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PATENTED NOV. 15, 1904.

G. C. CANNON.
AUTOMOBILE DRIVING GEAR.

APPLICATION FILED NOV. 5, 1903.

NO MODEL.

3 SHEETS—SHEET 1.

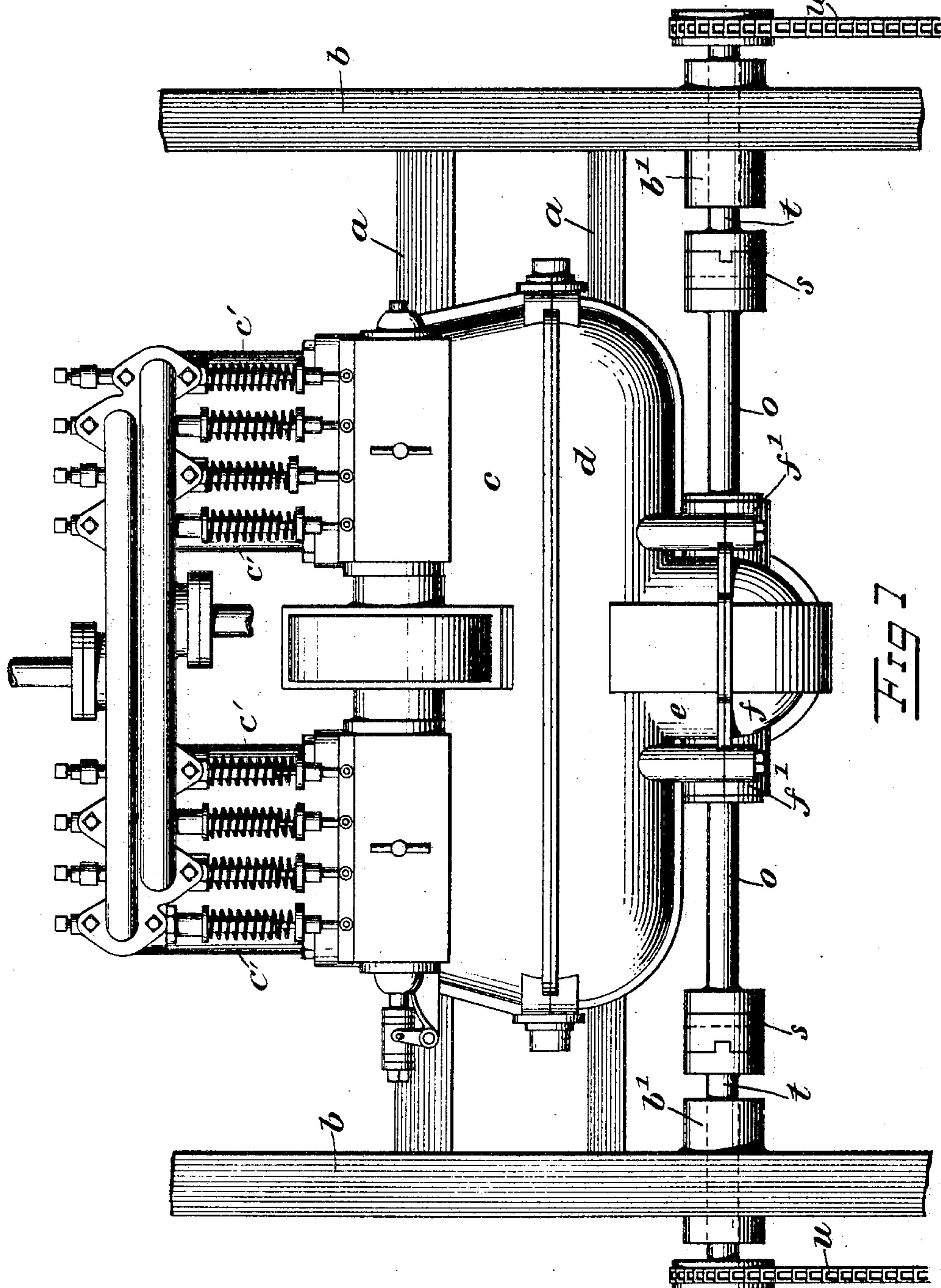


Fig. 1

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No. 775,233.

