No. 683,323. Patented Sept. 24, 1901.

A. E. OSBORN.

COMPENSATING DRIVING GEAR.

(Application filed Mar. 25, 1901.)

(No Model.) 4 Sheets—Sheet 1.

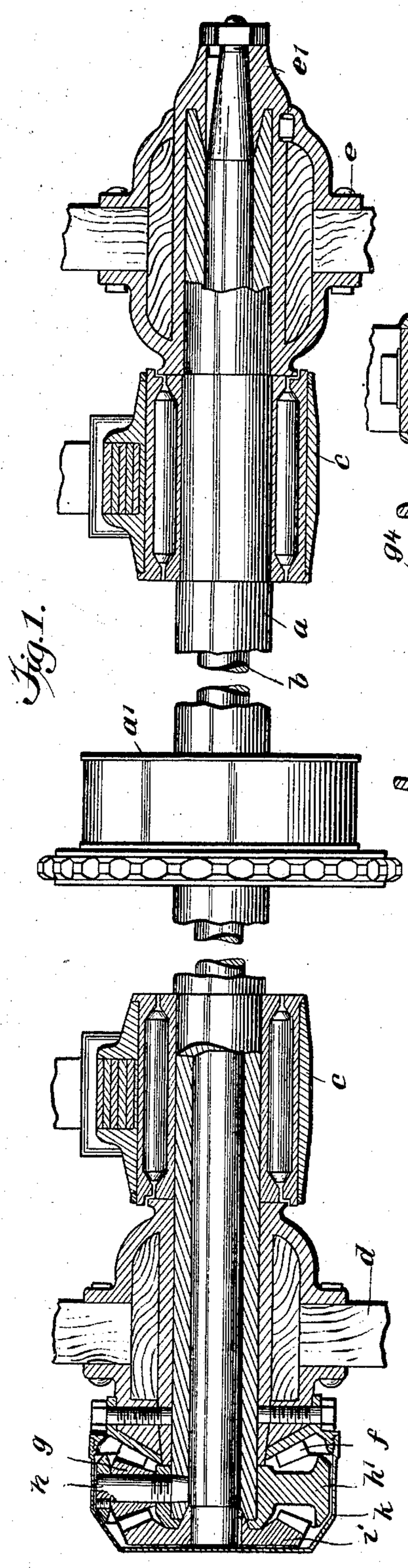

Fig. 1.

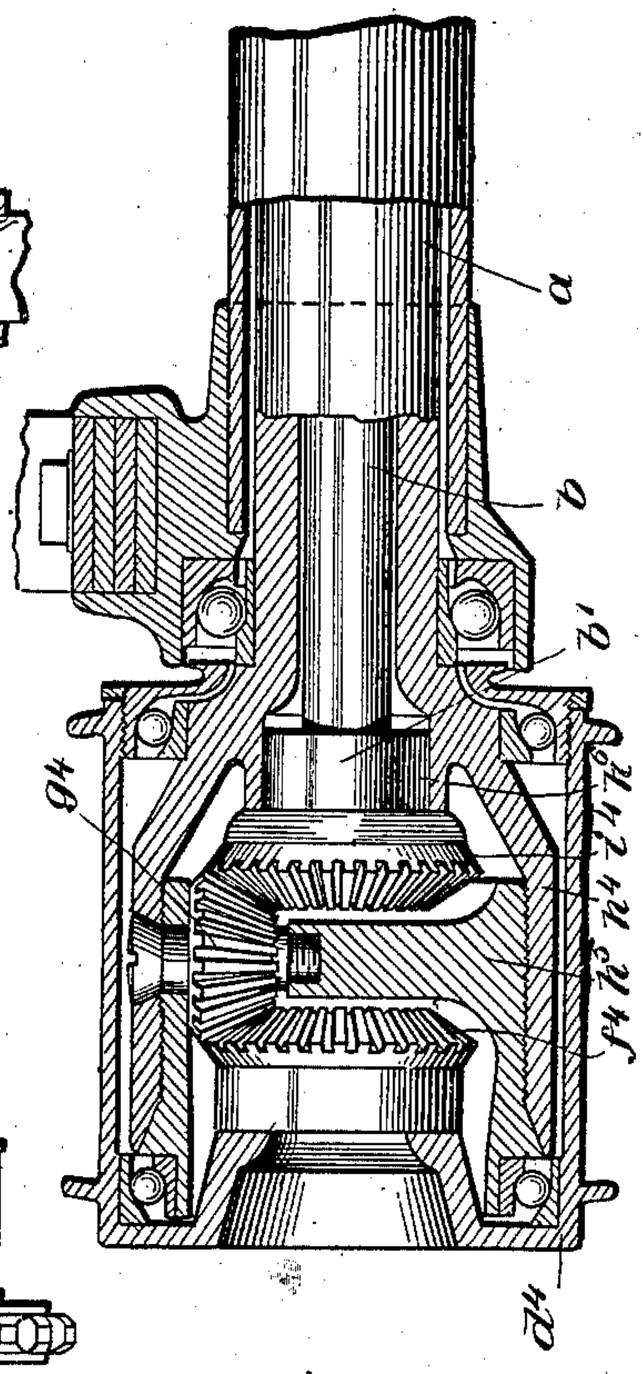

Fig. 5.

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Fig. 3.

