No. 722,744. PATENTED MAR. 17, 1903.

C. R. OTIS & A. M. COYLE.

DRIVING MECHANISM.

APPLICATION FILED OCT. 7, 1901.

NO MODEL. 5 SHEETS—SHEET 1.

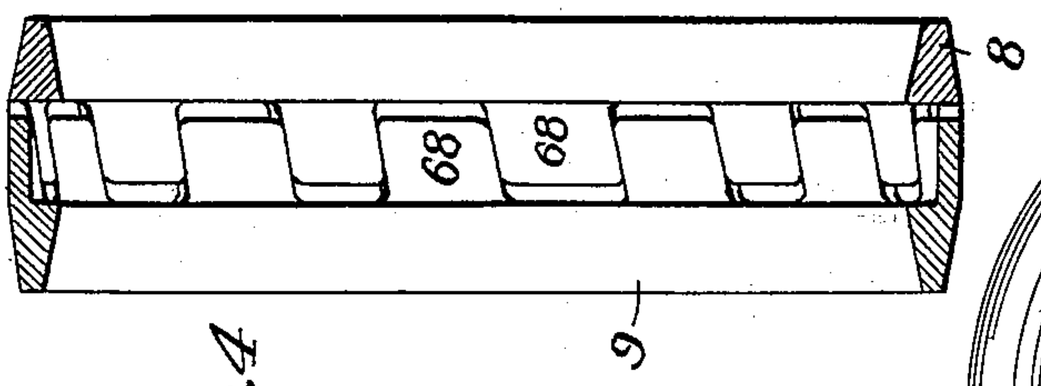

Fig. 4.

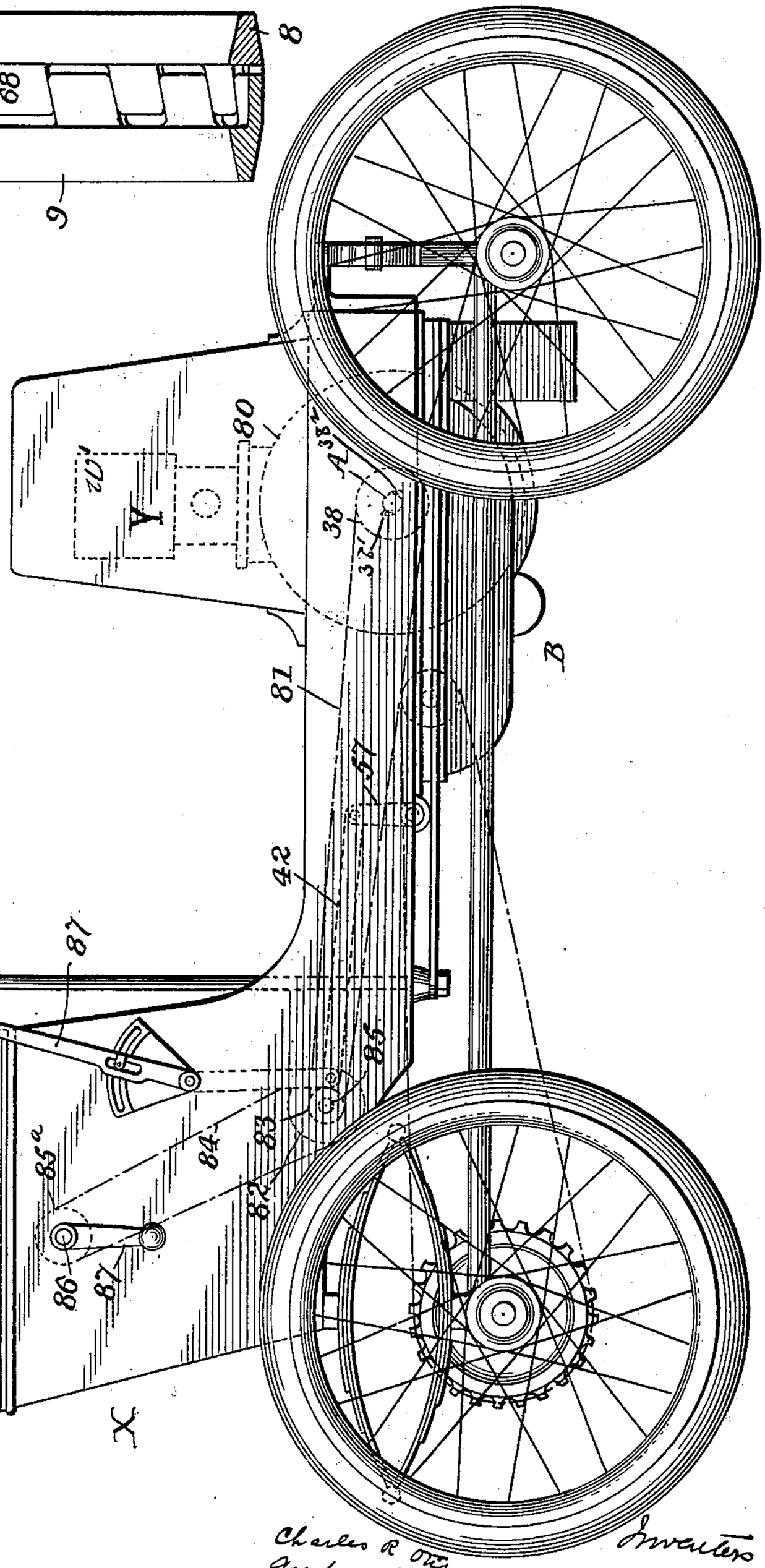

Fig. 1.

