No. 620,439. Patented Feb. 28, 1899.

L. M. GAUTIER.

MECHANICAL MOVEMENT.

(Application filed Oct. 14, 1898.)

(No Model.)

4 Sheets—Sheet 1.

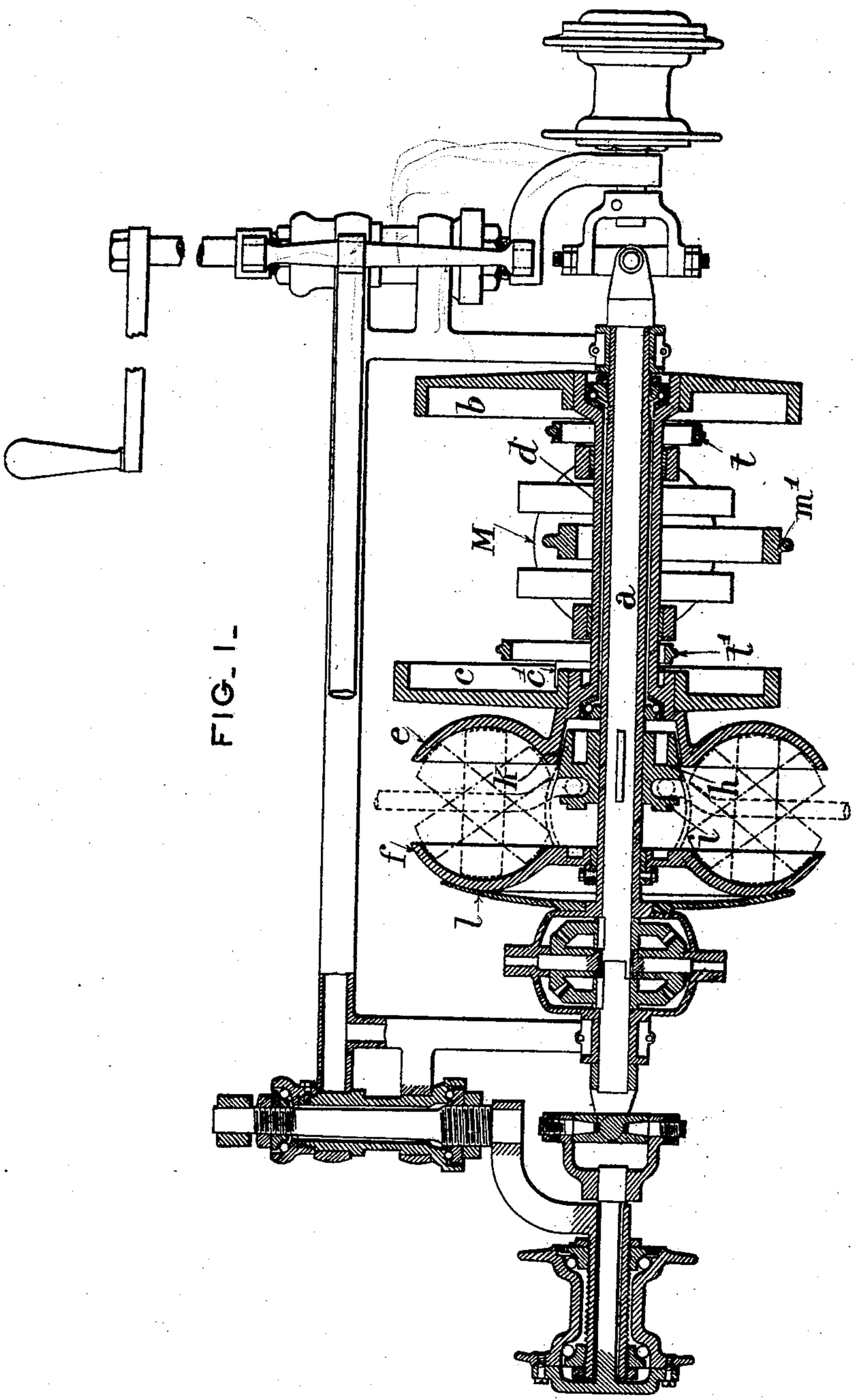

FIG. 1.

Witnesses.
Eugène Wattier.
Edmond Bletry

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(No Model.) 4 Sheets—Sheet 2.

FIG. 2.