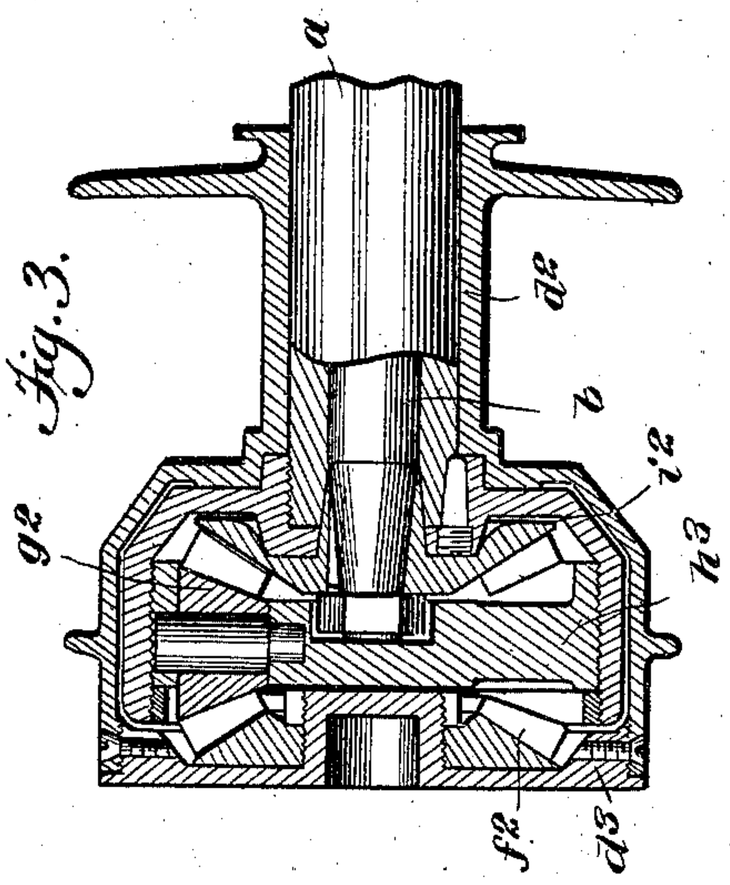

Fig. 6.

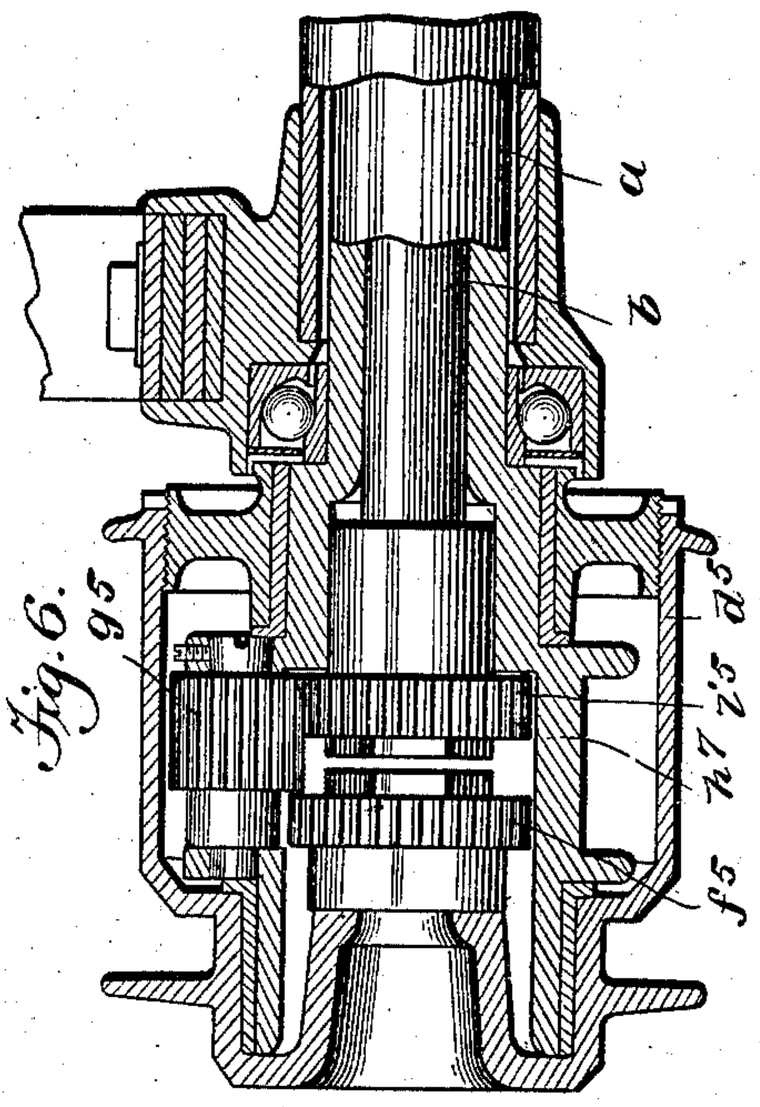

Fig. 2.

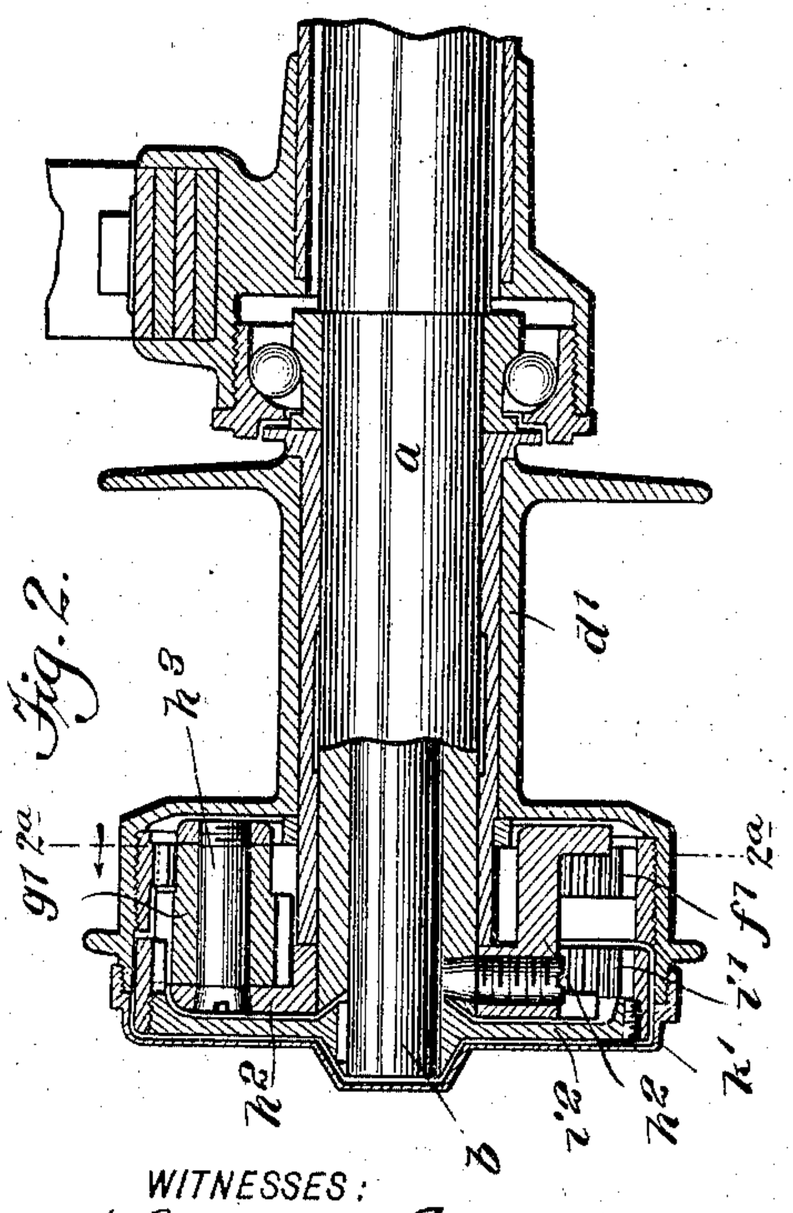

Fig. 4.