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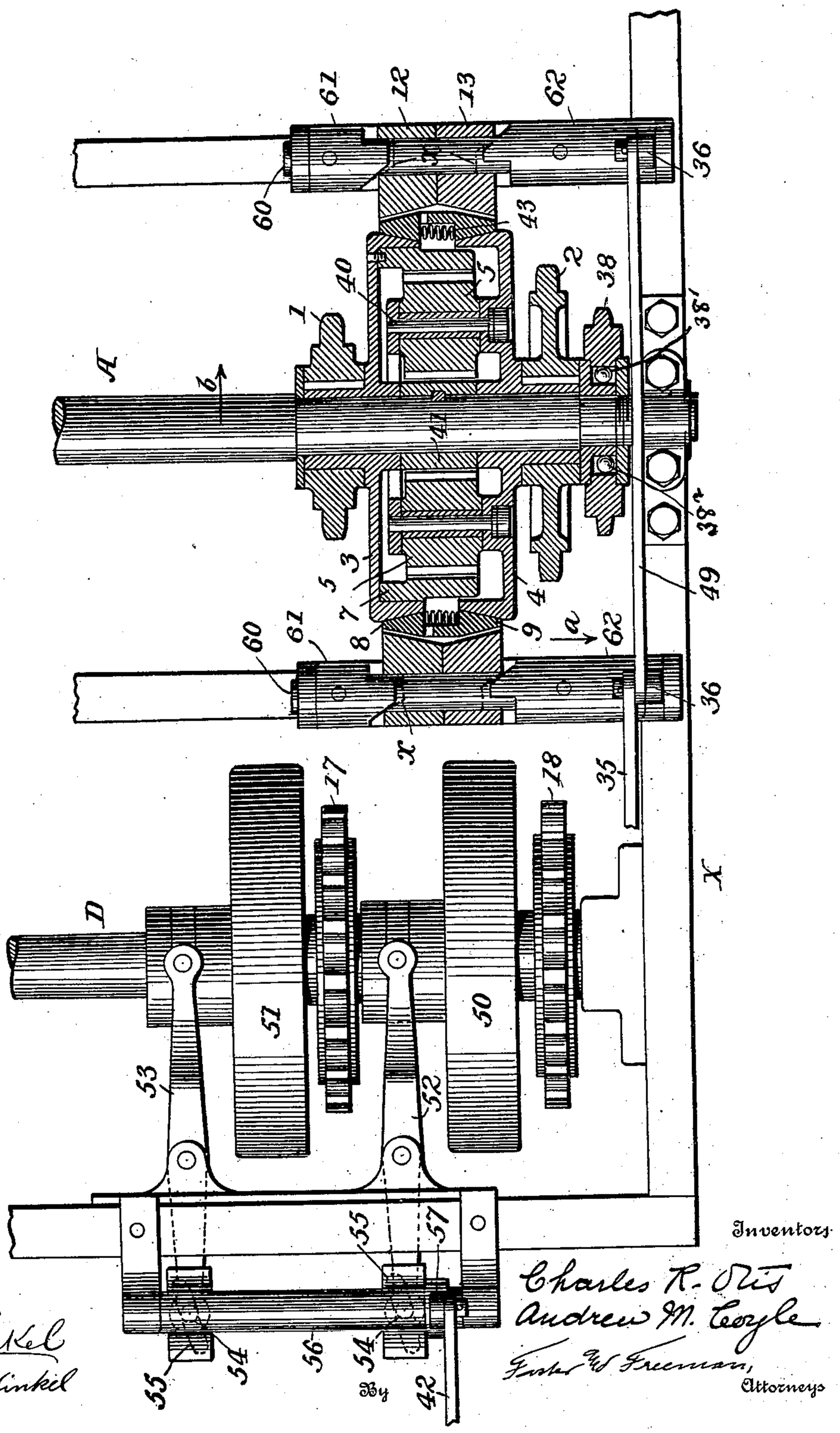
NO MODEL. 5 SHEETS—SHEET 2.

Fig. 2.



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NO MODEL. 5 SHEETS—SHEET 3.