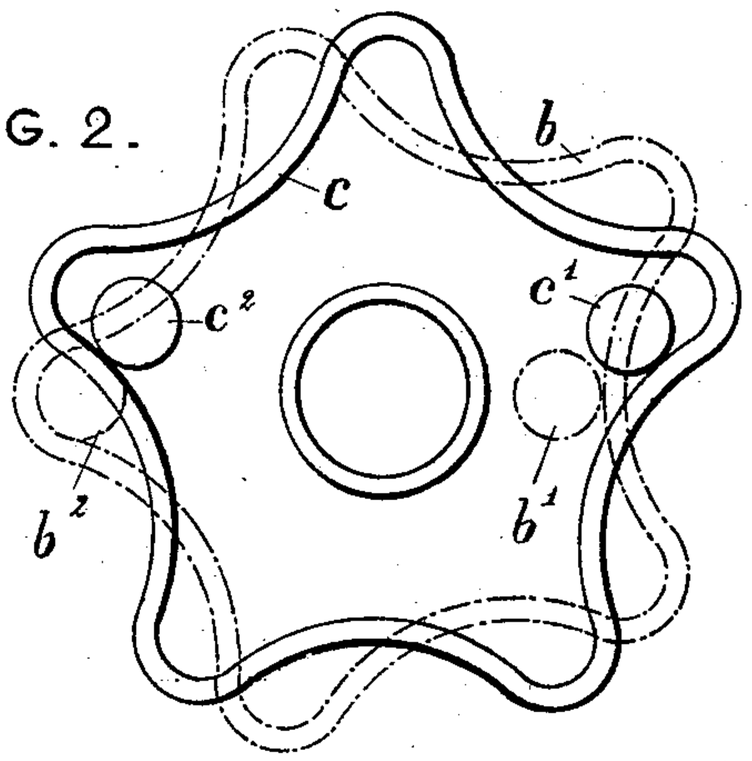


FIG. 3.

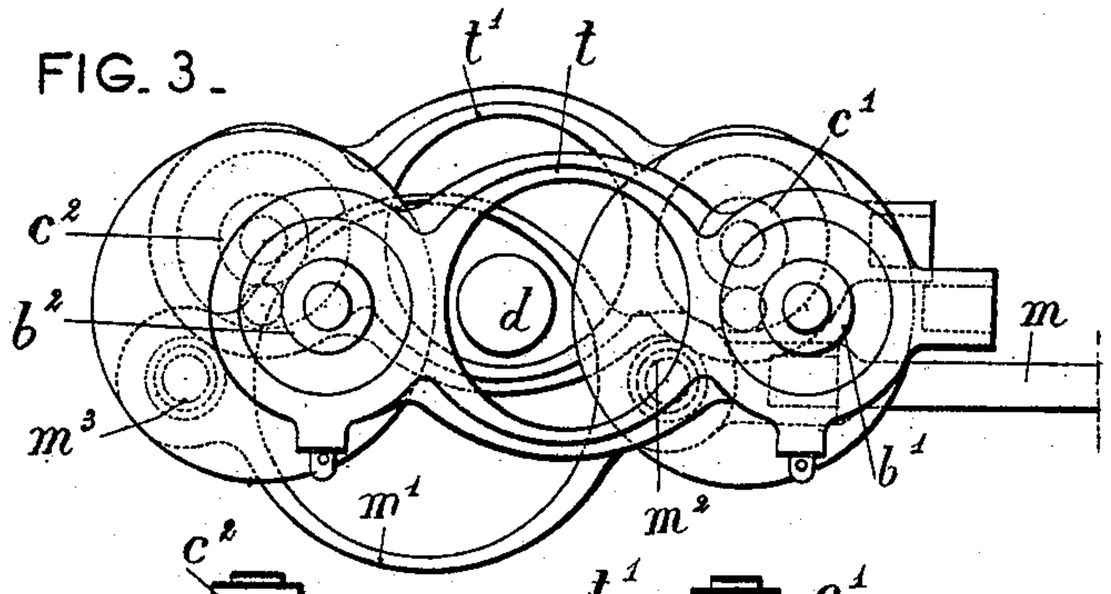
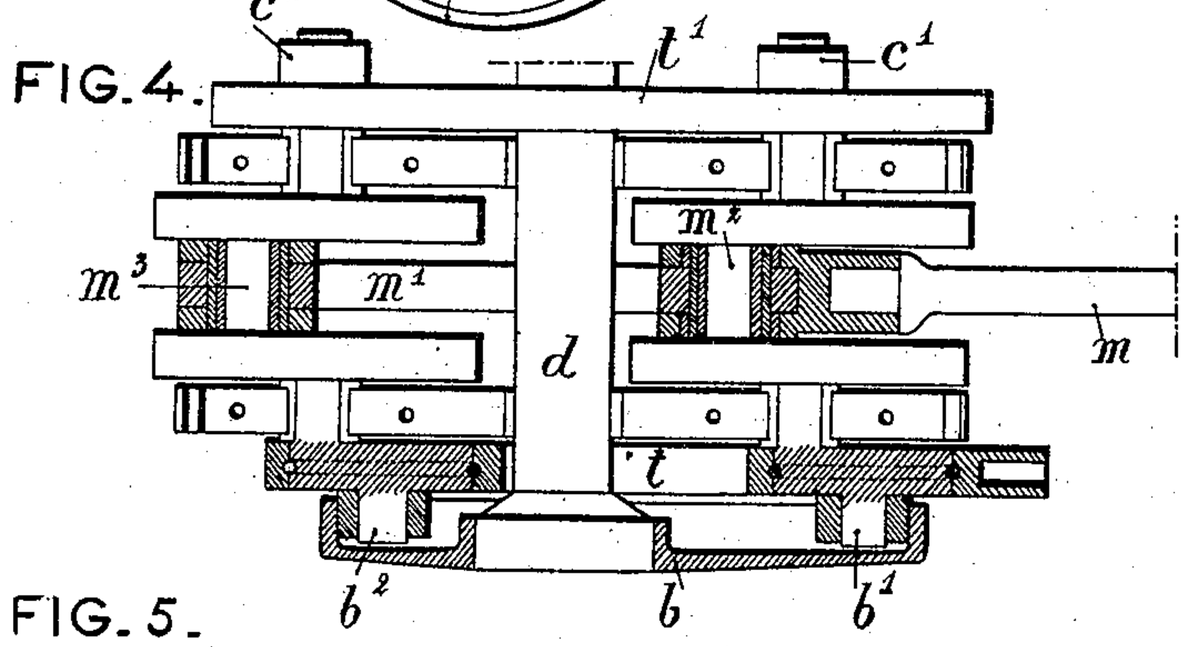