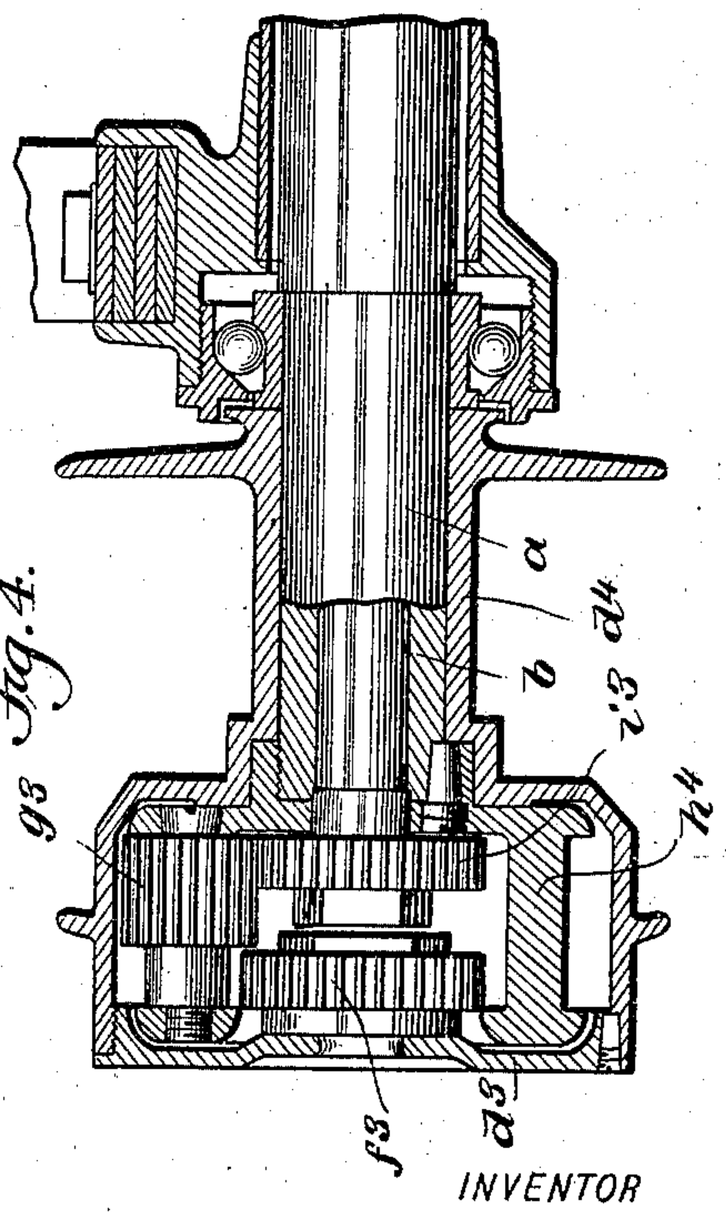

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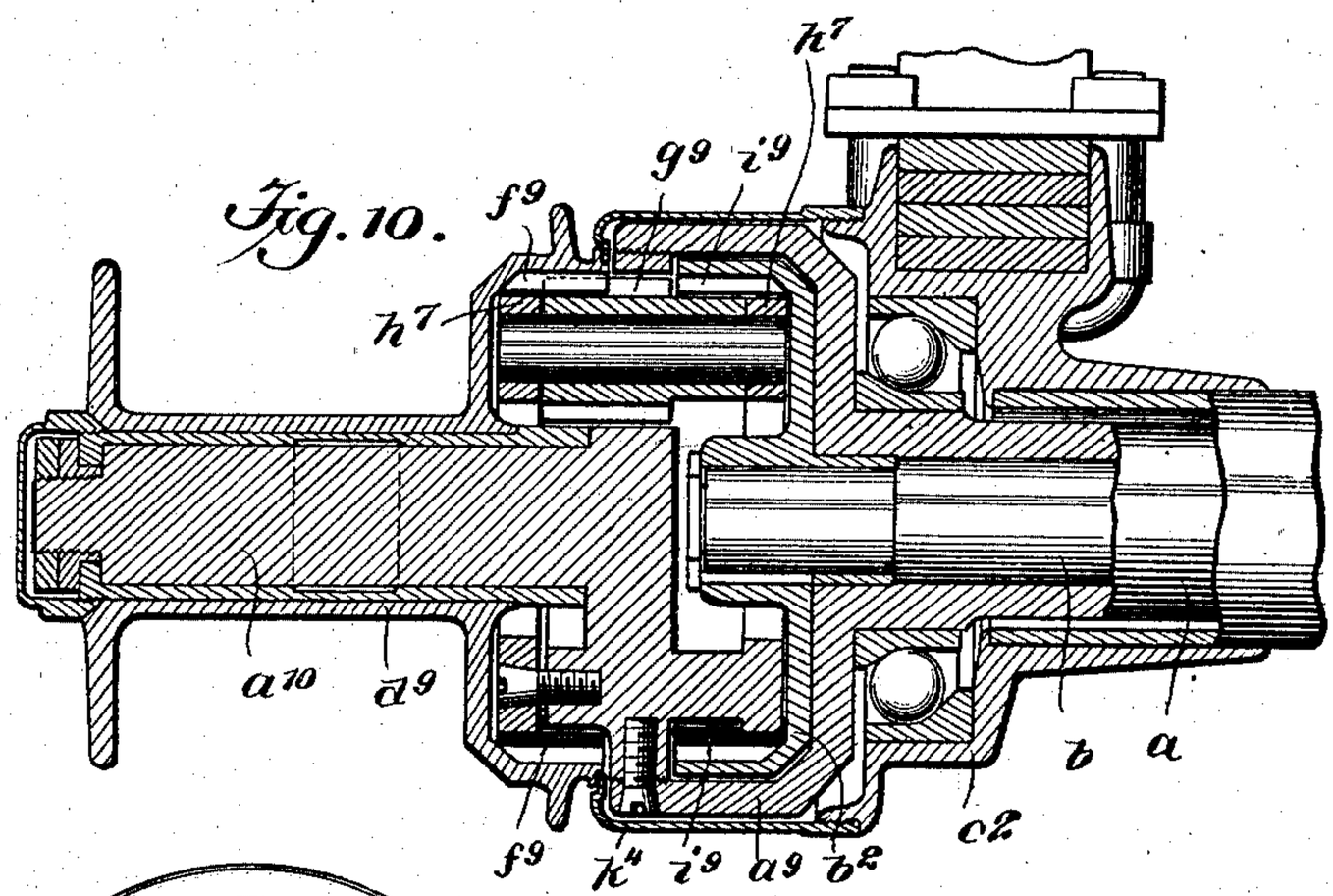
Fig. 10.