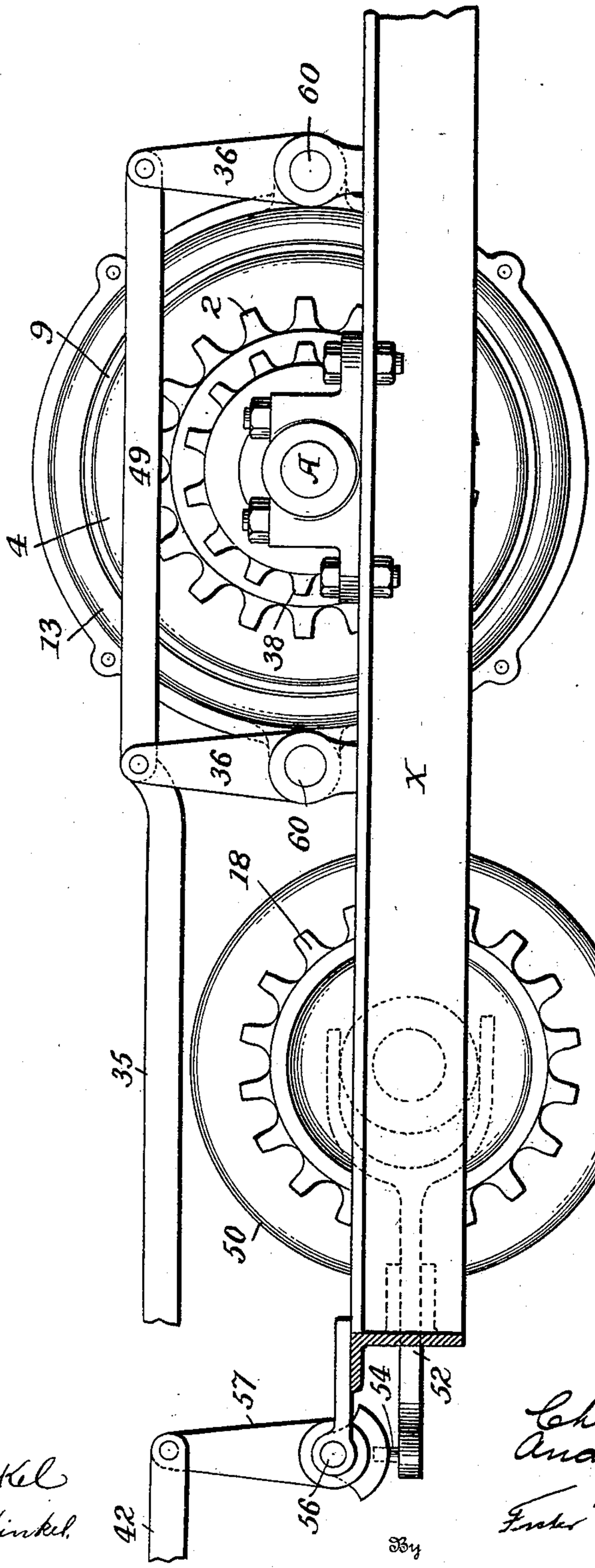

Fig. 3.

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NO MODEL. 5 SHEETS—SHEET 4.