FIG. 4.



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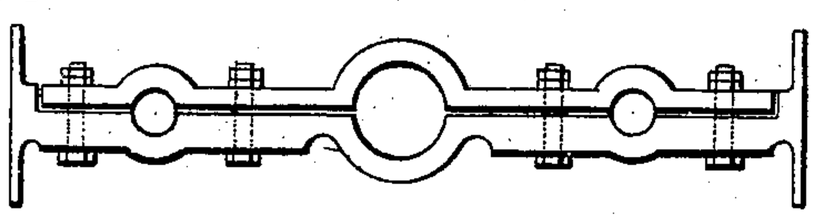

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(No Model.) 4 Sheets—Sheet 3.

FIG. 8.

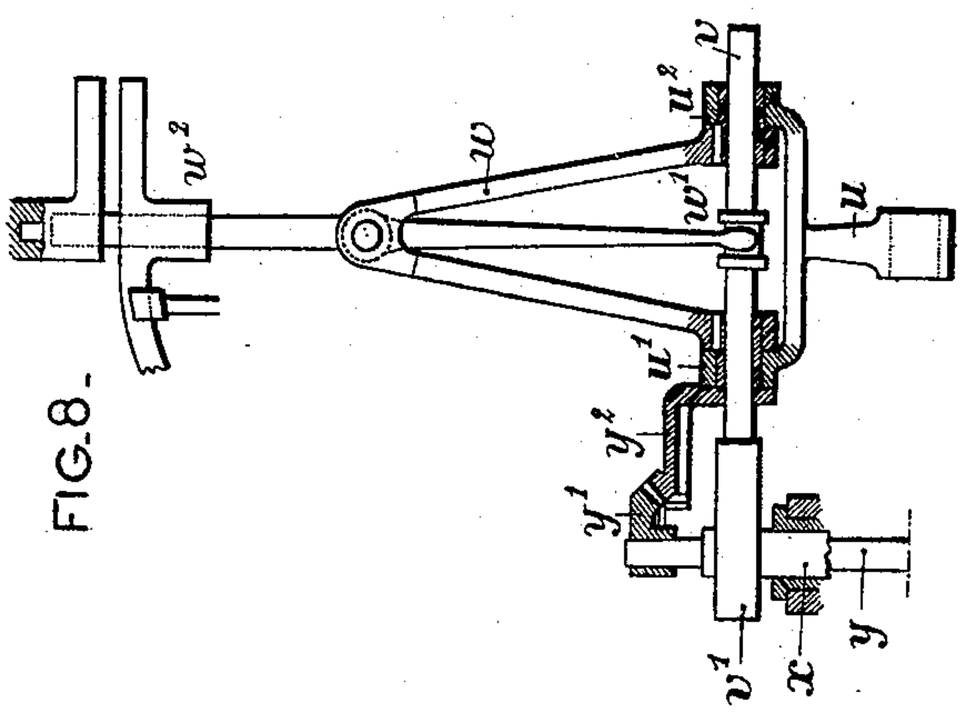


FIG. 9.

