to reduce the wear. This hardened portion of the inner surface may extend for any desired distance; but in practice it is found sufficient to harden that portion for a short distance near the ends which forms the immediate bearing-surface for the rollers.

In the annular space within the hub of the wheel and between it and the axle is interposed a roller-bearing frame *f*, which supports a number of rollers, arranged preferably at regular intervals in lengthwise roller-sockets f' in the frame, the periphery of each roller projecting a limited distance beyond the boundary line of the outer surface of the roller-bearing frame, as illustrated in Fig. 3 of the drawings. This enables each roller to bear on the outer surface of the axle on the inner side of the frame and against the inner surface of the bearing-case on the outside of the frame, the latter at all times being out of contact with the axle or the bearing-case and serving merely to support the rollers in their proper relative position between the hub of the wheel and the axle.

The rollers *e* are preferably so arranged as to be located diametrically opposite each other as to a pair of the rollers, as illustrated in Fig. 4 of the drawings. Each roller *e* is supported on a pin e', the end of which projects into an opening f^3 in the end of the roller-bearing frame *f*. These openings are larger in diameter than the pins, so as to permit a free movement of the latter radially of the frame, and each of the rollers *e* has a yielding support in the frame in such manner as to permit of a movement of the roller radially with reference to the axle about which the rollers are arranged. In the pre-

ferred arrangement of these rollers in the frame they are arranged in alternation, so as to be normally thrust by their yielding support in opposite directions—that is, part of the rollers are arranged so as to be thrust normally outward by their yielding supports. and the remainder are thrust inward, the object of this construction being to hold the rollers at all times in contact with either the inner surface of the roller-bearing case (or of the hub) or with the surface of the axle on which the wheel is supported.

In prior devices of this general class where a series of roller-bearings have been arranged in a frame so as to be interposed between an axle and the inner surface of a hub, and in which position the rollers turn at great speed as to surface velocity, it has been found difficult to prevent the rolls from wearing flat in spots. As soon as a roller begins to flatten by wearing the whole structure soon becomes useless, and the friction is increased rather than decreased by the device.

By a series of thorough experiments and tests I have found that where the weight of a structure, as in the case of a car-wheel, causes close contact between the axle and bearing-case, as to the lower rollers in the set the pressure is released, although to a very slight degree as to the rollers on the side opposite that where the weight and pressure come, the result being that the roller after passing in what may be termed the "pressure-point" turns less rapidly and the surface-speed at which the roller moves in what may be the inactive part of its path about the axle is much less than that speed at which it turns when it is interposed between the parts where pressure is greatest. It is this change in speed of the rollers that is a prime cause of the flattening, for the reason that the slow-moving roller is suddenly pinched between parts moving at so much greater speed as to subject the surface of the roller to a grinding action between the parts. It should be understood, however, that the degree of radial play of the rollers is very slight, so that the wheel or pulley cannot have any appreciable lateral motion which will cause the rollers to change in speed, which should be restored (as by my improved means) to obviate the serious difficulty which has prevented the practical use of bearings of this class.

A preferred form of roller-support is shown in Figs. 3 and 5 of the drawings, the pin e' having a lengthwise groove e^2, in which is located a spring g^3, the ends projecting beyond the ends of the roller and turned up, so as to fit into an opening f^4 in the annular end of the roller-bearing frame f. The spring thrusts against the pin e' as to its center part and against the bottom of the openings f^4 as to its ends, the spring serving, however, two functions, one to lock the pins against rotary movement and the other to thrust the rollers in a radial direction.

It is obvious that other means of holding the roller and its pin in place and of providing for the yielding support of the roller may be used without departing from the main feature of my invention and that it is not limited to the special form described.

In the case of the car-wheel illustrated in Fig. 1 of the drawings the roller-bearing frame f, with rollers e mounted and arranged as described, is held in place upon the axle a within the bearing-case d. On each end of the bearing-case there is secured a cap h, as by means of the interengaging threaded parts, these caps serving to close the ends of the space within which the bearing-frame is contained, the caps fitting so close as to prevent any lateral play of the frame within its socket. The axle a extends through the opening in each cap, a socket in the outer surface of each cap containing a packing-ring i, preferably of rawhide, which serves to exclude dust and prevent the leakage of oil, and outside of each packing is arranged a thick metal collar j, which is held against rotation, as by means of pins k. It is obvious that the shoulder formed by this collar may be made in any manner to accomplish the desired result without the aid of anything more than mere mechanical skill.

It is intended that the rollers shall be well supplied with oil by means of any suitable device for supplying it. A conduit for the oil may be formed by an opening through the center of the axle communicating by a transverse passage with the space in which the roller is located and its outer end with a reservoir from which the oil flows.

When the parts are arranged as shown in Fig. 1 of the drawings, the rollers are interposed between the axle and the inner surface of the hub or bearing-case, and they operate, as already described, when the wheel is in use and in motion, the yielding supports of the rollers holding them constantly in contact with the moving parts, so that their surfaces cannot be subjected to any grinding action of the axle or of the bearing-case. This feature of the invention effectually overcomes a serious and without doubt vital defect in prior bearings of this class.

It is obvious that my improvement in roller-bearings can be applied to bicycles, tricycles, and other vehicles, as well as to the crank and other bearing parts where it is of advantage to reduce friction without requiring changes other than would be within the skill of the art.

I claim as my invention—

1. An improved roller-bearing comprising a case, rollers supported in said case, and means whereby some of the rollers are normally pressed radially outward and the remainder radially inward.

2. In a bearing, in combination, an axle, rollers grouped about the axle and yielding supports whereby some of the rollers are thrust radially outward and the others in alternation thrust inwardly by their yielding

supports, and a case inclosing the rollers whereby contact of the rollers at all times with either the surface of the axle or the inner surface of the case is maintained, all substantially as described.

3. In combination with an axle, a roller-bearing frame mounted on the axle, a series of rollers mounted in the frame, a pin supporting each roller and having a lengthwise groove, a spring arranged in the groove with the opposite ends projecting into openings in each end of the roller-bearing frame whereby the said pins are held against rotation and the roller held with a yielding support, all substantially as described.

4. In combination with an axle or shaft, a roller-bearing frame supporting a series of rollers grouped about the shaft said rollers having a radial movement in openings in the bearing-frame, said rollers being arranged in pairs diametrically opposite to each other in the frame and in alternation as to the direction of the normal thrust of their yielding supports, the yielding supports, and a case inclosing the bearings, all substantially as described.

5. In combination with a frame, an axle *a* secured to the frame, a car-wheel *b* mounted on the axle and provided with a roller-bearing case *d*, a roller-bearing frame held within the case by caps secured to opposite ends of the roller-bearing case, rollers mounted within the roller-bearing frame, the said rollers being arranged in pairs diametrically opposite to each other and in alternation as to the direction of pressure of the yielding supports, yielding supports thrusting radially inward as to one pair of the rollers and radially outward as to the alternate pair whereby a continued rotary movement of the rollers between the axle and the bearing-case is insured, all substantially as described.

6. In combination with an axle or shaft, a roller-bearing frame supporting a series of rollers grouped about the shaft said rollers having a radial movement in openings in the bearing-frame and arranged in pairs diametrically opposite each other in the frame and in alternation as to the direction of the normal thrust of their yielding supports, the yielding supports, a case inclosing the bearings, a flanged shoulder removably secured to the axle-arm at the inner end of the inclosing case, and a packing located between the case and the flanged collar, all substantially as described.

GEORGE J. CAPEWELL.

Witnesses:
JAMES TRACY,
ARTHUR B. JENKINS.