Fig. 5

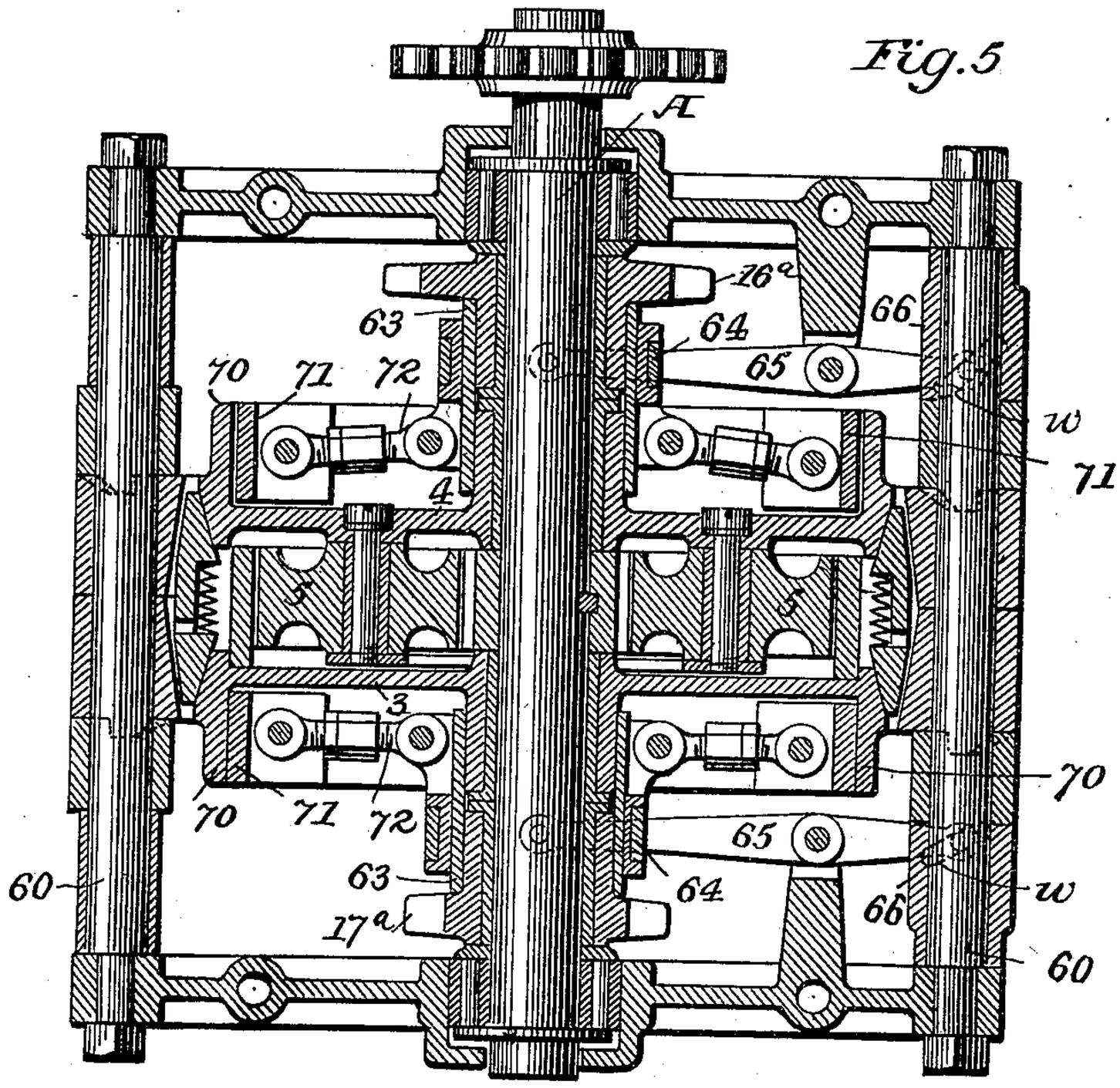
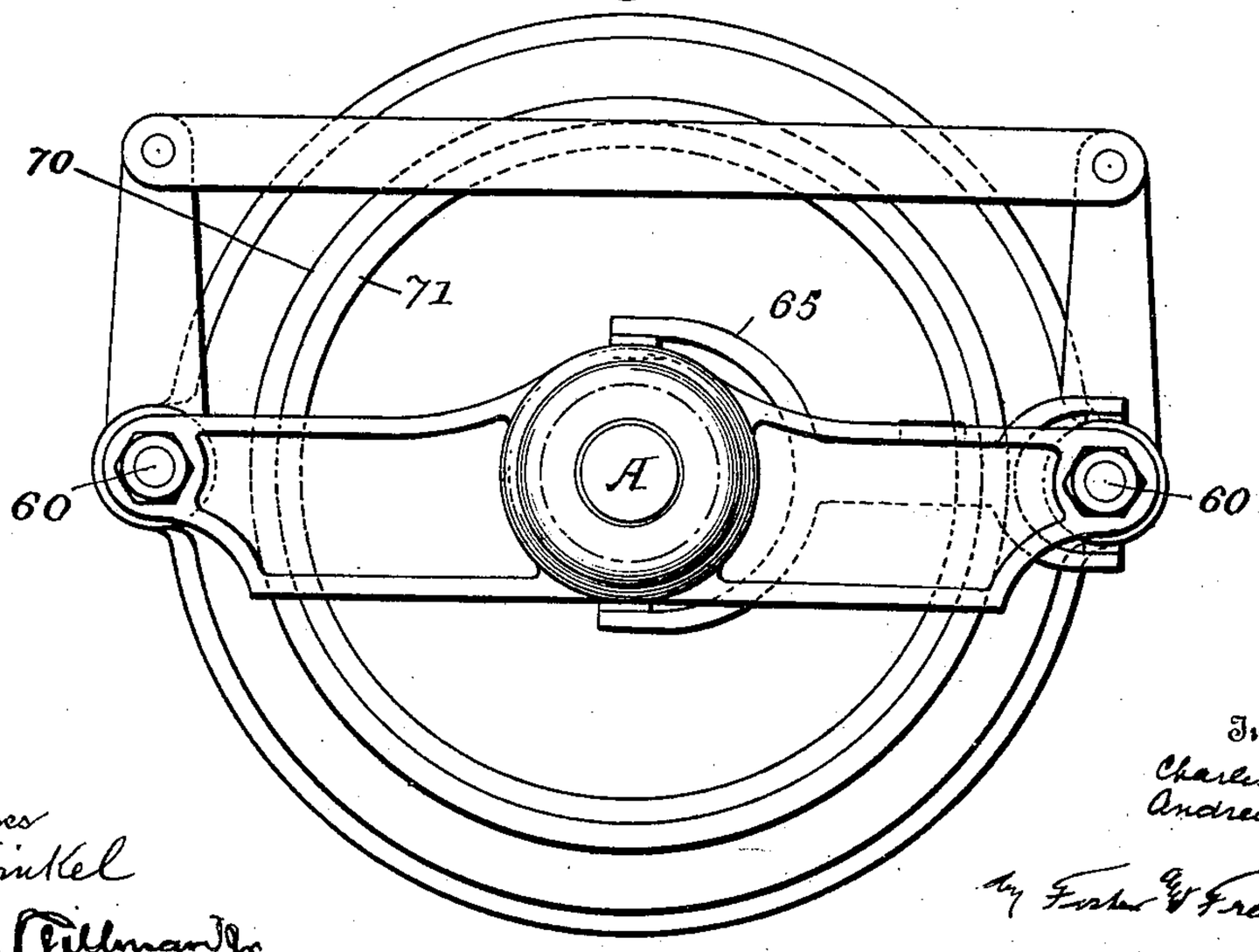


Fig. 6.