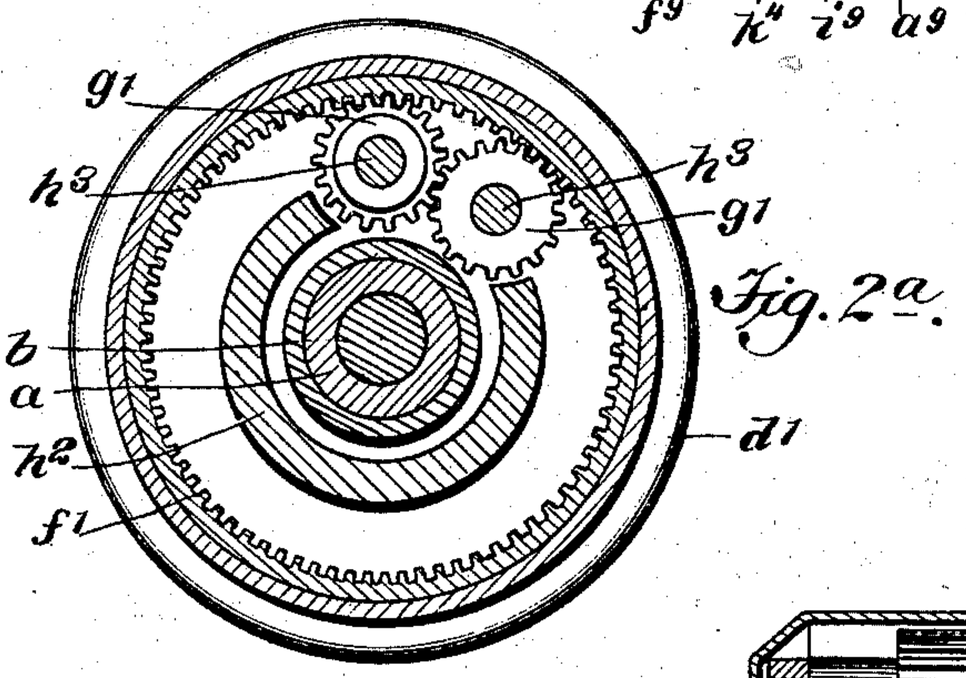


Fig. 2a.

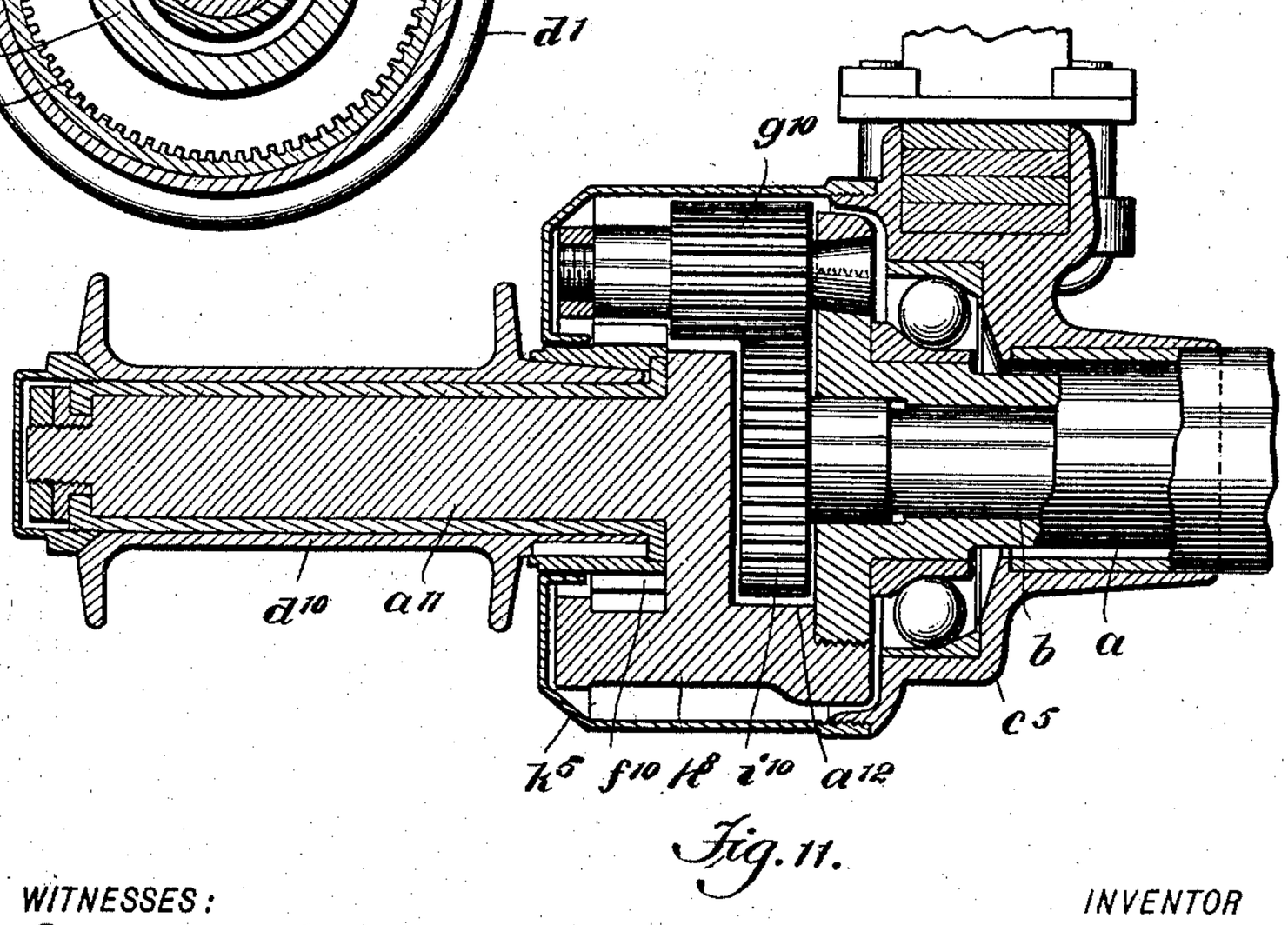


Fig. 11.