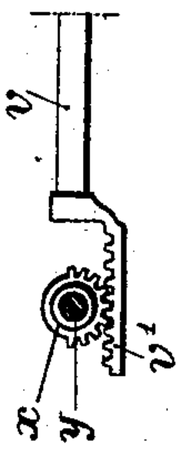


FIG. 6.

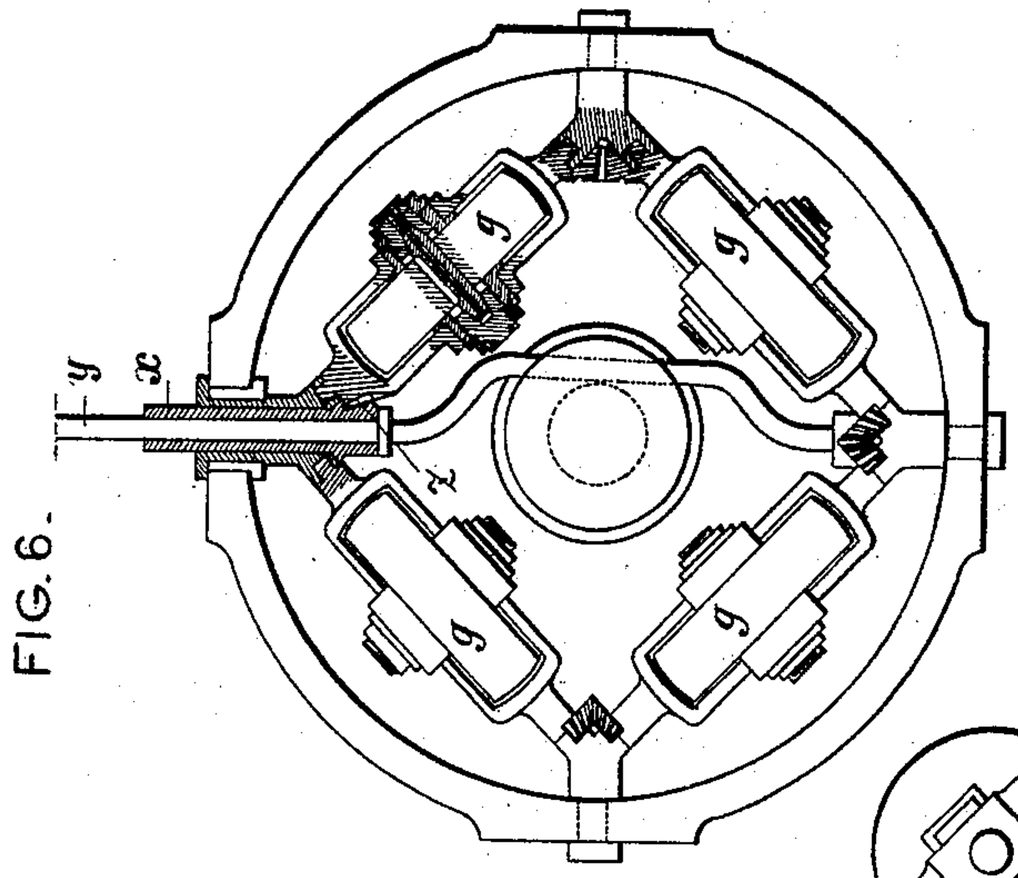
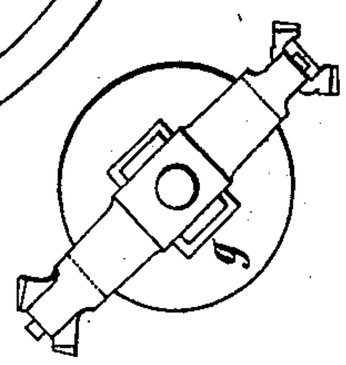


FIG. 7.



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MECHANICAL MOVEMENT.

(Application filed Oct. 14, 1898.)

(No Model.) 4 Sheets—Sheet 4.

FIG. 10.