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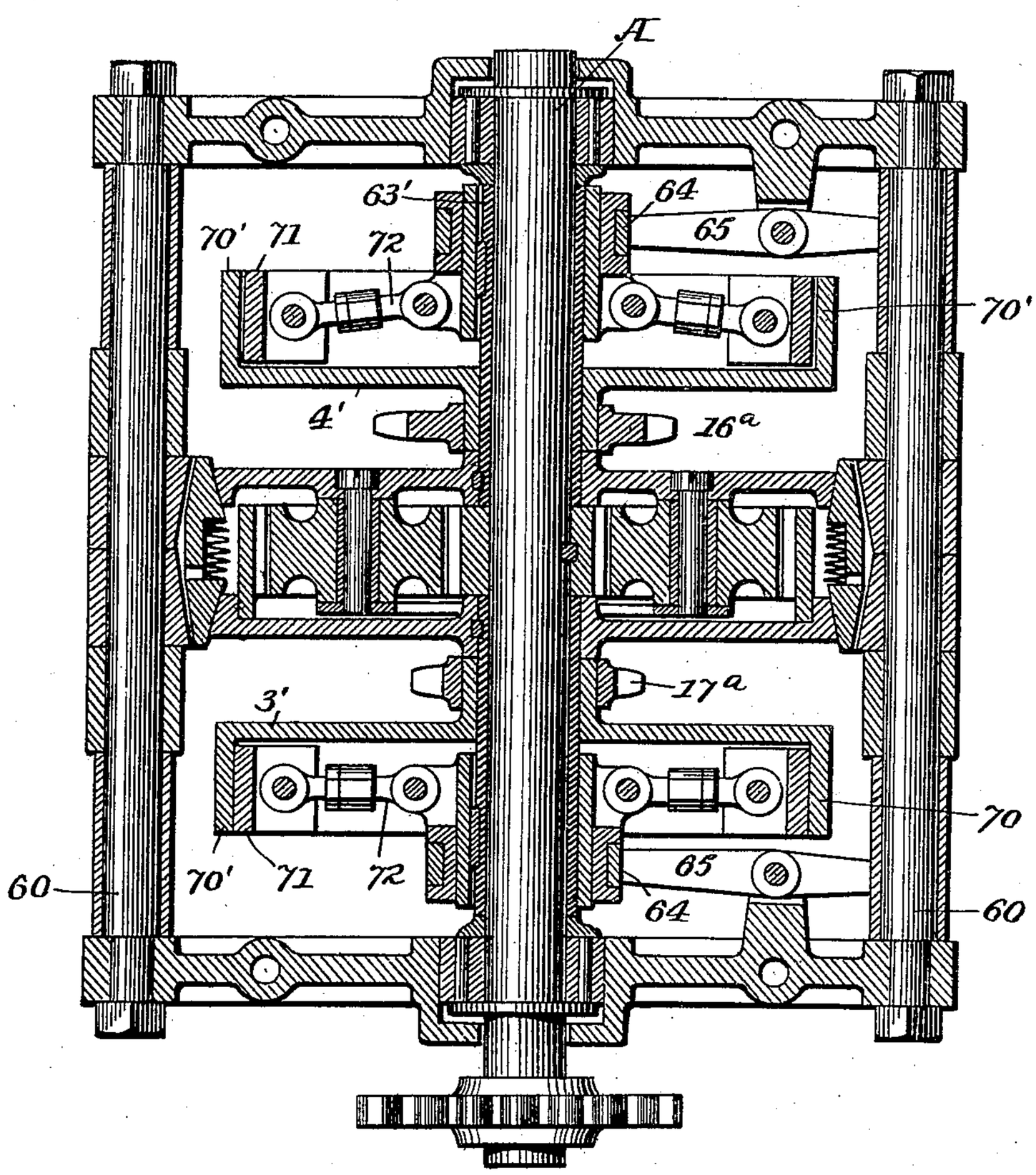
NO MODEL. 5 SHEETS—SHEET 5.

Fig. 7.



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UNITED STATES PATENT OFFICE.

CHARLES R. OTIS AND ANDREW M. COYLE, OF YONKERS, NEW YORK; SAID COYLE ASSIGNOR TO SAID OTIS.

DRIVING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 722,744, dated March 17, 1903.

Application filed October 7, 1901. Serial No. 77,901. (No model.)

To all whom it may concern:

Be it known that we, CHARLES R. OTIS and ANDREW M. COYLE, citizens of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Driving Mechanism, of which the following is a specification.