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4 Sheets—Sheet 4.

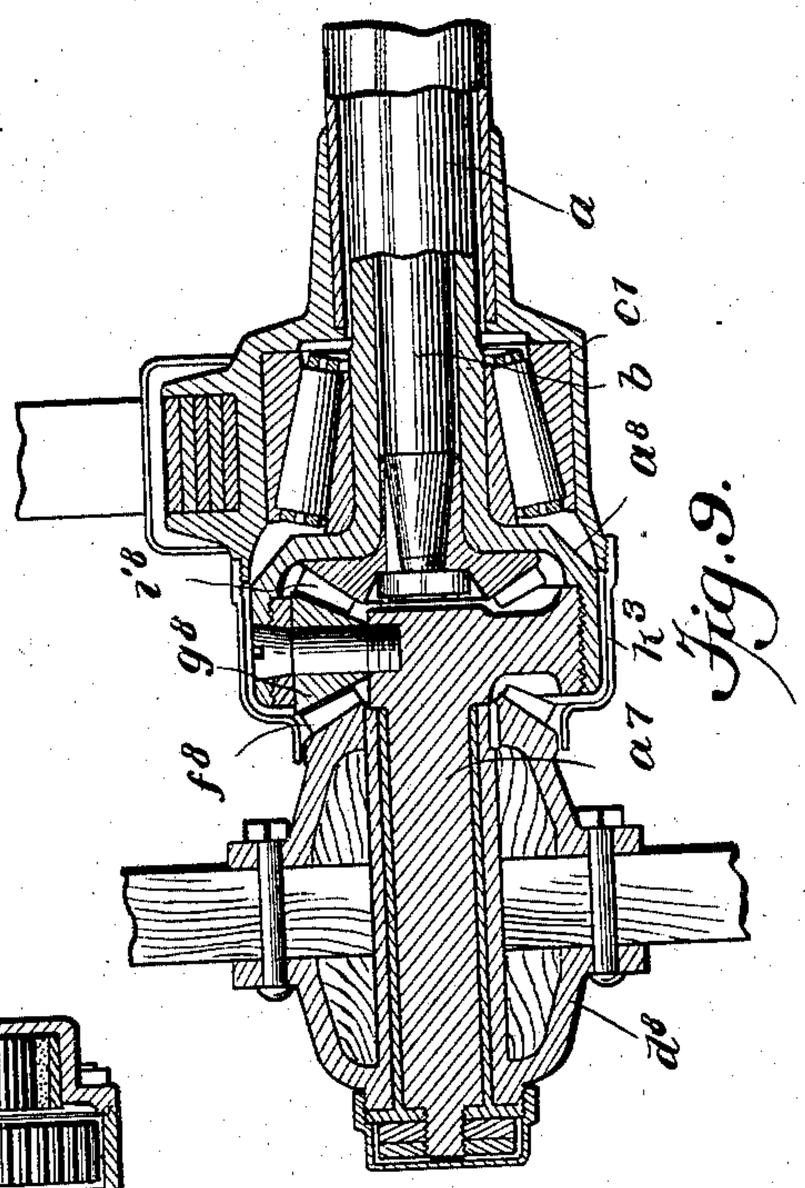

Fig. 9.

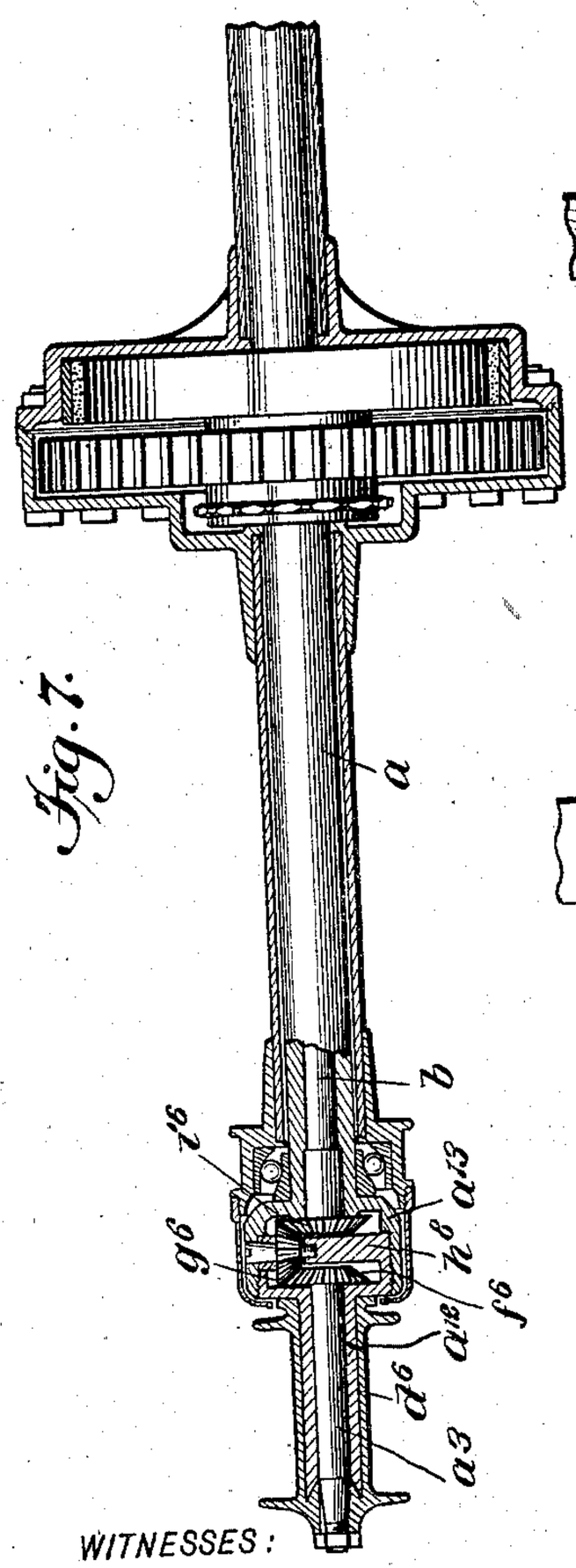

Fig. 7.