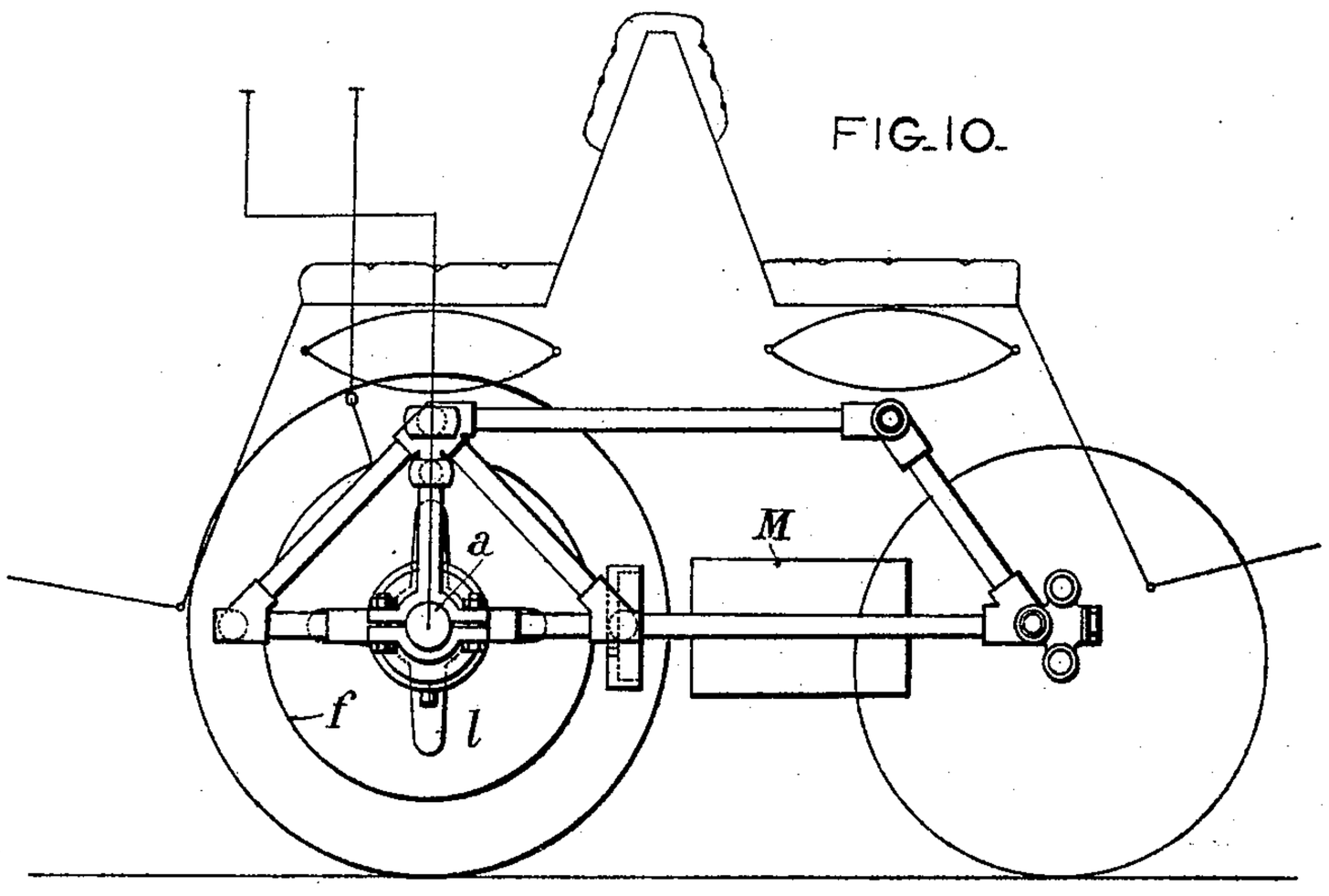
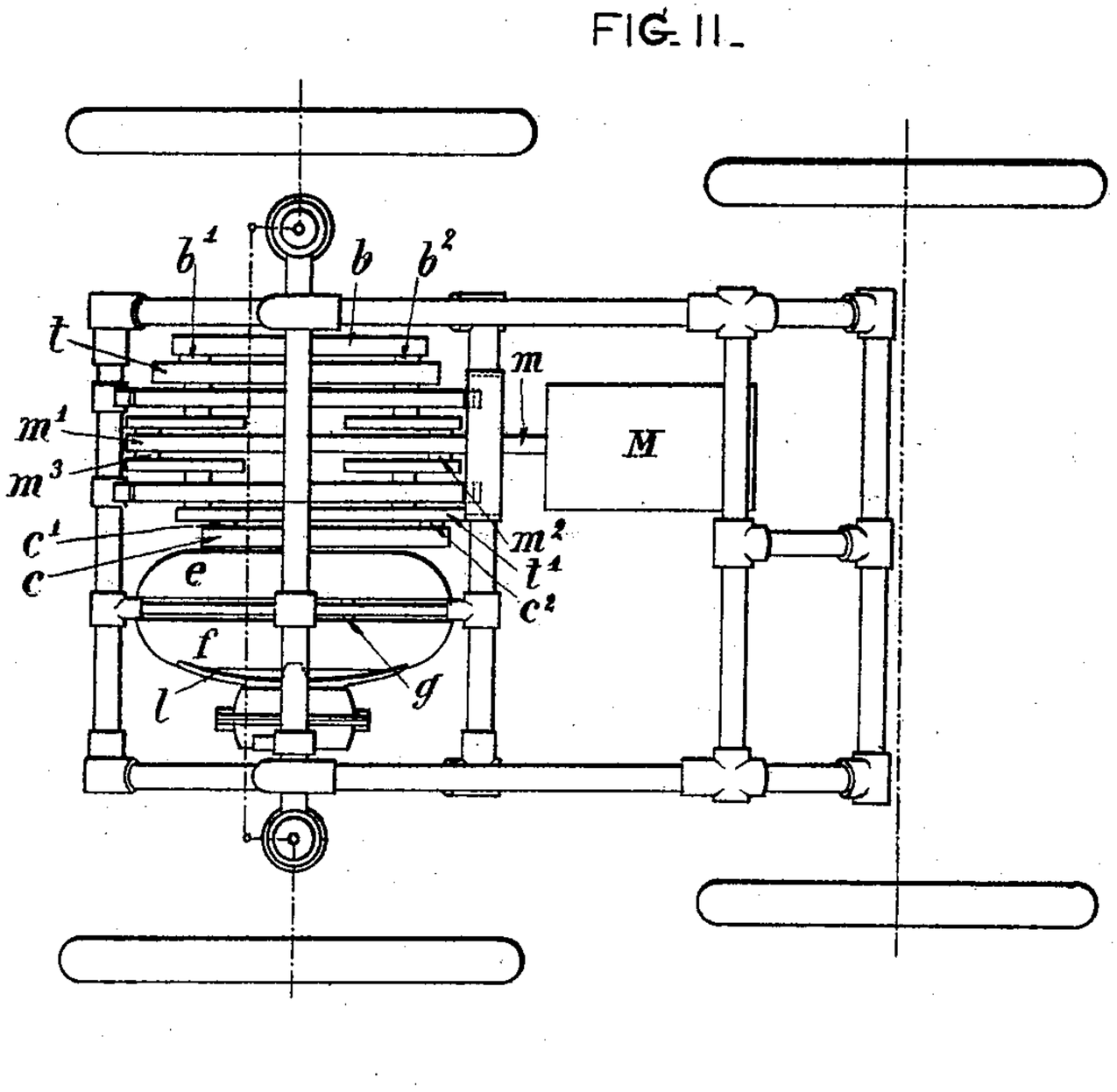