Our invention relates to that class of driving mechanism in which it is necessary to impart movements at different speeds and in different directions from a shaft turning always in the same direction; and our invention consists in certain transmitting devices constructed and arranged and operating to secure a direct movement in one direction, but at different speeds when required, while making use of gearing only when a slow movement in the said direction is necessary or when the movement must be reversed, the invention further consisting in means for adapting said devices for use in connection with motor-vehicles, all as fully set forth hereinafter and as illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a motor-vehicle, showing the arrangement of our driving mechanism thereon. Fig. 2 is an enlarged part-sectional plan of one form of driving mechanism; Fig. 3, a side view of Fig. 2; Fig. 4, a sectional view of the ring-clamp; Fig. 5, a sectional plan illustrating a modification of the driving devices where the counter-shaft is annular and concentric with the driving-shaft; Fig. 6, a side view of Fig. 5; and Fig. 7 is a sectional plan view of another modification of the driving devices shown in Fig. 5, wherein the sprockets are shown inside the clutch devices.

The shaft A is mounted to turn in suitable bearings upon the frame X and in the construction shown is driven from the engine Y in one direction or the other, and upon the shaft A are mounted so as to turn independently thereof two sprocket-wheels 1 2 of different diameters, each of which is connected with a flanged disk, the sprocket 1 being connected with a flanged disk 3 and the sprocket 2 with a flanged disk 4, and upon studs 40, projecting inward from the disk 4, turn pinions 5, each of which gears with a pinion 41, secured to the shaft A. Each of the pinions 5 also gears with an annular gear 7, bolted or otherwise secured inside of the disk 3. It will be evident that by applying power to turn the shaft A and then applying a brake or otherwise arresting or preventing the movement of either of the disks 3 or 4 motion will be imparted to the other disk through the intermediate gearing.

The brake devices, which may be employed for arresting either of the disks 3 4 or for insuring the turning of both together with the shaft, if desired, consist of two wedge-shape or tapering clamping-rings 8 9 and a shifter consisting of two rings 12 13, each beveled internally and adapted to engage the beveled outer face of one of the rings, but so proportioned that when the clamping-rings 8 9 are separated by springs 43 placed between them, so as to each bear upon the outer beveled face of the adjacent flange of the ring 3 or 4, and when the shifter is in its mid-position, as shown in Fig. 2, there will be no contact between the shifter and the clamping-rings; but by carrying the shifter to one side or the other one of the rings 8 or 9 will be carried toward the other and out of contact with one of the flanges, while the other ring will be forced into frictional contact with its flange, and thereby arrest or prevent the rotation of the disk provided with such flange.

In the construction shown in Figs. 2 and 3 the sprockets 1 and 2 are arranged to drive sprockets 17 and 18 upon a counter-shaft D, the said sprockets turning freely on said shaft, but each adapted to be engaged therewith through the medium of a clutch device 50 51 of any suitable character and the details of which are therefore not shown, the clutch device 50 being actuated by a lever 52 and the clutch device 51 by a lever 53, and the outer end of each lever is provided with a pin 54, projecting into an inclined slot of a cam 55 on a rock-shaft 56, having an arm 57, with which connects an operating-rod 42. The slots of the cams 55 are so arranged that when the shaft 56 is rocked in one direction one of the clutch devices will engage the adjacent sprocket with the shaft, while the other will be released, and vice versa.

Any suitable means may be employed for

carrying the shifter laterally in either direction. As shown, there are shafts 60, carrying two cams 61 62, adapted to engage each a shoulder *x* (dotted lines, Fig. 2) upon the shifter, and each shaft 60 has an arm 36, the two arms being connected by a rod 49, so that both shafts may be rocked simultaneously in the same direction by means of an operating-rod 35.

The clamping-rings 8 9 taper in opposite directions from the inner and outer sides, and from the inner edge of each projects a series of inclined teeth 68 68, the inclined edges in contact, so that there is a constant tendency of the rings to separate. This results from the fact that there is always a certain amount of resistance to the rotation of either sprocket, and consequently of either flanged disk, and as the disk 3 tends to turn in a direction opposite to the shaft and the disk 4 always tends to turn in the same direction as the shaft, therefore the turning of one clamping-ring in one direction or the other clamping-ring in the other direction will tend to cause a separation of the rings.

When the parts are in the position shown in Fig. 2 and the shifter is out of contact with the clamping-rings, which are forced into engagement with the flanges of both disks by the springs 43, both sprockets will rotate with the shaft A and will impart motion to the sprockets 17 and 18 at different speeds proportioned to the different diameters of the sprockets 1 and 2, so that by bringing either sprocket 17 or 18 into engagement with the shaft D the latter may be rotated, but the speed of rotation will be different accordingly as the clutch 50 or 51 is shifted. Two different forward speeds of the driven shaft may therefore be obtained by shifting the clutches 50 and 51, but without any movement of gears in the apparatus. When it is necessary to ascend a steep grade and greater power is required, this is secured by moving the shifter in the reverse direction to the arrow *a*, Fig. 2, when the ring 9 will be carried away from the flange of the disk 4 and the disk 3 will be rendered immovable, and the rotation of the shaft A in the direction of its arrow *b* will cause the pinions 5 to travel forward within the annular gear 7, carrying with them the studs 40 and the disk 4 and its sprocket 2, thereby imparting the desired forward movement, but at a slow speed. In order to reverse the vehicle, the shifter is moved in the direction of the arrow *a*, carrying the clamping-ring 8 away from the disk 3, rendering the disk 4 immovable, while the pinion 41 turns back the pinions 5, carrying with them the gear 7 and the disk 3 and driving the sprockets 1 and 17 in a reverse direction from that of the rotation of the shaft A and with the proportion of gear shown at about one-third of the speed of the latter.