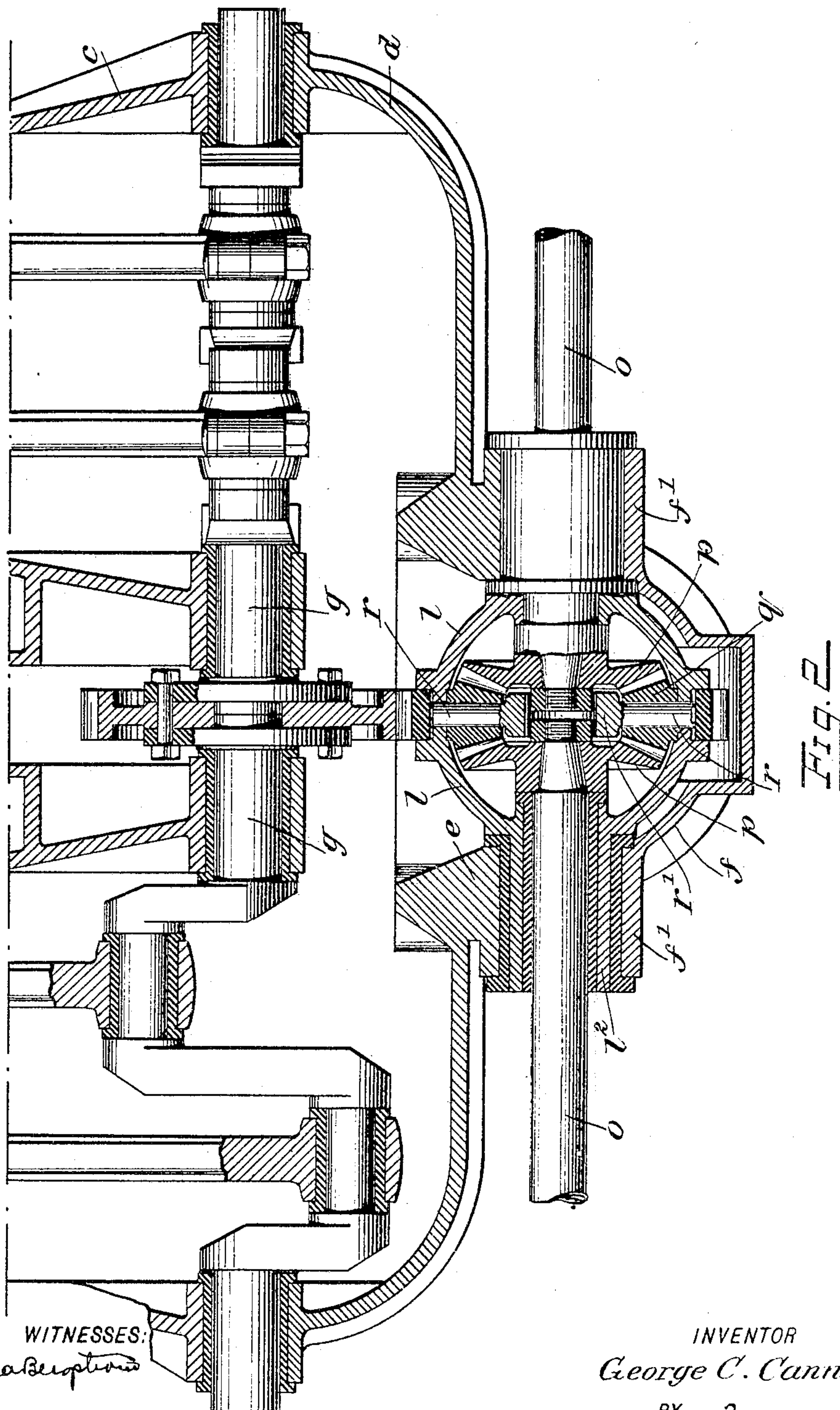
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3 SHEETS—SHEET 2.



