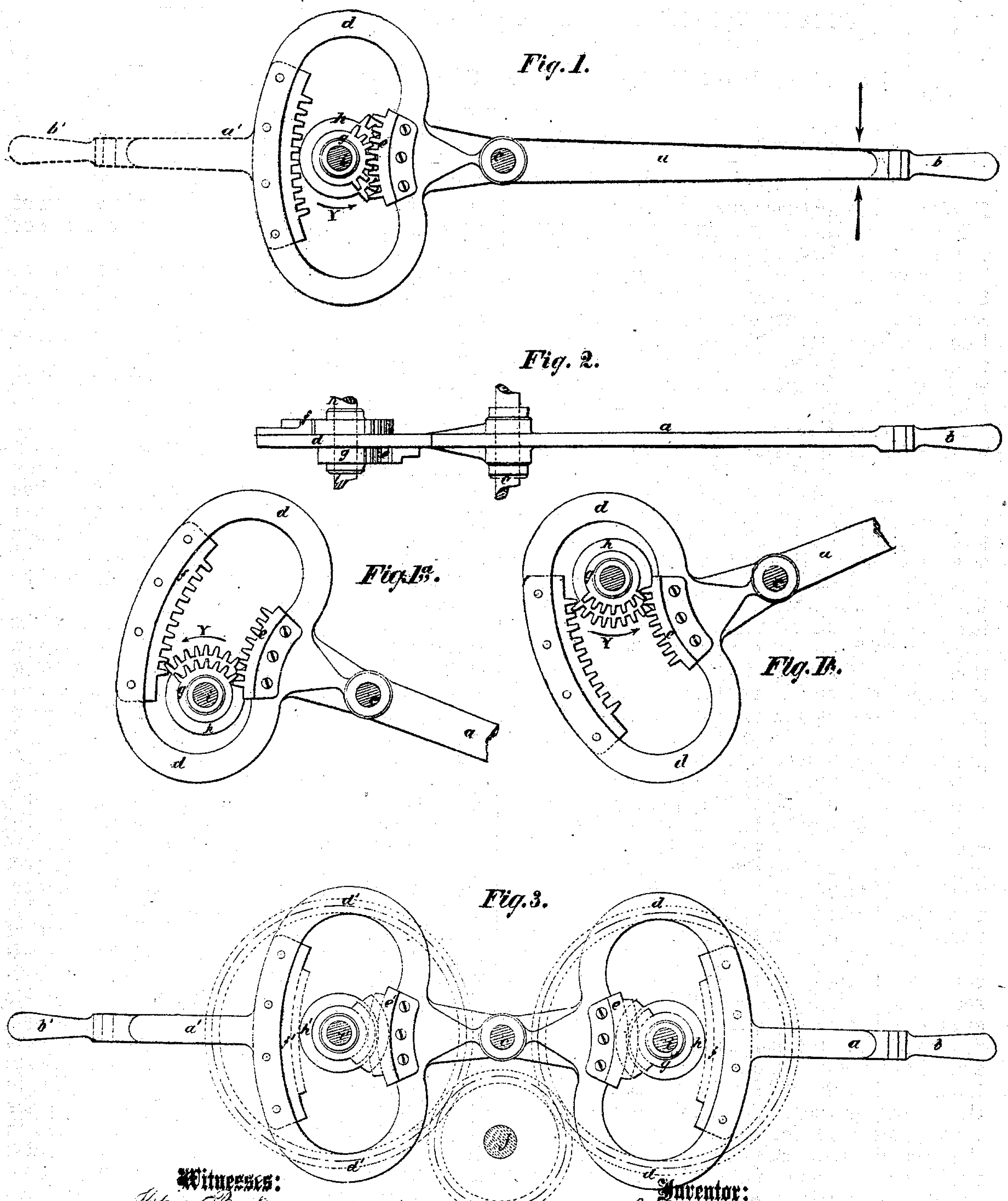
J. J. CHENAL.

Improvement in Apparatus for Converting Motion.

No. 120,622. Patented Nov. 7, 1871.



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IMPROVEMENT IN APPARATUS FOR CONVERTING MOTION.

Specification forming part of Letters Patent No. 120,622, dated November 7, 1871.

To all whom it may concern:

Be it known that I, JOSEPH JULIEN CHENAL, of Génissiat, (Ain,) in the Empire of France, have invented a new Lever, called Continual Lever, for changing alternate rotary motion into continuous rotary motion, and vice versa; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawing making a part of the same.

This invention is an improvement on that for which a patent was issued to Edward Wadham, dated July 11, 1865, No. 48,780. In his invention, a rocking or oscillating lever is widened out at the point where resistance is applied, into a sectoral slot or frame that is armed with teeth so as to engage with mutilated pinions keyed on a shaft passing through said slot or frame. The frame is, however, so constructed, and the pinions so connected with sleeves that turn backward on the shaft, as to cause considerable friction. This I have obviated by a peculiar construction or arrangement of racks and pinions or toothed disks, as hereinafter set forth. In my invention, the number of teeth in each disk or pinion is such that, as soon as one ceases to be in gear with its rack, the other will at once mesh with its rack without interruption or dead-point.

