No. 787,085. PATENTED APR. 11, 1905.

E. C. DOOLITTLE.

COMPENSATING GEARING.

APPLICATION FILED NOV. 3, 1904.

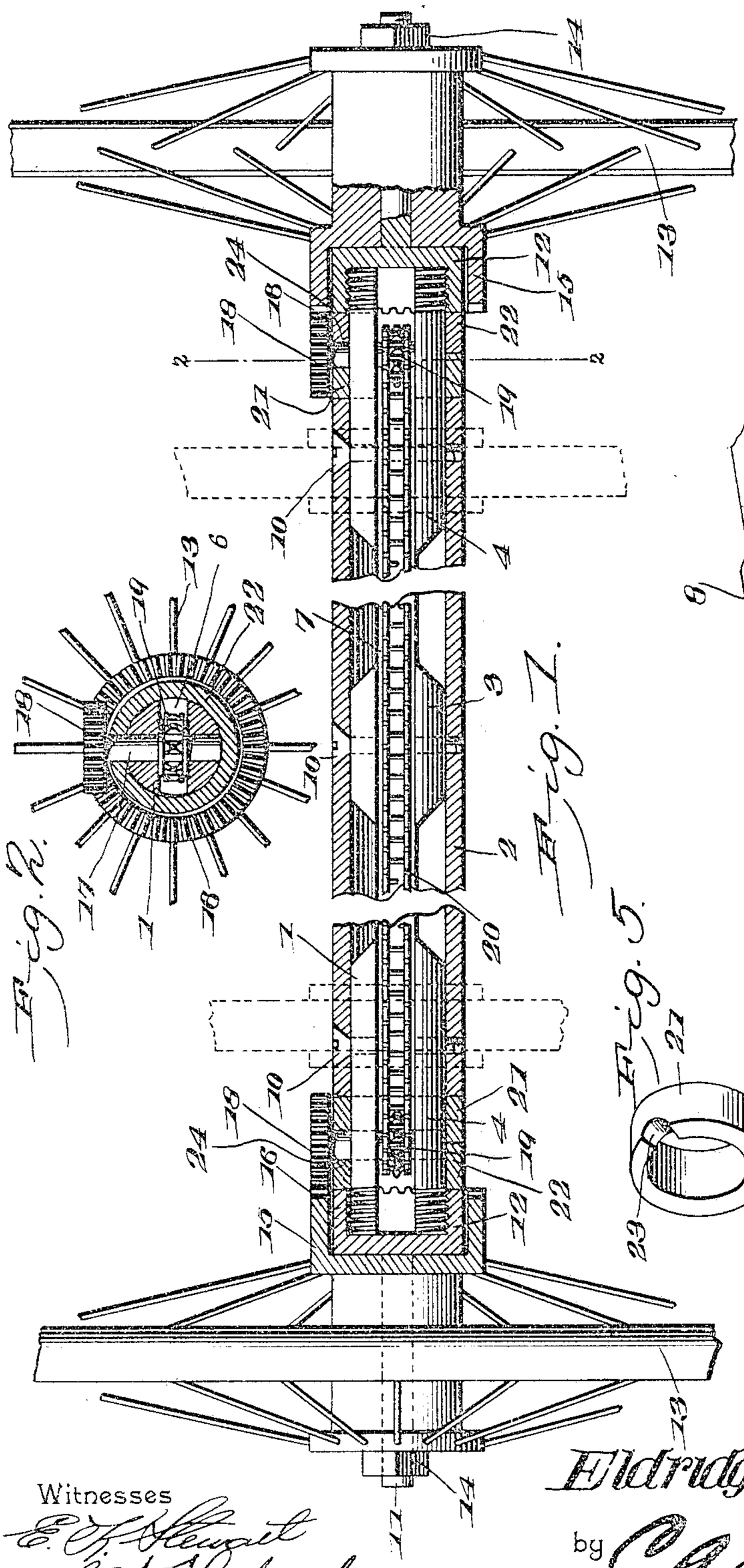

Fig. 1.