It will be seen that in driving forward at a fast or medium speed there is no movement of the gears, but a simple direct drive, so that for what constitutes the much greater part of the movements of the apparatus the gearing is quiescent and that it is only brought into use when necessary to ascend an incline or on the infrequent occasions of reversing.

Instead of using a counter-shaft parallel to the shaft A there may be used a hollow or sectional counter-shaft concentric with the shaft A, the sprockets 1 and 2 being dispensed with and the sprockets 17 and 18 being connected with the said counter-shaft, with clutches for connecting one sprocket or the other with one flanged disk or the other. Such an arrangement is shown in Figs. 5 and 6, where the flanged disks, clamping-rings and shifter, and shaft D are arranged substantially as in the other figures; but each disk 3 and 4 has an outer flange 70, adapted to receive the shoes 71, carried by links 72, pivoted to a sleeve 63, which constitutes practically the counter-shaft, one of said sleeves sliding upon but turning with a sprocket 16^a and the other sleeve sliding on but turning with a sprocket 17^a, the chain from the said sprockets passing to sprockets on the axle of the vehicle. In each sleeve 63 is an annular groove receiving a ring 64, pivoted to a shifting lever 65, so that by swinging inward either lever the shoes 71, connected with the sleeve 63, moved by said lever, are brought into frictional contact with the inner face of the flange of the adjacent disk, which is thus caused to drive the sprocket thus brought into engagement therewith. The levers 65 are simultaneously swung in the same direction by suitable means—as, for instance, by hollow cams 66, provided with cam-grooves *w*, receiving pins on the outer ends of the levers 65, said cams being connected with one of the rock-shafts 60. It will be seen that the operation in this construction is substantially the same as that before described, except that the sleeves 63 and sprockets 16^a 17^a take the place of the counter-shaft D and its sprockets, the sprockets 1 2 being dispensed with.

Referring to Fig. 7, a modification is shown of Fig. 5 in which the sprockets 16^a and 17^a are arranged between the flanged disks and the clutches instead of being outside of the clutches. In this construction the flanges 70 on the disks 3 4 are dispensed with and the disks are connected to turn with a sleeve 63′ or counter-shaft concentric with the shaft A, while other disks 3′ 4′, provided with flanges 70′, connected to the sprockets 16^a 17^a, are arranged loosely upon the sleeve 63′ and are adapted to be connected to turn with the sleeve by clutches, represented, as before, by links 72 and shoes 71. The clutches are slidable upon the sleeve 63′ or counter-shaft, but are connected to turn therewith. By thus arranging the sprockets as described they may be brought much closer together, which is highly desirable with certain arrangements of driving devices. The operation of the parts is substantially the same as hereinbefore described for the other constructions.

Where a gas-engine is used as a motor, it is necessary to start the same by imparting rotation to the shaft A. The means which we have employed for effecting this result are shown in Fig. 1, where the shaft A is shown as provided with a fly-wheel 80 (dotted lines) and with a sprocket 38, also shown in Fig. 2. The sprocket 38 is provided with a clutch device of any suitable character between the sprocket and the shaft A, so that rotation of the sprocket in one direction will turn the shaft A; but after the engine has started the continued rotation of the shaft will not drive the sprocket 38. As shown in Figs. 1 and 2, a suitable roller-clutch is provided, the balls or rollers 38′ being provided with tapering slots 38″ between the inner periphery of the sprocket 38 and the shaft A. A chain 81 (dotted lines, Fig. 1) passes from the sprocket 38 to a sprocket 83, turning upon a stud 85 on the frame and carrying a larger sprocket 82, from which a chain 84 passes to a sprocket 85ª upon a shaft 86, turning in bearings on the frame and provided with a handle 87, arranged or adapted to be applied from outside the body X of the vehicle. By means of the handle the shaft 86 may be rotated, thereby imparting motion to the shaft A to start the engine, and preferably the parts are so arranged that the handle 87 may be outside of the body below the seat, so that the engine may be started from the position of the driver.

While we have referred to sprockets and chains as a means of conveying movement from one part to the other, it will be evident that where required different forms of gearing may be employed—as, for instance, belt-wheels and belts or grooved pulleys—and while the devices shown are more especially intended for use in connection with motor-vehicles it will be evident that they may be employed for other purposes where it is necessary to impart rotation at different speeds and in different directions from a shaft turning in one direction. It will also be evident that various different forms of clutch devices may be used instead of those shown, with different means for shifting the clutches and the rings 12 and 13, constituting the shifter.

In the construction illustrated in Fig. 1 the engine is arranged at the front in a casing *w′*, with the driving mechanism intermediate the engine and the axle. This evenly distributes the weight of the apparatus, affords ready access to the engine from the seat, if necessary, and so distributes the parts that easy access may be had to each.

