

(No Model.)

2 Sheets—Sheet 1.

A. E. D. F. DE VILLEPIGUE.
APPARATUS FOR RECORDING THE DIRECTION AND GRADIENTS OF A ROAD.
No. 382,868.

Patented May 15, 1888.

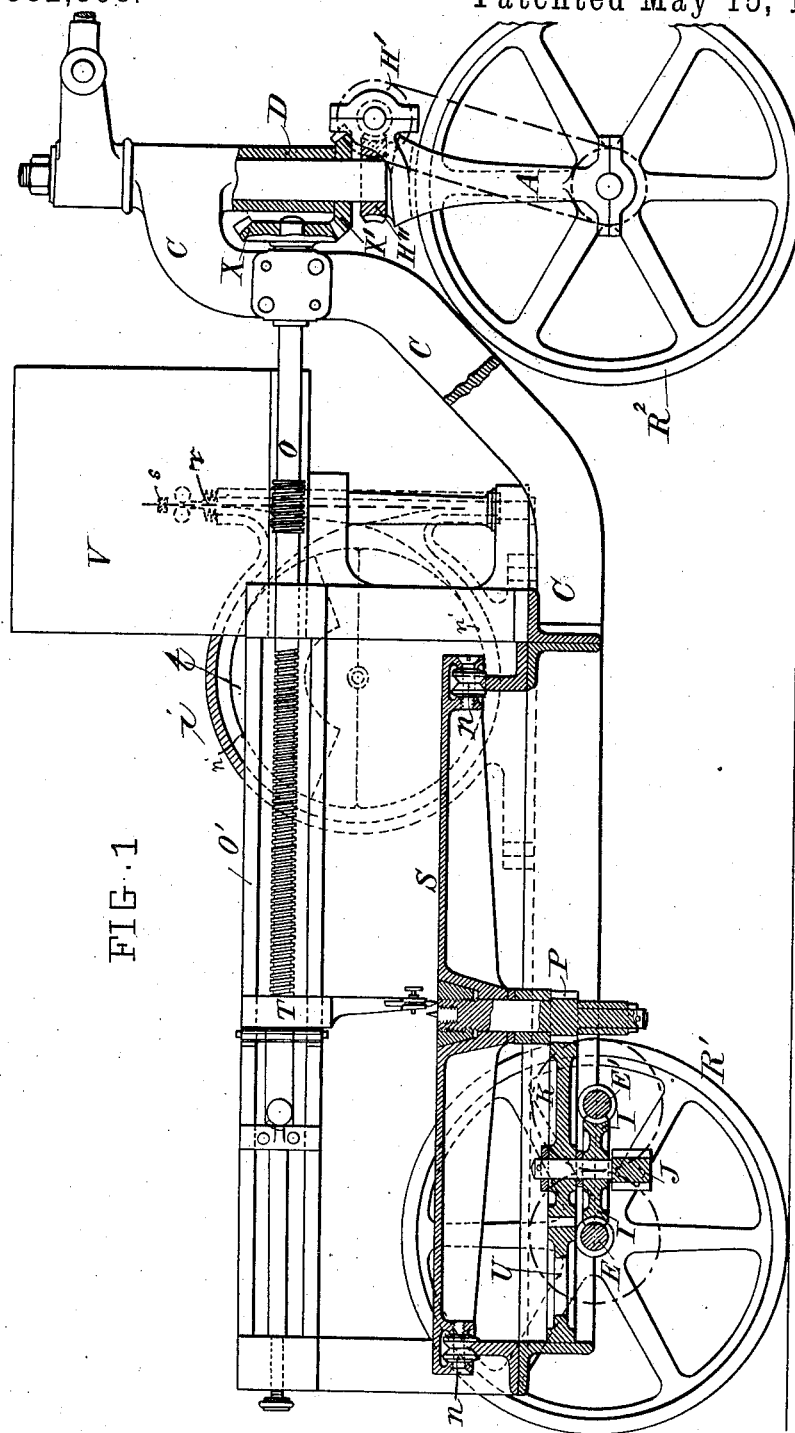


FIG. 1

Witnesses

John M. Speer.
Gustav Schmeppé.