FIG. 11.



Witnesses.
Eugène Wattier.
Edmond Bletry

Inventor:
Louis Marie Gautier

UNITED STATES PATENT OFFICE.

LOUIS MARIE GAUTIER, OF ST. MALO, FRANCE.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 620,439, dated February 28, 1899.

Application filed October 14, 1898. Serial No. 693,516. (No model.)

To all whom it may concern:

Be it known that I, LOUIS MARIE GAUTIER, engineer, of St. Malo, in the Republic of France, have invented certain new and useful Improvements in Mechanical Movements, of which the following is a specification.

My invention relates to a motor-car which is so geared as to allow of transforming by means of combined pitmen, crank-shafts, and cam-grooves reciprocating rectilinear motion into continuous circular motion and also of varying the speed and the direction of rotation by means of a particular clutch. The said gearing, or rather transmission of motion, as there are neither sprocket-chains, nor cog-wheels, nor pulleys, is as applicable to various devices or machines as to motor-cars, motor-cycles, and tricycles, and I reserve to myself the right of using any suitable arrangement for each of such applications. In particular I hereinafter describe and show in the accompanying drawings the construction of a mechanism intended for operating a motor-carriage. The said mechanism is essentially characterized by the use of grooves or cams of curvilinear polygonal profile rotated by sets of rollers (operated by connecting-rods) rotating within their perimeter and by the use of friction-wheels transmitting the rotatory motion between two clutch-cups, the variation in the relation of transmission being obtained by the greater or less inclination of the friction-wheels toward the axes of the system.

Figure 1 of Sheet 1 of the accompanying drawings is a longitudinal section of the gearing or motion-transmitting devices. Fig. 2 shows the form of the two transmitting-cams. Fig. 3 is a side elevation of the mechanism which receives the direct action of the driving-pitman and which transmits the motion to the polygonal cams. (Not shown) Fig. 4 shows in plan the same mechanism as in Fig. 3. Fig. 5 shows in elevation the support of the wheel-shaft and of the crank-shafts operated by the driving-pitman. Fig. 6 represents the arrangement of the transmission-rollers placed between the two clutch members. Fig. 7 is a plan view of one of the said rollers and of the spindle supporting the same. Fig. 8 shows the arrangement for operating the clutch and changing the speed. Fig. 9 is a plan of the arrangement of the operating-rods shown in Fig. 8. Fig. 10 is a diagram of my system of motor-carriage provided with the transmitting mechanism, the details of which are shown in Figs. 1 to 9. Fig. 11 is a plan of the carriage, the body of which is removed.