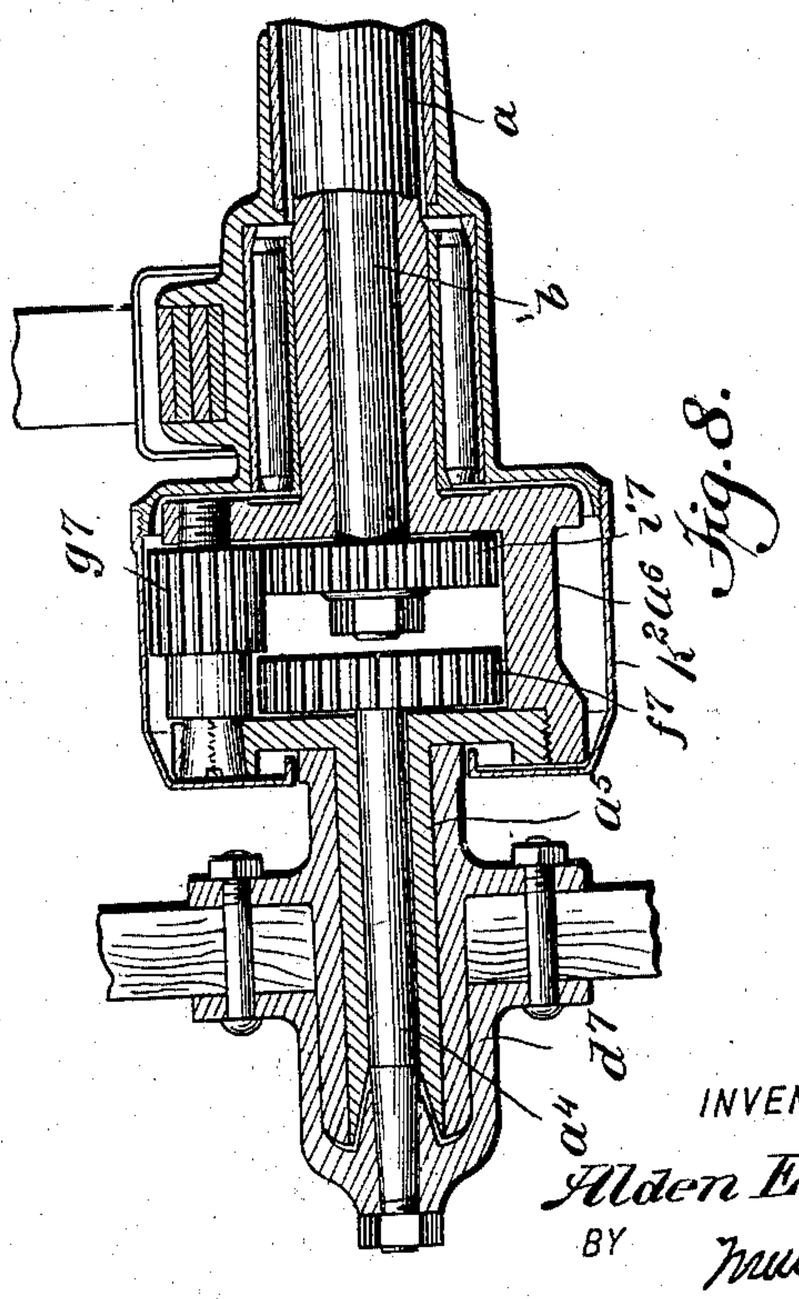

Fig. 8.

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UNITED STATES PATENT OFFICE.

ALDEN E. OSBORN, OF NEW YORK, N. Y.

COMPENSATING DRIVING-GEAR.

SPECIFICATION forming part of Letters Patent No. 683,323, dated September 24, 1901.

Application filed March 25, 1901. Serial No. 52,718. (No model.)

To all whom it may concern:

Be it known that I, ALDEN E. OSBORN, a citizen of the United States, and a resident of the city of New York, borough of the Bronx, in the county and State of New York, have invented a new and Improved Compensating Driving-Gear, of which the following is a full, clear, and exact description.

This invention relates to a driving-gear for automobile vehicles which will permit the traction-wheels, while mounted on a solid axle, to rotate at different speeds when the vehicle turns a curve without interfering with the driving movements of the wheels.

In the Letters Patent to Andrew L. Riker, reissued July 18, 1899, No. 11,760, a gear of this sort is disclosed. Such gear comprises a hollow driving-axle, a shaft turning freely inside thereof, road-wheels, one mounted to turn on the hollow axle and the other fastened to turn with the shaft inside of the axle, and a compensating gear connected with and driving the first-named road-wheel. The disadvantage of the Riker construction is that one of the road-wheels is carried principally on the shaft which turns in the axle, such shaft bearing the major portion of the strain of the wheel, which itself has only a very slight bearing on the tubular axle. This places an undue strain on the rotating shaft and precludes the possibility of an even and effective action of the parts. My invention seeks to overcome this disadvantage, which end I attain by mounting both of the wheels wholly upon the hollow axle, so that said axle bears absolutely the entire strain of the wheels, and by effecting between one of the wheels and the shaft which is within the hollow axle a connection merely sufficient to transmit movement from the shaft to the wheel, or vice versa.

This specification is a description of several forms of my invention, while the claims are definitions of the actual scope thereof.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a fragmentary sectional view of one form of my invention. Fig. 2 is a sectional view of essentially the same arrangement, except that the gearing is of the spur-and-pinion sort instead of the miter-gearing shown in Fig. 1. Fig. 2^a is a section on the line 2^a 2^a of Fig. 2. Fig. 3 is a sectional view of a third form of the invention. Fig. 4 is a sectional view of a form practically that of Fig. 3, excepting that spur-and-pinion gearing is employed. Fig. 5 is a sectional view of a further modification. Fig. 6 is a sectional view of the same form, except that spur-and-pinion gears are utilized. Fig. 7 is a sectional view showing a further modification. Fig. 8 is a sectional view showing the same gear as that shown in Fig. 7, except that spurs and pinions are employed. Fig. 9 is a sectional view of a further modification. Fig. 10 is a sectional view of a spur-gear modification of Fig. 9, and Fig. 11 is a sectional view of a further spur-gear modification.