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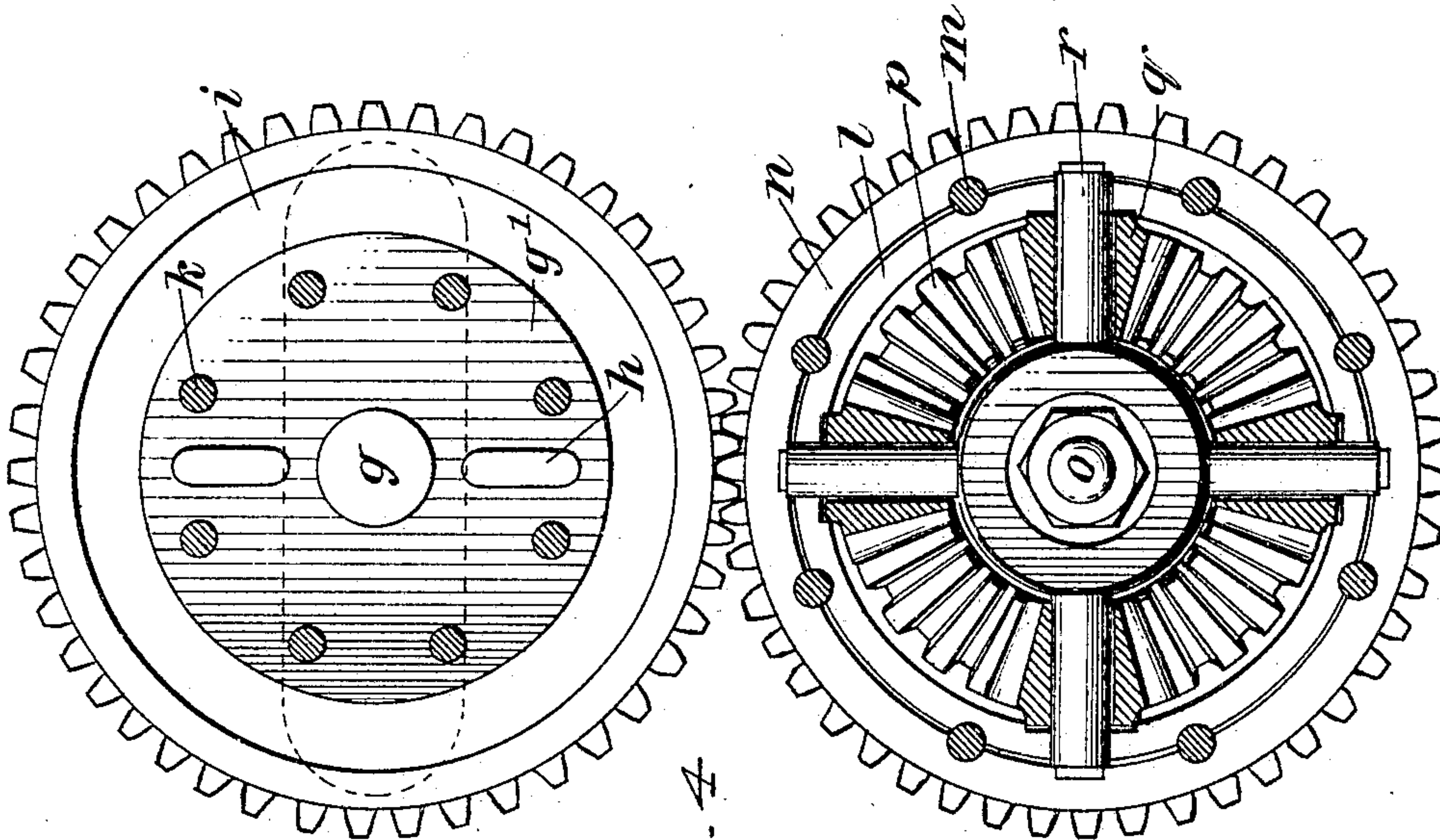
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