I will describe successively the device for transmitting motion by cams and the clutch mechanism for varying the speed which characterize my invention.

The motor M, fixed to the truck of the carriage, Figs. 1, 10, and 11, operates the front axle a, which drives by the medium of the driving-pitman m, of the coupling-pitman m', of the two crank-pins m^2 m^3, of the rollers b' b^2 c' c^2, of the pentagonal cams b c, and of the clutch device e f g, which allows of rotating the shaft a in either direction. To that end the crank-shafts rotating in bearings fixed to the truck, Fig. 5, and having crank-plates on each end of the shaft are each provided with three pins or trunnions, the two outer ones of which are fixed at right angles to each other and at an angle of one hundred and thirty-five degrees with respect to the central trunnion, Figs. 2, 3, and 4. The two crank-shafts are operated directly by the driving-pitman m and by the coupling-pitman m', which latter is recessed to give clearance to the differential shaft a. The four outer pins or trunnions provided with rollers b' b^2 c' c^2 receive on that account a continuous rotary movement. The crank-plates supporting said rollers are connected together, two by two, by centrally-apertured connecting-rods t t', which maintain them at a distance which is rigorously constant.

The form of the cam-grooves in which move the rollers b' b^2 c' c^2, Fig. 2, is such that their perimeter always remains in contact with the two corresponding rollers in their rotary movement, one of them moving away from the center of the cam while the other is approaching the same, and reciprocally their contact with the polygonal perimeter of the cam determines the rotary movement of the latter at the rate, say, of one-fifth of a revolution for each complete revolution of the rollers. I thus obtain a reduction of speed of five to one between the crank-shafts and the pentagonal cams. I reserve to myself the

right of using cams having any number of sides in order to obtain different rates of reduction of speed, the said rates being always equal to the number of sides of the polygon used.

The developed length of the curvilinear side of the cam is equal to the circumference described by a roller, so that there is no sliding movement between the pieces. The two cams *b c*, Fig. 2, are similar the one to the other; but they are set at an angle of ninety degrees the one with respect to the other in order to overcome dead-points.

The circular motion of the cams being obtained as above described, it is required to transmit the same to the differential shaft and to get the forward movement at different speeds and the backward movement at will. For the forward movement the transmission is effected by the cup or clutch member *e*, Figs. 1, 6, and 7, the rollers *g*, the cup or clutch member *f*, and the teeth *i* of the clutch *h*. To that end the two clutch members *e f* have the form of a tore, (or torus, a form of molding well known in architecture,) having the same axes as the differential shaft *a*. The first cup *e* is fixed onto the tubular driving-shaft *d*, which carries the two polygonal cams *b c*, and which turns freely on the driven shaft *a*. The second cup *f* is loosely mounted on the said shaft *a*. Between the two cups or clutch members rollers *g* are loosely mounted on spindles fixed in blocks pivoted to spindles which are perpendicular to the first-named spindles and situated in the median transverse plane between the clutch members The spindles of the said blocks are pivoted to supports connected together by a rim which is concentric to the shaft *a* and fixed to the truck of the car. The blocks to the number of four in the arrangement shown in the accompanying drawings are also connected together by bevel-pinions which cause the same to be all inclined at the same angle when one of the same is acted upon. The said bevel-pinions are provided with stop-pins which limit their angular movement to about one hundred and seven degrees. The rollers *g* are on that account enabled to occupy, between the cups or clutch members *e f*, any and every position comprised within two extreme positions distant about fifty-three degrees from the normal position parallel to the differential shaft *a*. In all the said positions the spindles of the rollers converge toward a point on the said shaft. Their rolling-surface is spherical and of the same radius as the generating-sphere of the tore, hereinbefore described, which forms the inner surface of the cups. When the rollers are in the mean position and in contact with the two clutch members *e f*, they transmit a circular movement of the same speed and in an opposite direction from one of the said clutch members to the other. If at this moment the teeth of the cup *f* and of the clutch *h* are in gear, the differential shaft will be rotated in the same direction as the cup *f*. A flat spring *l*, acting on the said cup *f*, maintains also on the rollers *g* a pressure which is sufficient to secure frictional transmission under good conditions. To obtain a change of speed all that is required is to modify the inclination of the rollers *g*, which then transmit the motion between circumferences of contact having different diameters, and thus allow of changing the rate of the speeds from one to about two and a half in a continuous manner. For the backward movement the motion is simply transmitted from the cup *e*, Fig. 1, to the clutch *h* by the contact of the friction-surfaces *k*. These different effects are obtained by simply moving the clutch *h* and by varying the inclination of the rollers *g*. This is done by the following mechanism: On the truck of the carriage is fixed a frame *u*, carrying a rod *v*, movable longitudinally and terminating in a rack *v'* in gear with a pinion fixedly attached to a hollow shaft *x*, perpendicular to the rod *v*. Rotatable about the latter and journaled in bearings u' u^2 is forked support *w*, to which is pivoted a lever w' w^2, the end w' of which is placed between two stop-pins of the said rod *v*, while the other end w^2 is within reach of the driver of the carriage. Within the hollow shaft *x* is a second shaft *y*, the pinion y' of which is operated by a toothed segment y^2, connected to the pivoted support *w*. With this arrangement one can by simply operating the lever w^2 either forward or backward or to the left or right rotate in either direction either of the two shafts *x* and *y* or both at the same time. These two shafts suffice for the operation. The first shaft *x* terminates and *z* in a miter-wheel, Fig. 6, by which the inclination of the four rollers *g* is varied when it is required to change the speed. As to the shaft *y*, which passes freely through the shaft *x*, it is bent adjacent to the differential shaft and forms a crank, the handle of which is engaged in a groove of the clutch *h*. The rotation of the crank-shaft *z* therefore determines either the gearing of the teeth *i*, Fig. 1, for the forward movement or the complete separation of the said teeth or the engagement of the friction-wheels *k* for the backward movement.