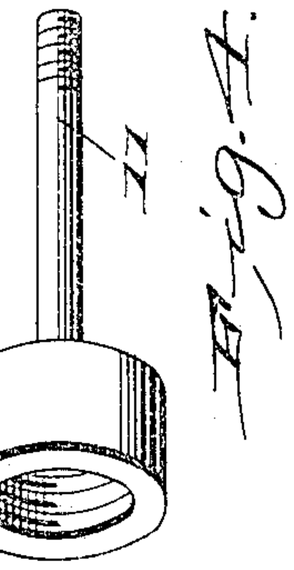

Fig. 4.

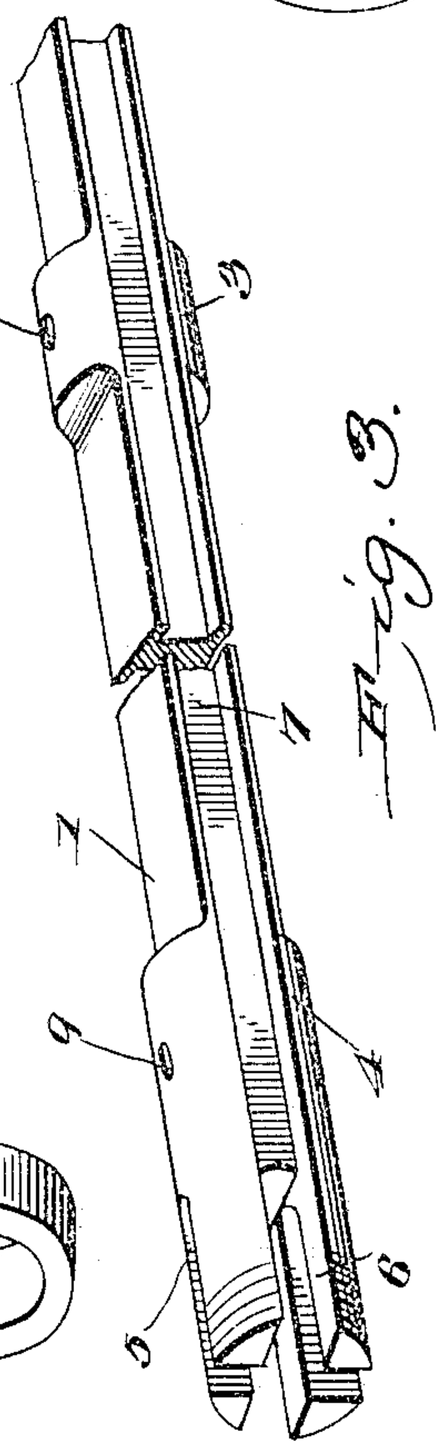

Fig. 3.

Fig. 5.

Witnesses

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No. 787,085. Patented April 11, 1905.

UNITED STATES PATENT OFFICE.

ELBRIDGE C. DOOLITTLE, OF WALLINGFORD, CONNECTICUT, ASSIGNOR OF ONE-HALF TO WILLIAM HASSETT, OF WALLINGFORD, CONNECTICUT.

COMPENSATING GEARING.

SPECIFICATION forming part of Letters Patent No. 787,085, dated April 11, 1905.

Application filed November 3, 1904. Serial No. 231,247.

To all whom it may concern:

Be it known that I, ELBRIDGE C. DOOLITTLE, a citizen of the United States, residing at Wallingford, in the county of New Haven and State of Connecticut, have invented a new and useful Compensating Gearing, of which the following is a specification.

This invention relates to drive-gearing, and is designed to provide an improved compensating arrangement particularly applicable to the drive-axles of motor-vehicles, although capable of use in other relations. In this connection it is designed to effect a direct drive of each of the wheels of the axle and at the same time to permit of the wheels running at different rates of speed whenever necessary—as, for instance, when the vehicle is turning or changing its course.