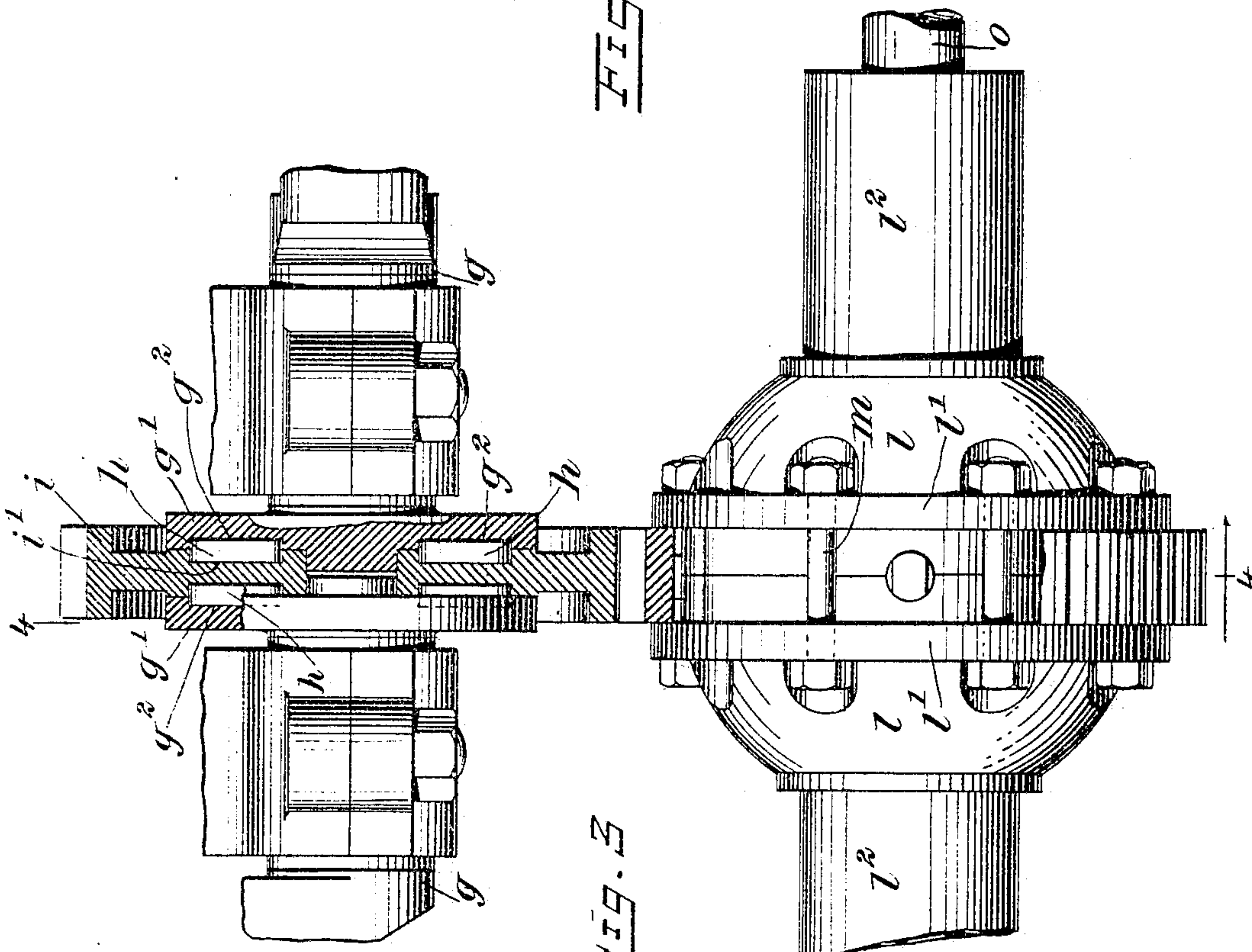
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NO MODEL.