I claim—

1. A mechanical movement, comprising a drive-shaft, a cup mounted to rotate with said shaft, a loose cup coaxial with the said rotatable cup, rollers arranged between the said cups, and engaging both of them, to rotate one cup in the opposite direction to the other, a driven shaft, and a clutch movable upon the driven shaft and adapted to engage either one of two clutch-surfaces rigidly connected with the said cups.

2. The combination of the driving member and driven member facing each other and rotatable about the same axis, the transmission-rollers located between said members and engaging both of them, said rollers being mounted to rotate about axes converging to-

ward a point of the axis of said members, bearings in which said rollers are mounted, said bearings being mounted to swing so as to cause the axes of the rollers to move in planes axial with respect to the said rotatable members, the bearings of the several rollers being arranged along the sides of a polygonal figure surrounding the axis of the driving and driven members, and the adjacent ends of the bearings meshing into each other, whereby the bearings are operatively connected to move in unison, and means for adjusting said bearings.

3. The combination of the driving member and driven member facing each other and rotatable about the same axis, the transmission-rollers located between said members and engaging both of them, said rollers being mounted to rotate about axes converging toward a point of the axis of said members, bearings in which said rollers are mounted, said bearings being mounted to swing so as to cause the axes of the rollers to move in planes axial with respect to the said rotatable members, an operative connection between the bearings of the several rollers to cause them to move in unison, a hollow adjusting-shaft for turning said bearings, a clutch-shaft passing independently through the adjusting-shaft and provided with a crank member, and a clutch operated by the crank member of the clutch-shaft and adapted to engage either the driving member or the driven member.

4. The combination of the driving member and driven member facing each other and rotatable about the same axis, the transmission-rollers located between said members and engaging both of them, said rollers being mounted to rotate about axes converging toward a point of the axis of said members, bearings in which said rollers are mounted, said bearings being mounted to swing so as to cause the axes of the rollers to move in planes axial with respect to the said rotatable members, an operative connection between the bearings of the several rollers to cause them to move in unison, a hollow adjusting-shaft for turning said bearings, a clutch-shaft passing independently through the adjusting-shaft and provided with a crank member, a pinion upon the adjusting-shaft, a rack engaging said pinion, a bearing in which the rack is mounted to slide, a sleeve mounted to turn upon the bearing of the rack and provided with a gear engaging a pinion upon the clutch-shaft, a support rigid with said sleeve, a clutch-lever pivoted upon said support so as to swing in a plane longitudinally of the rack, said lever engaging the rack to move the same, and a clutch operated by the crank member of the clutch-shaft and adapted to engage either the driving member or the driven member.

5. A mechanical movement comprising a driven shaft, a polygonal cam thereon, driving pins or rollers engaging said cam at opposite sides of its axis, rotatable supports carrying said rollers and likewise located at opposite sides of the cam's axis, the distances of the pins from the axes of their respective supports being equal, and means for rotating said supports in unison.

6. A mechanical movement comprising a driven shaft, a polygonal cam thereon, driving pins or rollers engaging said cam at opposite sides of its axis, rotatable supports carrying said rollers and likewise located at opposite sides of the cam's axis, the distances of the pins from the axes of their respective supports being equal, crank-pins upon said supports, a pitman for driving said supports, and a rod connecting the crank-pins on opposite sides of the driven shaft, said rod having a clearance for the passage of said shaft.

Signed at Paris, in the Republic of France, this 7th day of September, 1898.

LOUIS MARIE GAUTIER.

Witnesses:

EUGÈNE WATTIER,

EDMOND BLÉTRY.