A fly-wheel may be fitted on the shaft so as to regulate the motion, which may then be communicated to machinery by any of the known means. Thus the shaft receives a continuous rotary motion, and the action of the two racks gearing alternately, as the lever oscillates, into the partly toothed sectors, (or sectoral pinions,) may be compared to the working of a pinion toothed all round, into which two sectors gear alternately, each on its own side, and moving in opposite directions. It is evident that, instead of a simple arm, the motive lever may have another arm attached to the other side of the slotted rack-frame, thus affording the means of applying additional power, and this second arm will act as a lever of the second kind. Also, in case two arms are used, each of them may have its own slotted double concentric rack-frame, communicating motion to two separate shafts; or, the motion of these two shafts may be jointly imparted to one single main shaft—in this case each of the arms of the levers acts both as a lever of the first and second kind. Conversely, by deriving motion from the shaft the continuous rotary motion of the said shaft will communicate an alternate or rocking motion to the lever.

In order to more fully explain the nature of my invention, and the various ways in which it may be carried into practical effect, I have represented the lever motion on the annexed drawing, on which—

Figure 1 is an elevation of a lever of the first kind, having its short arm constructed according to this principle. Figs. 1[a] and 1[b] show different positions of the lever in motion. Fig. 2 is the plan of the same. Fig. 3 is an elevation of a double-arm lever acting on two shafts. The dotted lines show the way in which the joint dynamical effect produced on these two shafts is communicated to one central shaft.

The same letters of reference denote the like parts in all the figures.

a is the lever-arm, which is set in motion at its extremity *b* by hand or any other motive power, and oscillates about the fixed point or pivot *c*. *d* is a framed slot carrying two toothed sectors or bent racks, *e f*, whose center of curvature coincides with the center of the fixed point *c*. *g* is a disk, partly toothed, gearing into the rack *e*; *h*, a similar disk, gearing into the rack *f*; *i*, a shaft, on which the disks *g h* are keyed, and which takes up the continuous rotary motion. The disks or toothed segments *g h*, instead of being made of two pieces, may also be cast together. The shaft *i* propagates its motion to any distance. It also carries, at some point, a regulating fly-wheel, which is balanced to suit the mode of driving used. Since Fig. 3 only refers to modifications of the motive lever system, the principle remaining unaltered, I will describe the mode of action of the arrangement shown in Figs. 1, 1[a], 1[b], and 2, the other being worked precisely alike. Supposing the lever *a* to be at rest when in the position shown, Fig. 1, if any power is applied to the point *b* in the direction of the arrow X the lever *a* is depressed and the frame *d* raised in the opposite direction, thus describing circular arcs about the fulcrum *c*. During this half revolution the rack *e*, gearing into the toothed portion of the disk *g*, causes the same to revolve with the shaft in the direction of the arrow Y, and the apparatus takes the position shown at Fig. 1[a]. If the power by which the lever *a* is made to oscillate is then applied in the opposite direction, (see the arrow Z,) the lever *a* rises again, and the slotted frame *d* descends. It will be seen by Fig. 1^a, that the number of teeth of the disks and racks is such that when the oscillation of the lever is completed in one direction and just about to begin in the other, the last tooth of the disk *g* leaves the rack *e*, and the first tooth of the disk *h* is seized by the rack *f*. For this purpose, the first and the last tooth of each rack are made a little longer than the others, so as to allow for the transition or passage of the disks from one rack to the other. The rack *f* being lowered by the action exerted along the arrow Z, will thus, in its turn, become a driver, and by communicating with the disk *h*, completes the revolution of the shaft *i*, as commenced by the rack *e*, in the direction of the arrow Y. At the end of the oscillation effected in the direction Z, the mechanism will be in the position illustrated by Fig. 1^b. The power ceasing to act on the lever *a* in the direction Z, and the contrary action in the direction X taking place, the rack *e* again becomes a driver by acting on the disk *g*, &c. In case, as stated above, it be required to change a continuous rotation into an alternate circular motion, the disks *g h* will receive a rotary motion by any motive power, so as to alternately gear into and drive the racks *e f*, thus imparting to the lever *a* an oscillating motion about its fulcrum *c*. In Fig. 1 is shown, by dotted lines, a lever, *a′*, or lever-arm, projecting from the slotted frame *d*, opposite to the lever *a*. This arm is acted upon at *b′*. In this arrangement the lever *a* belongs to the first kind, and the lever *a′* to the second kind. In Fig. 3, each of the levers *a a′* is provided with a slotted frame, *d d′*, which are both constructed in the same manner, and act on separate shafts *i i*. If it is desired to couple the effects thus obtained, each of these shafts is made to carry a wheel by which rotary motion is jointly given to a single shaft, *j*. In this case, each of the arms *a a′* acts both as a lever of the first and second kind.

I claim—

The combination of the lever *a* provided with slotted frame *d d′* and having racks *e f e′ f′*, and the disks *g h g′ h′* arranged with their toothed portions contiguous and opposite, as shown and described.

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(67)