A further object of the invention is to facilitate the application and removal of the several parts of the gearing for convenience in repairing and also to house the greater portion of the gearing in a simple and efficient manner, so as to be protected from the effects of dust and the weather.

Another object of the invention is to have the exterior of the axle free throughout its entire length to permit of the drive connection between the motor and the axle being applied to the latter at any point thereon.

With these and other objects in view the present invention consists in the combination and arrangement of parts, as will be hereinafter more fully described, shown in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that changes in the form, proportion, size, and minor details may be made within the scope of the claims without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is a plan section of the drive-axle of the motor-vehicle embodying the features of the present invention. Fig. 2 is a cross-sectional view on the line 2 2 of Fig. 1. Fig. 3 is a fragmentary perspective view of one end portion of the core of the present form of axle. Fig. 4 is a detail perspective view of one of the spindle members. Fig. 5 is a detail perspective view of one of the spacing-rings.

Like characters of reference designate corresponding parts in each and every figure of the drawings.

The axle of the present invention is made up of a single-piece core 1, contained within a tubular case or external member 2, slightly shorter than the core. The general shape of the core is substantially rectangular in cross-section, having a central cylindrical enlargement 3 and terminal cylindrical enlargements 4. Each cylindrical terminal of the core is externally threaded and is provided with longitudinal bifurcations 5 and 6, intersecting one another at substantially right angles and extending inwardly beyond the threads. Longitudinal grooves 7 are formed in opposite sides of the core and extend throughout the entire length thereof into communication with the bifurcations 6 at opposite ends of the core. A diametric opening 8 pierces the central cylindrical enlargement, and each terminal cylindrical enlargement 4 is pierced by a diametric opening 9. The tubular case or external member 2 snugly fits the enlarged cylindrical portions of the core and is connected thereto for simultaneous rotation therewith by means of suitable pins or fastenings 10, which pierce the case and engage the respective openings 8 and 9 in the core, it being preferred to have one end of each pin or fastening threaded to engage a threaded opening in the case, so as to prevent endwise displacement of the fastening. Each end of the axle is provided with a detachable spindle 11, which is provided at its inner end with an enlarged circular internally-threaded socket or cap 12 to engage the adjacent threaded end of the core, with a wheel 13 of any suitable character mounted to rotate loosely upon the spindle and retained thereon by a suitable hub-retaining nut 14. The inner end of the hub is provided with a cylindrical extension 15, having gear-teeth 16 upon its outer edge, thereby constituting a crown-gear.

It will be understood that the tubular case 2 is shorter than the core and centered thereon to permit of the core projecting at oppo-

site ends of the case, there being a suitable space intervening between each crown-gear 15 and the adjacent end of the case. A stub-shaft 17 is rotatably mounted in the bifurcation 5 at each end of the core with one end projected beyond the case and provided with a pinion 18 in mesh with the crown-gear 16. Fixed upon this shaft is a sprocket-wheel 19, working in the bifurcation 6, there being a sprocket-chain 20 running in the grooves 7 of the core and engaging the sprockets 19 at opposite ends of the axle to connect the opposite pinions for simultaneous rotation. Each shaft 17 is held against lateral play in the bifurcation 5 by means of bearing-rings 21 and 22, which embrace the adjacent cylindrical enlargement 4 of the core back of the threaded portion of the latter and are clamped between the adjacent end of the case 2 and the cap or socket 12 of the spindle. The meeting edges of the rings 21 and 22 are provided with registered notches or openings 23 and 24 to accommodate the stub-shaft 17 without binding thereon, so as to permit rotation thereof.

As indicated by dotted lines in Fig. 1 of the drawings, it will be understood that the springs for the body of the vehicle are supported directly upon the tubular case 2 of the axle in the usual or any preferred manner, and the exterior of the axle is unobstructed between the pinions 18, except for the springs, and therefore the drive connection between the motor and the axle may be fitted to any portion of the tubular case.