3 SHEETS—SHEET 3.



FILE 4



S. 614

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UNITED STATES PATENT OFFICE.

GEORGE CURTIS CANNON, OF NEW YORK, N. Y.

AUTOMOBILE DRIVING-GEAR.

SPECIFICATION forming part of Letters Patent No. 775,233, dated November 15, 1904.

Application filed November 5, 1903. Serial No. 179,934. (No model.)

To all whom it may concern:

Be it known that I, GEORGE CURTIS CANNON, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Automobile Driving-Gear, of which the following is a full, clear, and exact description.

This invention relates to the differential gear and appurtenant parts of a motor-vehicle.

According to my present invention the differential gear is located directly in the crank-case of the engine and driven by a direct connection with the crank-shaft. The divided transmitting-shaft passes from the differential gear and is joined by Cardan or equivalent flexible connections with short shafts mounted, respectively, in the sides of the vehicle-frame, which shafts in turn have suitable connections with the driving-wheels. In this manner a more compact and reliable structure is produced, and owing to the peculiar arrangement of the shaft-sections and cardans the unavoidable "working" of the vehicle-frame in no way affects the easy movement of the driving parts.

This specification is an exact description of one example of my invention, while the claims define 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 plan view of the invention. Fig. 2 is an enlarged horizontal section of the crank-case and differential gear. Fig. 3 is a still further enlargement of the differential-gear case and the driving-gear of the crank-shaft, and Fig. 4 is a sectional elevation on the line 4-4 of Fig. 3.

The engine here illustrated is a four-cylinder poppet-valve engine and is described and claimed in my copending application for engines, filed of even date herewith, Serial No. 179,933. Obviously, however, this is not essential to the present invention.

The engine lies horizontally, as illustrated in Fig. 1, and is secured firmly to two cross-bars *a*, joined to the side rails *b* and forming

with said rails parts of the vehicle-frame. *c* indicates the forward section of the crank-case, and *d* the rear section, which are bolted together in the usual manner. *c'* indicates the cylinders, which are directly joined to the crank-case section *c*. The rear section *d* has a rearward extension *e*, to which is bolted a cap *f*, these parts *e* and *f* forming the inclosure for the differential gear.

The crank-shaft is formed in two sections *g*, and, as best shown in Fig. 2, each section is formed with a flange *g'*, these flanges lying opposite to each other and having cavities *g''* formed in their adjacent or inner faces. In said cavities are set gibs *h*, and the gibs also sit in corresponding cavities *h'*, formed in the web of a spur-gear *i*, which gear lies between the flanges *g'* and is centrally orificed to receive the contiguous ends of the sections *g* of the crank-shaft. Bolts *k* are passed transversely through the flanges *g'* and gear *i*, and in this manner the two sections of the crank-shaft and the gear *i* are firmly connected together to turn as one integral part.

l indicates the two sections of the differential-gear case, these sections being essentially semispherical and being connected rigidly together by transverse bolts *m*, which pass through the flanges *l'* of the sections *l*. Lying between said flanges and encircling the contiguous edges of the case-sections *l* is an annulus *n*, peripherally toothed to form a spur-gear and notched for the reception of the bolts *m*, as shown in Fig. 4. In this manner the sections *l* of the differential-gear case and the gear-ring *n* are rigidly connected together to turn as one integral part. Said gear-case sections *l* have tubular extensions *l''*, which are suitably mounted in boxes *f'*, formed on the protuberance *e* and cap *f*, as shown best in Fig. 2.

o indicates the two sections of the drive-shaft. These sections are revolubly mounted within the tubular extensions *l''* of the differential-gear case and respectively carry within said case the beveled gears *p*. With these gears mesh the bevel-pinions *q*, and said pinions are freely mounted on radial studs *r*, projecting from an annulus *r'*, which encircles

the contiguous ends of the shaft-sections *o*. The said studs *r* project between the contiguous edges of the sections *l* and have squared ends secured in corresponding cavities formed in the inner periphery of the gear-ring *n*, as best shown in Fig. 4. In this manner the shaft-sections *o* are driven uniformly from the crank-shaft *g* and said shaft-sections *o* are allowed that differential movement essential in motor-vehicles, as will be understood. If necessary, some additional support rigid with the engine may be provided for the outer portions of the shaft-sections *o*; but this is not essential.

The shaft-sections *o* project oppositely to the respective sides of the frame and have Cardan connections *s* with short shafts *t*, mounted in suitable boxes *b'*, carried by the side rails *b* of the frame. Said shafts *t* are connected to the vehicle driving-wheels (not shown) either directly or by a suitable gear *u*. In this manner the shaft-sections *o* are mounted securely in and move with the engine; but at the same time the shafts *t* are revolubly driven, and through the cardans *s* any working of the frame intending to throw the shaft-sections *o* and the shafts *t* out of alinement is prevented from interfering with the evenness and efficiency of the drive.

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

1. The combination of a sectional crank-shaft, said sections having flanges respectively on their contiguous ends, a gear set between said flanges, gibs bearing between the flanges and gear, and means for fastening the flanges and gear together.