Referring to Fig. 1, *a* indicates a tubular driving-axle, and *a'* the gear for imparting movement thereto. *b* indicates the shaft, which may be either solid or hollow and which is fitted loosely within the tubular or hollow axle *a*. *c c* indicate the bearings whereby the axle *a* is mounted on the vehicle. *d* indicates one of the traction-wheels, and *e* the other traction-wheel, these wheels being mounted loosely and wholly on the tubular axle *a*. This wheel *e* has an extension *e'* of its hub, which is keyed to the adjacent end of the shaft *b*, which end is projected beyond the tubular axle. Outside of the wheel *d* and fastened rigidly to the hub thereof is a miter-gear *f*, in mesh with a miter-pinion *g*, carried on a pin *h*, which in turn is held in the tubular axle *a* and in a sort of cage *h'*, fastened rigidly thereto and turning therewith. *i* indicates a miter-gear which is fastened to the adjacent end of the shaft *b* and which meshes with the pinion *g* on the side opposite the side at which the gear *f* is located. The gears *f*, *g*, and *i* are covered by a suitable case *k*, which is carried by and turns freely with the wheel *d*. Now with reference to a gear of this sort it will be observed that the hollow axle *a* is passed uninterruptedly through the hubs of both wheels, so that said wheels are mounted wholly upon the tubular axle, and such part bears the entire strain of these wheels. The connection *e'* between the wheel *e* and the shaft *b* is a connection which bears

simply the turning strain of the shaft and carries in no way the weight of the vehicle. The tubular axle being extended through the hub of the wheel d and projected beyond the same enables the compensating gears f, g, and i to perform their functions without in any way necessitating the shaft b bearing any of the strain of the weight of the vehicle. Driving movement being imparted to the element a, the gear g is caused to turn bodily with the axle, and this gear, being in mesh with the gears f and i, transmits a like movement to such parts, driving, in turn, the wheel d and the wheel e. This driving movement allows, as will be readily understood by persons skilled in the art, independent movement of the traction-wheels under the action of extraneous force.

Fig. 2 illustrates a modification of the invention in which spur-and-pinion gears are employed. d' indicates the wheel-hub, which is loosely mounted on the tubular axle a. f' indicates an internal spur-gear which is fast on the hub d'. i indicates an internal spur-gear which is fast on the shaft b through the medium of a web i^2. h^2 indicates a suitable cage or carrier which is fastened rigidly to the tubular axle a and which carries two pins h^3. On these pins are mounted pinions g', which are one for each pin and which have broad-toothed faces meshed, respectively, with the gears f' and i' and intermeshed together. (See Fig. 2^a.) The pinions g' are loosely mounted on their respective shafts.

Comparisons of Figs. 1 and 2 will show that the principles of operation of the two forms are essentially the same. In Fig. 2 I have shown a hub adapted to carry wire spokes, and in Fig. 1 I have shown a hub with wooden spokes. Both wooden and metallic hubs may be employed, their form being inessential. In both instances the shaft b extends entirely through and beyond the compensating gear, it being covered, of course, by a case k', corresponding to the case k in Fig. 1.

In Fig. 3 I have shown a form of my invention in which the gear for driving the hub of the wheel adjacent to the compensating mechanism is outside of the other parts, as contradistinguished from on the inside thereof, as in Figs. 1 and 2.

In Fig. 3, d^2 indicates the wheel-hub, which is loose on the hollow axle a, and f^2 indicates the beveled gear, which is fastened to a web d^3, forming part of the hub d^2. h^3 indicates a cage or holder which is fastened rigidly to the exterior of the hollow axle a and turns therewith. g^2 is a pinion carried by the holder or cage h^3, and i^2 is a gear which is fastened to the shaft b. The gear i^2 is located on the inner side of the gear g^2, and the gear f^2 on the outer side. The hub d^2 has an enlarged portion which loosely incloses the part h^3 and the gears i^2, g^2, and f^2. Movement of the axle a drives the holder h^3 and carries the gear g^2 around the axis of the axle. This gear, meshing with the gears i^2 and f^2, turns the hub d^2 and the shaft b, through the medium of which the hub of the other wheel is also turned.

Fig. 4 shows, essentially, the arrangement shown in Fig. 3, excepting that spur-and-pinion gears are employed. d^4 indicates the hub, which is mounted loosely on the hollow axle a. f^3 is a spur-gear which is fastened to the hub through the medium of the web d^3, which is the same as that shown in Fig. 3. h^4 indicates the cage or holder, which is fastened rigidly to the hollow axle a and turns within an enlarged portion of the hub d^4. The cage or holder has two pinions g^3, which are the same as the pinions g', before described, and these pinions are respectively meshed with the spur-gear f^3 and with a spur-gear i^3, fastened to the adjacent end of the shaft b and operating according to the same principle explained with respect to the construction shown in Figs. 2 and 2^a.

In Figs. 1, 2, 3, and 4 the pinions g, g', g^2, and g^3 are carried in holders or cages which are formed separate from but rigidly fastened to the hollow axle.

In Fig. 5 I have shown a construction in which the hollow axle a is provided with an enlargement h^4, integral therewith. On this enlargement the hub d^4 of the wheel is loosely mounted, the hub being carried wholly by the enlargement h^4, and this enlargement containing a cage or holder h^5 for the bevel-pinion g^4, these parts turning with the hollow axle a, as before explained. f^4 indicates a gear which is fastened to the hub d^4, and i^4 indicates a gear which is fastened to the shaft b. As shown in Fig. 5, the shaft b has an enlarged bearing portion b', which is housed in a box h^6, forming part of the enlargement h^4 of the axle a.

Fig. 6 shows the arrangement shown in Fig. 5, with modifications to permit the use of spur-gearing. h^7 indicates the integral enlargement of the axle a, which enlargement serves in place of the gear-holders h', h^2, h^3, and h^4, previously described. d^5 indicates the hub of the wheel, which is mounted loosely on this enlargement h^7 of the axle a. f^5 indicates the spur-gear which is fastened to the hub d^5, and i^5 indicates the spur-gear which is fastened to the shaft b. g^5 indicates one of the two pinions which are carried in the enlargement h^7 and meshed, respectively, with the gears f^5 and i^5, according to the principle illustrated in Fig. 2^a.