As the tubular case and the core are rigidly connected by the fastenings 10, these two members rotate simultaneously, and the pinions 18, which are rigid upon their shafts, constitute clutch members between the axle and the other clutch members provided by the crown-gears 15, whereby a positive drive connection is provided between the axle and the wheels, the latter and the axle of course rotating simultaneously.

It will here be explained that the chain belt 20 has no function whatsoever to produce rotation of the axle, and the pinions 18 do not rotate upon or with their shafts when the vehicle is traveling straight ahead, but remain fixed with respect to rotation upon their shafts, whereby the relation between each pinion and the adjacent crown-gear 15 is not changed by the rotation of the axle, and therefore the pinion and the crown-gear operate as clutches to interlock the wheel with the axle for simultaneous rotation therewith.

When changing the direction of movement of the vehicle—for instance, to the left—the right-hand wheel will of course rotate faster than the left-hand wheel, due to the greater distance through which the right-hand wheel must travel. By reason of the fact that each wheel is capable of rotation upon the adjacent spindle the right-hand wheel will rotate faster than the axle, whereby the adjacent pinion 18 will be rotated by the crown-gear 15 traveling around the axle, and the chain belt 20 will cause the other pinion to rotate, and thereby travel around its adjacent crown-gear, and thus permit the adjacent wheel to rotate at a less rate of speed than the axle. A reverse operation of the gear will of course take place when the vehicle is turned to the right.

From the foregoing desciption it will be noted that the axle is continuous from end to end and not separated into sections and there is a positive connection between the axle and the wheels to effect simultaneous rotation thereof, while at the same time permitting either of the wheels to run faster than the other without affecting the drive connection between the motor and the axle and without offering any appreciable resistance to the motor. Moreover, all of the parts of mechanism are housed with the exception of the pinions 18, while at the same time the wheels may be removed and the axle taken apart for convenience in repairing the chain and the sprocket-wheels.

Having fully described the invention, what is claimed is—

1. The combination of an axle-core having cylindrical terminals and provided with longitudinal grooves in opposite sides thereof, each terminal being provided with bifurcations disposed at substantially right angles to one another with one of the bifurcations communicating with the grooves, a tubular case embracing and fixed to the core with its ends terminated adjacent the inner ends of the bifurcations of the core, the terminals of the core being threaded, stub-shafts rotatable within corresponding bifurcations at opposite ends of the core and pinions fixed thereon at the outer side of the core, sprocket-wheels carried by the shafts within the respective other bifurcations, a sprocket-chain connecting the sprocket-wheels and running in the grooves of the core, bearing-rings embracing the core and lying at opposite sides of the projected ends of the stub-shafts, spindles having internally-threaded caps fitted to the threaded terminals of the core and engaging the adjacent bearing-ring to hold the same in place, and wheels rotatable upon the spindles and provided at the inner ends of their hubs with crown-gears meshing with the respective pinions.

2. The combination of an axle terminating at opposite ends in spindles, wheels rotatable upon the spindles and provided at their inner sides with gears, rotatable stub-shafts carried transversely by the axle and having pinions fixed thereon and meshing with the respective gears, and an endless belt connecting the stub-shafts.

3. The combination of a rotatable drive member, wheels mounted to rotate thereon and provided with gears, rotatable gears carried

by the drive element upon axes disposed transversely of said element and in mesh with the respective gears, and a connection between the pinions to transfer motion from one to the other.

4. The combination of a continuous drive element, wheels loosely rotatable thereon, individual locking means to interlock the wheels with the drive element for simultaneous rotation thereon, and to permit acceleration of one of the wheels without acceleration of the other wheel.

5. The combination with a drive-axle, of wheels rotatable thereon, pinions carried by the axle upon axes transverse thereto, gears carried by the wheels and in mesh with the respective pinions, each pinion being rotatable upon its axis to permit rotation of the adjacent gear and wheel upon the axle, and means connecting the pinions for simultaneous rotation.

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

ELBRIDGE C. DOOLITTLE.

Witnesses:

A. L. JUDD,

W. E. ATKINSON.