2. The combination of an engine-crank case having parts forming an inclosure for a differential gear and having boxes at opposite sides of said inclosure, a gear-case having tubular extensions mounted loosely in the boxes, a differential gear carried by the gear-case and comprising a gear-ring encircling the case, and shaft-sections mounted revolubly in the said tubular extensions of the gear-case and connected with the differential gear.

3. The combination with a motor-vehicle frame, of an engine mounted directly thereon, a differential gear supported by bearings rigid with the engine, shaft-sections connected with the differential gear and extending transversely toward the respective sides of the frame, shafts mounted respectively in the sides of the frame, Cardan connections between the last-named shafts and the respective shaft-sections, and driving means connected to the last-named shafts.

4. The combination with a vehicle-frame, of an engine mounted directly thereon and comprising a crank-case having parts rigid therewith forming an inclosure for a differential gear, a differential gear mounted in said inclosure, shaft-sections connected with said differential gear and extending respectively toward opposite sides of the frame, additional

shafts mounted respectively in the sides of the frame, Cardan connections between the additional shafts and the shaft-sections, and driving means connected to said additional shafts.

5. The combination with a motor-vehicle frame, of an engine mounted thereon, a differential-gear case rigid with the engine, a differential gear contained in the gear-case and driven from the engine, shaft-sections connected with the differential gear and extending transversely toward the respective sides of the frame, shafts mounted respectively in the sides of the frame, Cardan connections between the last-named shafts and the respective shaft-sections, and driving means connected to the last-named shafts.

6. The combination with a motor-vehicle frame, of an engine mounted thereon, a differential gear supported rigidly by the engine, shaft-sections connected with the differential gear and extending transversely toward the respective sides of the frame, means mounted on the sides of the frame for driving the vehicle, and Cardan connections between said means and the respective shaft-sections.

7. The combination with a motor-vehicle frame, of an engine mounted thereon, a differential-gear case rigid with the engine, a differential gear mounted in the case and driven from the engine, shaft-sections connected with the differential gear and extending toward the sides of the frame, vehicle-driving means mounted on said sides of the frame, and Cardan connections between the said means and the respective shaft-sections.

8. The combination with a motor-vehicle frame, of an engine mounted thereon, a differential gear sustained rigidly and directly by the engine and driven therefrom, shaft-sections connected with the differential gear, two vehicle-driving means mounted on the frame, and Cardan connections respectively between said driving means and the shaft-sections.

9. The combination of an engine-crank case having an inclosure for a differential gear carried directly by the said case and formed with boxes, a differential-gear case proper having tubular extensions forming bearings mounted in the boxes, a differential gear mounted in the differential-gear case, and shaft-sections connected with the differential gear and projected respectively through the said extensions of the differential-gear case.

10. The combination with a supporting means, of a differential-gear case having tubular extensions mounted in said supporting means and sustained thereby, a differential gear mounted in the gear-case, and shaft-sections connected with the differential gear and passed respectively through the said extensions of the differential-gear case.

11. The combination of a sectional shaft, the sections having flanges at their contiguous

ous ends, a gear set between said flanges, fastening means passing through the flanges and gear, and means bearing between the sides of the gear and the respective flanges for resisting the independent turning movement of said parts.

12. The combination of a sectional shaft, the sections having flanges at their contiguous ends, a member located between said flanges, gibs bearing between the flanges and said members, and means for fastening the flanges and said member together.

13. The combination of a motor-vehicle frame, an engine mounted thereon, a differential gear supported by the engine, shafts connected to the differential gear and extending transversely toward the respective sides of the frame, shafts mounted respectively in the sides of the frame, Cardan connections between the last-named shafts and the respec-

tive shaft-sections, and driving means connected with the last-named shafts.

14. The combination of an engine-crank case having a hollow extension, a cap fastened to said extension and forming therewith an inclosure for a differential gear, a differential gear mounted in said inclosure, a crank-shaft, a spur-gear attached to the crank-shaft and projecting into the said hollow extension of the crank-case, and a spur-gear connected to the differential gear and meshed with the first-named spur-gear.

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

GEORGE CURTIS CANNON.

Witnesses:

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ARTHUR J. MOULTON.