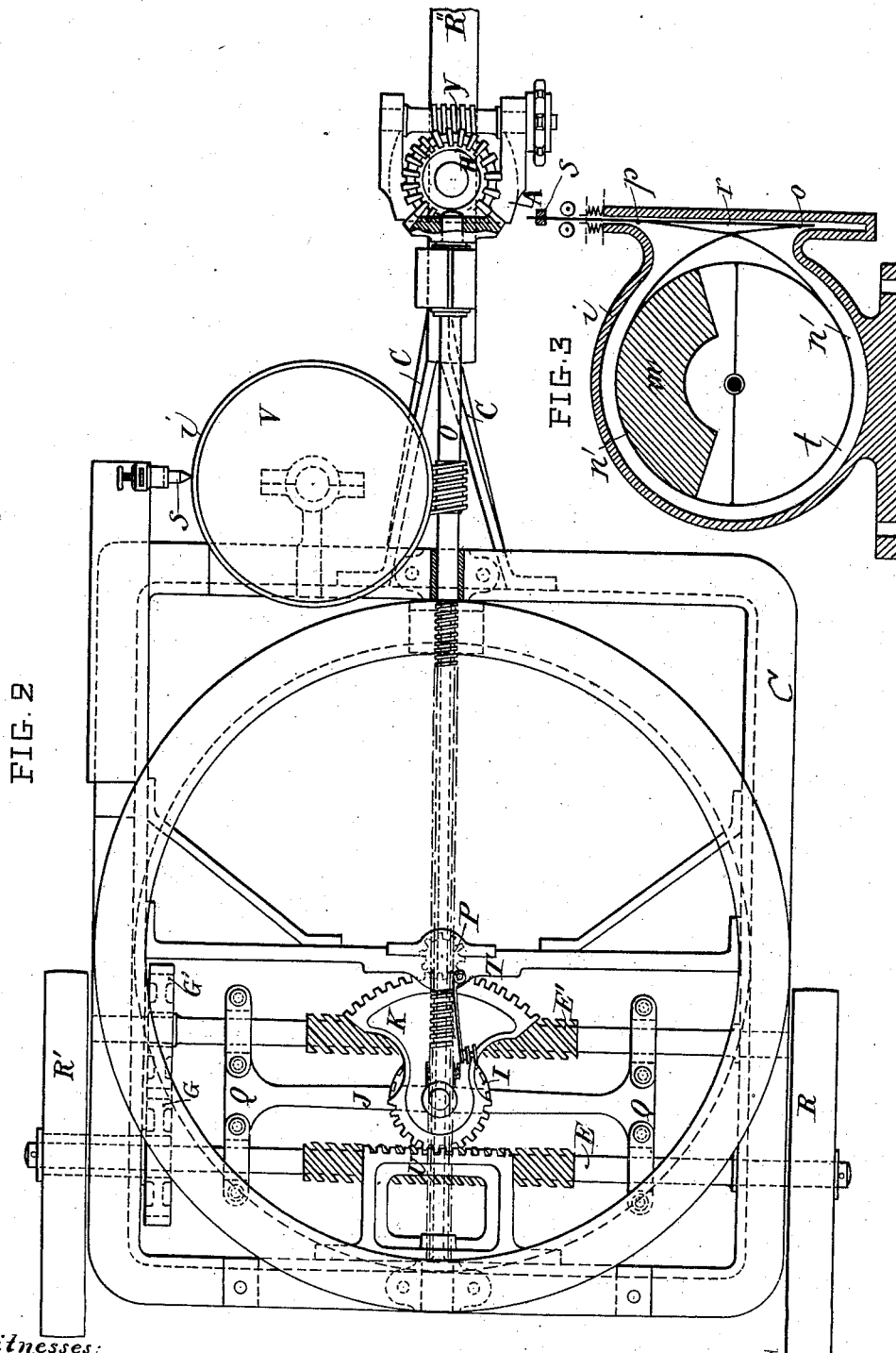
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UNITED STATES PATENT OFFICE.

AUGUSTE EDOUARD DENIS FLORAN DE VILLEPIGUE, OF PARIS, FRANCE.