Without limiting ourselves to the precise construction and arrangement of parts, we claim as our invention, and desire to obtain by Letters Patent, the following:

1. The combination with the driven shaft, its pinion, disks, and gears between the pinion and disks, of means for connecting both disks to turn together, and means whereby the rotation of either disk may be arrested, substantially as set forth.

2. The combination with the shaft A, and means for driving it, of the disks 3, 4, and means for connecting the disks and for preventing the rotation of either as desired, sprockets connected to be driven each by one of the disks, and intermediate gearing between the disks and the shaft A whereby to drive one of the disks in a reverse direction from the shaft when the rotation of the other disk is arrested and to drive the said other disk in the same direction with the shaft when the first disk is arrested, substantially as set forth.

3. The combination with the shaft A, of disks 3, 4, independent gears driven thereby, means whereby the disks may be connected together and simultaneously driven from the shaft, and means for disconnecting the disks and preventing the rotation of either one of the disks, substantially as set forth.

4. The combination with the shaft A, and counter-shaft, of disks 3, 4, gearing between the disks and counter-shaft, means whereby the disks may be simultaneously driven from the shaft, and means for preventing the rotation of either one of the disks, the same consisting of rings adapted to the faces of the disks, and means for bringing one of the rings to bear frictionally upon a disk, substantially as set forth.

5. The combination with the shaft A, of disks 3, 4, and sprockets connected therewith, means whereby the disks may be simultaneously driven from the shaft, and means for preventing the rotation of either one of the disks, the same consisting of tapered rings adapted to beveled faces on the disks, and means for shifting the rings to bring one or the other of them to bear frictionally upon a disk, substantially as set forth.

6. The combination with the shaft A, of disks 3, 4, and sprockets connected therewith, means whereby the disks may be simultaneously driven from the shaft, and means for preventing the rotation of either one of the disks, the same consisting of interlocking tapered rings adapted to beveled faces on the disks, and means for shifting the rings to bring one or the other of them to bear frictionally upon a disk, substantially as set forth.

7. The combination with the shaft A, beveled-faced disks 3, 4, and intermediate gearing, of a clamping device consisting of a two-part ring having beveled faces adapted to those of the disks and interlocking inclined teeth, substantially as set forth.

8. The combination with the shaft, of disks and intermediate gearing, a clamping device for the disks, and a shifter adapted by a lateral movement of the same to be brought into contact with the clamping device, substantially as set forth.

9. The combination with the shaft, of disks and intermediate gearing, a clamping device

for the disks consisting of rings, and a shifter consisting of rings adapted by the lateral movement of the same to be brought into contact with the faces of the rings of the clamping device, substantially as set forth.

10. The combination of the shaft, disks, intermediate gearing, a clamping device consisting of beveled rings, and a shifter consisting of rings having beveled faces adapted to be brought into contact with the faces of the clamping-rings by the lateral movement of the shifter, substantially as set forth.

11. The combination with the shaft, disks, clamping device, and annular shifter, of rocking cams for moving the shifter laterally, and connected rock-shafts for rocking said cams, substantially as set forth.

12. The combination with the shaft A, beveled-faced disks 3, 4, and intermediate gearing, of a shifter, and a clamping device consisting of two beveled-faced rings with interlocking inclined teeth and intermediate springs, substantially as set forth.

13. The combination with the shaft A, disks, intermediate gearing, and means for arresting the movement of either disk, of sprockets connected with the disks, a counter-shaft with sprockets and clutches for connecting either sprocket with the counter-shaft, and chains connecting the sprockets, substantially as set forth.

14. The combination of the shaft A, disks, intermediate gearing, and sprockets 1, 2, means for preventing the rotation of either disk, a counter-shaft, sprockets 17 and 18 carried thereby, clutch devices 50, 51, means for alternately engaging and disengaging the said clutch devices, and chains connecting the sprockets, substantially as described.

15. The combination in a power-transmission gear, of a shaft A, and means for driving it, disks 3, 4, sprockets connected to be driven thereby, gearing intermediate the shaft A and the disks, and means for connecting the disks to turn with the shaft and for arresting the movement of either disk, substantially as set forth.

16. The combination in a motor-vehicle, of a shaft A and means for driving it in one direction, sprockets and means for connecting either sprocket to drive the axle to secure two different forward speeds, disks and intermediate gearing connected to drive said sprockets, and means for preventing the movement of either disk whereby to secure a reduced speed in ascending inclines and in reversing, substantially as set forth.

17. The combination with a driven shaft A and counter-shaft D, clutch-gears thereon, of disks 3, 4, gearing between each disk and a clutch-gear on the counter-shaft, means for connecting the clutch-gears independently with the counter-shaft, means for arresting or preventing the rotation of either disk independently, a pinion on the shaft A, and gearing intermediate the pinion and the disks whereby either may be independently driven from the shaft A when the rotation of the other is arrested, and whereby both may be frictionally connected and carried with the shaft, substantially as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

CHARLES R. OTIS.
ANDREW M. COYLE.

Witnesses:
GEORGE MARTIN,
HENRY MARTYN BAIRD, Jr.