Fig. 7 shows a form of my invention in which the compensating gear is located inward from the adjacent traction-wheel. In the forms of my invention previously described the compensating gear is located within or outward from the adjacent traction-wheel.

In Fig. 7, a indicates the tubular axle, and b indicates the shaft therein, connected to the other wheel-hub. The wheel-hub d^6 is carried loosely on an extension a^{12} of the tubular axle, and this extension is joined rigidly to

the axle, so as to turn therewith as an integral part thereof, through the medium of an enlargement a^{13}. This enlargement a^{13} forms a cavity which contains the pinion-holder h^8, carrying the beveled pinion g^6, which meshes with a bevel-spur i^6 on the shaft b and a bevel-spur f^6, carried on a spindle a^3, which turns loosely within the extension a^{12} of the axle a and which is keyed to the hub d^6. In connection with this form of the invention it will be observed that the parts a a^{12} a^{13} turn continuously as an integral structure, carrying with them the gear g^6, and that this gear meshes with the gears f^6 and i^6 and turns the parts a^3 and b, the former driving the hub d^6 and the latter driving the hub of the other traction-wheel. (Not shown in Fig. 7.)

Fig. 8 shows the same structure as in Fig. 7, except that spur-gears are used. d^7 indicates the wheel-hub, and a^4 indicates the spindle which is connected therewith. The wheel-hub turns freely around an extension a^5 of the axle a, through which extension the spindle a^4 passes. a^6 indicates an enlargement on the shaft b, which forms a casing wherein are located the pinion-gears f^7 and i^7 and the spur-gears g^7. k^2 indicates a case which fits over the parts to protect them from dust.

In Fig. 9 I have shown a slight modification of the construction in Fig. 7, in which the wheel-hub d^8 turns directly on an extension a^7 of the axle a. This extension is fastened rigidly in an enlargement a^8 of the axle. The extension a^8 carries the beveled pinion g^8, and this meshes with a bevel-gear f^8, attached directly to the hub d^8, and also with a bevel-gear i^8 on the shaft b. k^3 indicates a suitable dust-case, which incloses the mobile parts of the gear elements. In Fig. 9, c' indicates the bearing by which the tubular axle a is mounted on the framing of the vehicle. In this form of the invention it will be observed that the case k^3 is carried by the stationary part of the frame of the vehicle and that the bearing c' is directly adjacent to the enlargement a^8 of the axle a.

Fig. 10 illustrates, essentially, the same structure as that shown in Fig. 9, except that spur-gears are employed. a^9 indicates the enlargement on the axle a, and to this enlargement a^9 is rigidly fastened an extension a^{10} of the axle, whereon is mounted to turn freely the wheel-hub d^9. i^9 indicates an internal spur-gear which is carried fast on the shaft b. f^9 indicates an internal spur-gear which is carried fast within an enlargement of the hub d^9. Carried in a cage or holder h^7, forming part of the extension a^{10} of the tubular axle a, are two pinion-gears g^9, respectively meshed with the gears f^9 and i^9 and intermeshed with each other, so as to act according to the pinciple delineated in Fig. 2^a. The parts a, a^9, h^7, and a^{10} turn continuously together, thus driving the hub d^9 of the shaft b and allowing for compensating movement thereof. k^4 indicates the gear-case, and this is carried by the bearing c^2 of the stationary frame of the vehicle, as in Fig. 9. In Fig. 10 the gear i^9 is connected with the shaft b through the medium of a web b^2, lying snugly against the outside of the vertical wall of the enlargement a^9 of the axle a, so that the gear i^9 may be of internal form.

Fig. 11 shows the construction illustrated in Fig. 10, with the exception that in Fig. 11 external spur-gears are employed. a^{11} indicates an extension of the tubular axle a, which extension is fastened rigidly to the tubular axle and forms practically a part thereof. d^{10} indicates the wheel-hub, which is mounted on the extension a^{11}. f^{10} indicates a spur-gear which is fast on the wheel-hub or a part thereof. i^{10} indicates a spur-gear which is fast on the shaft b, the extension a^{11} of the axle a having a cavity a^{12} formed therein for the reception of the spur-gear i^{10}. h^8 indicates a cage or holder for the pinions g^{10}, which are the same as the pinions in Fig. 2^a and work according to the same principle. k^5 indicates the gear-case, which in this instance, as in the several figures previously described, is carried in bearings c^5 of the frame of the vehicle.

Now from the above description it will be seen that in every form of my invention the end of the tubular shaft adjacent to the compensating gear or a secure extension of said end passes through the hub of the adjacent traction-wheel, so as to mount the same and to carry it wholly and independently of the shaft which turns in the hollow axle. This places the entire strain of the weight of the vehicle and the driving force of the motor upon the axle, which is continuous, or practically so, from end to end and which allows the shaft within the axle to turn freely and does not place thereon any load other than that which is incident to the compensating action of the parts.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A compensating driving-gear, comprising a tubular axle, a shaft arranged to turn therein, a wheel-hub at one end of the axle, through which hub said axle extends to mount the hub wholly on the axle, a second wheel-hub at the other end of the axle and having connection with the said shaft, and compensating gear adjacent to the first-named hub, for the purpose specified.

2. A compensating driving-gear, comprising a hollow axle, a shaft extended therethrough, wheel-hubs through which the ends of the hollow axle are extended, said hubs being mounted wholly on the axle and supported entirely thereby, one of said wheel-hubs having connection with the shaft, and compensating gearing adjacent to the other wheel-hub and connected respectively therewith and with the said shaft.

3. The combination of a hollow driving-axle, a shaft extending loosely therethrough, a driving-wheel mounted loosely on each end

of the axle and carried wholly thereby, one of said wheels being fastened to the said shaft, and a compensating gear located outside of the other wheel and connecting together the said wheel, the axle and the shaft, for the purpose specified.

4. In a compensating gearing of the class set forth, the combination with the hollow axle, the shaft and the wheel-hub, of a gear fast to the wheel-hub, a gear fast to the shaft, and two additional gears intermeshed together and respectively meshed with the two first-mentioned gears.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALDEN E. OSBORN.

Witnesses:

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JNO. M. RITTER.