APPARATUS FOR RECORDING THE DIRECTION AND GRADIENTS OF A ROAD.

SPECIFICATION forming part of Letters Patent No. 382,868, dated May 15, 1888.

Application filed February 26, 1887. Serial No. 228,947. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTE EDOUARD DENIS FLORAN DE VILLEPIGUE, at present residing at 71 Rue Legendre, Paris, in the Republic of France, engineer, have invented new and useful Apparatus for Recording and Delineating the Direction and Gradients of a Road, of which the following is a full, clear, and exact description.

This invention relates to an apparatus for automatically ascertaining and graphically delineating to a known scale the direction and gradients of a road.

The apparatus consists of a vehicle whose wheels actuate mechanism whereby two graphic delineations are obtained upon any desired scale, one representing the direction and length of the different portions of the road and the other the section or profile of the ground. An electric bell or other audible signal indicates—say at the completion of every mile—that the paper upon which the delineations are made is filled up and that fresh sheets must be supplied to the apparatus.

In order that the invention may be more readily understood, I will proceed to describe it with reference to the accompanying drawings, in which—

Figure 1 represents an elevation of the apparatus, and Fig. 2 a partly-sectional plan with the platform removed. Fig. 3 shows the mechanism for ascertaining the gradients.

The same letters of reference represent the same parts in all the figures.

The carriage is supported upon three wheels, of which the hind pair, $R R'$, are keyed the one R upon the axle E and the other, R' , on a sleeve loose upon said axle and carrying a pinion, G , which gears with an equal pinion, G' , on a shaft, E' , mounted parallel to axle E in suitable bearings on the framing C . The axle E and shaft E' each carry a worm, the two worms gearing with the opposite sides of a worm-pinion, I , turning loose on a vertical stud fixed on a bar, J , supported by cross-heads and ears which slide upon the axle and shaft $E E'$. Upon the same stud turns a double-toothed sector, K , the one sector being cycloidal in form and gearing with a pinion, P , and the other with a fixed rack, U . A circular table, S , is fixed upon the axis of pinion P , and is supported by friction-rollers $n n$

upon a circular rail carried by the framing C . A horizontal shaft, O , is mounted above the table S , so as to intersect a prolongation of its vertical axis. At its forward end it gears by a miter-pinion, X , with a similar pinion, X' , turning upon the vertical axis of the fork A of the guiding-wheel R^2 . The pinion X' is in one with a worm-wheel, H'' , gearing with a worm, y , on a cross-shaft driven from the axis of the guiding-wheel R^2 by a pitch-chain running on chain-wheels $H H'$, having any desired relative ratio to one another. The shaft O has a leading screw-thread upon it, which may be engaged, when desired, with a nut in a slide-block, T , moving along guides O' , and carrying a pencil holder or leg in position to mark a sheet of paper fixed on the table S . The shaft O also carries a worm which gears with a worm-wheel at the base of a vertical drum, V , which carries the paper upon which the section or profile of the ground is to be delineated.

The operation of the above described mechanism is as follows: The contact-points of the three wheels with the ground are at the angles of an isosceles triangle, the contact-point of the leading wheel, R^2 , being always situated at the apex. If the vehicle be drawn in a straight line, the three wheels will revolve in parallel planes and to the same extent, they being all of the same diameter. By the equal revolution of the wheels $R R'$ the axle E and shaft E' are caused to rotate in opposite directions and to revolve the worm-wheel I without shifting the position of its center, and without, therefore, causing any rotary motion of the table S . The revolution of the front wheel, R^2 , at same time rotates the shaft O through the gearing described, thereby causing the pencil-holder to advance and trace a radial right line from the center of the table S . If, however, the vehicle be directed to left or right, the leading wheel, R^2 , being in the middle plane, will run over the true distance, while the one hind wheel will turn slower and the other faster. The difference of motion of the two hind wheels causes a difference of motion of the two shafts $E E'$, in consequence whereof the worm-wheel I will be caused to roll along one of the worms as along a rack, thereby moving its stud toward the one side or the other of the vehicle, carrying with it

the double segment K. The double segment, rolling along rack U and gearing with pinion P, rotates the latter, and consequently the table S. Supposing the vehicle to be directed toward the right, the worm-wheel I will be moved over toward the left and the table S revolved to the right through an angular distance equal to the angular deviation of the vehicle. As the pencil moves in a right line it will trace an arc of a circle corresponding to the said angle, and then continue its radial movement if the vehicle follows a straight line.

The leveling mechanism is as follows: On the left of the hollow cylinder V a metal casing, *i*, (separately represented in section in Fig. 3,) is bolted to the framing C. The interior of the casing is bored truly cylindrical, and is closed by a cover bolted thereon. Upon an axis fixed at the center of the casing rotates a drum, *t*, of thin sheet-iron, a segment of which is inclosed to form a fluid-tight chamber, *m*. The casing *i* is provided with a vertical guide-tube of rectangular section, in which is fitted to slide a rod, *r*, carrying a pencil, *s*, at its upper end. The rod *r* is tangential to the casing and is connected to the drum by two flexible steel bands encircling opposite sides of the drum *t* and attached thereto at *n'* and to the rod *r* at *o* and *p*, respectively. These bands convert without slip the alternate rotary motion of the drum into alternate rectilinear motion of the rod *r* and the pencil *s*. The casing *i* having been hermetically closed and filled with mercury, the compartment *m* of the drum acts as a float, whose center of gravity is always in a vertical line passing through the center of the cylinder whatever may be the inclination of the casing *i* or framing C, and the casing *i* may therefore be said to gravitate around the drum. By this relative movement of the casing and drum motion will be transmitted to the pencil-carrier *r*. By the revolution of the paper-carrying drum V at a speed having a known ratio to the distance traveled the pencil carried by the rod *r* will graphically record upon the paper the distance traveled, the record being on a scale corresponding to the said ratio, and by the vertical movement of rod *r* the value of the gradients of the road will also be recorded. Thus an exact record or delineation may be obtained of the length and direction of the road, as well as of its variation of level relatively to the starting-point of the vehicle.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In an apparatus for delineating or recording the direction of a road, the combination, with a rotating table, S, of a double sector, K,

the axis thereof, a fixed rack gearing with the sector, the pinion I, the slide J, carrying said pinion and sector, and the shafts E E', rotated independently by the two hind wheels of the vehicle and gearing with pinion I, all arranged so that the pinion I and sector K shall receive a movement of translation when the shafts E E' revolve at different speeds, substantially as herein described.

2. In an apparatus for delineating or recording the direction of a road, the combination of a rotating table, S, pinion P, sector K, gearing with said pinion, rack U, gearing with the sector, and means, as described, for moving the sector, the pencil-carrier T, the screw-shaft O, for moving said carrier, the leading wheel R², and gearing X X' H' y H H', and a chain connecting H H' for moving the screw-shaft O from the wheel R², substantially as specified.

3. In an apparatus for recording or delineating the gradients of a road, the combination, with a drum, V, receiving continuous rotary motion from the traveling wheel, as described, of a casing, *i*, mercury in the casing, a drum, *t*, within the casing and immersed in the mercury, a pencil-carrier, *r*, and bands connecting the carrier *r* with the drum *t*, the pencil-carrier receiving vertical motion in consequence of the relative motion of the mercury and drum and of the casing containing the same, substantially as specified.

4. In an apparatus for recording or delineating the direction and gradients of a road, the tables S, the double sector K, gearing therewith, the fixed rack U, slide J, carrying the double sector, the pinion I, and independent worms operated by different wheels gearing with pinion I, in combination with the pencil-carrier T, the worm-shaft O, operating the same, and means for operating said shaft from the wheel R², substantially as described.

5. In an apparatus for recording or delineating the direction and gradients of a road, the combination of the table S and means as described, for operating the same, the pencil-carrier T, screw-shaft O, for operating the same, drum V, casing *i*, containing mercury, drum *t* in the mercury, and pencil-carrier *r*, connected with the drum *t*, all arranged and operating substantially as described, and for the purposes set forth.

The foregoing specification of my apparatus for recording and delineating the direction and gradients of a road signed by me this 1st day of February, 1887.

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Witnesses:

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