(No Model.)

A. BOUCHARAT.

DEVICE FOR CONVERTING MOTION.

No. 563,444. Patented July 7, 1896.

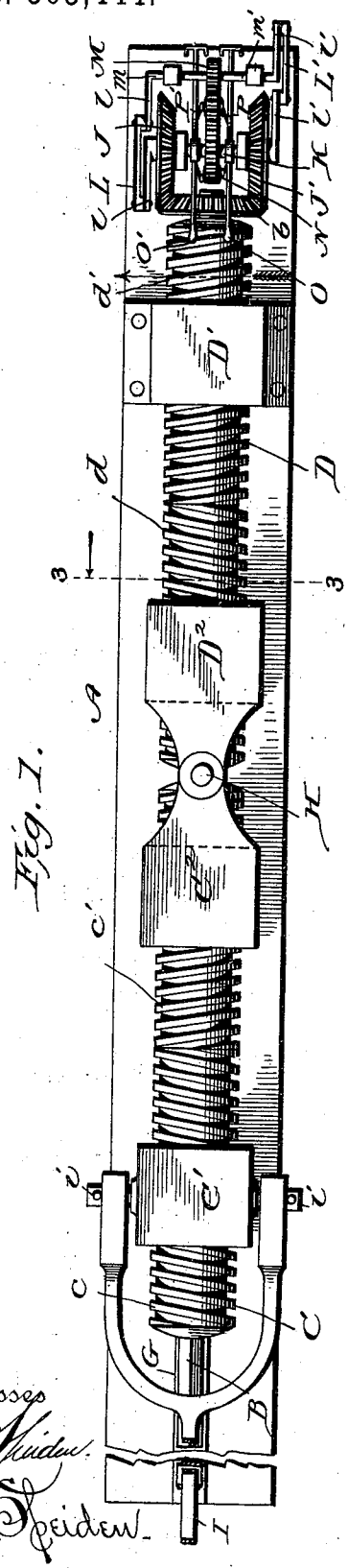

Fig. 1.

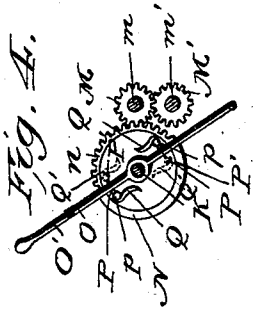

Fig. 4.

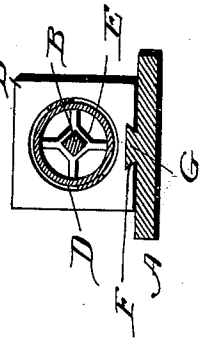

Fig. 3.

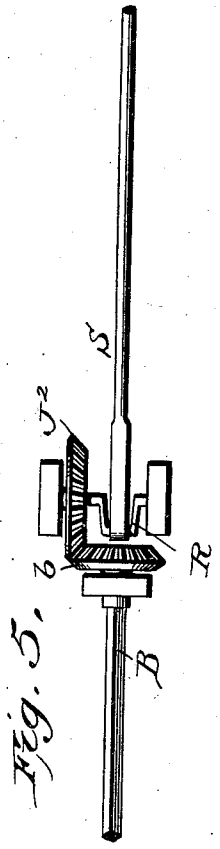

Fig. 5.

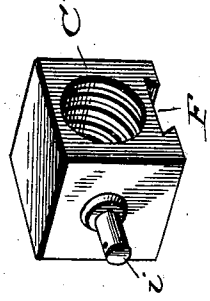

Fig. 2.

Witnesses
Albert Speiden.

Inventor
Auguste Boucharat
By Attorney Woodbury Lowery

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

AUGUSTE BOUCHARAT, OF GUSTON, COLORADO.

DEVICE FOR CONVERTING MOTION.

SPECIFICATION forming part of Letters Patent No. 563,444, dated July 7, 1896.

Application filed October 6, 1893. Serial No. 487,348. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTE BOUCHARAT, a citizen of the United States, and a resident of Guston, in the county of Ouray and State of Colorado, have invented certain new and useful Improvements in Devices for Converting Motion, of which the following is a specification.

The object of my invention is to provide a device for converting motion and at the same time to increase the rate of speed with the least expenditure of force, and my invention is particularly adapted to be applied to the driving of small boats and light vehicles, such as tricycles and hand-cars, which can be operated by hand-power; and my invention consists of a longitudinally-fixed driving-shaft rotated alternately to right and left by any suitable mechanism.

The driving-shaft communicates a reciprocating longitudinal motion to a pair of abutting cylindrical screws mounted thereon by causing one of said cylinders to turn in a stationary nut fixed to the motor-frame. On the adjacent cylinder ends, which are screw-threaded in opposite directions, are mounted sliding nuts coupled to each other in such wise that they increase the longitudinal motion of the second screw-threaded cylinder upon the driving-shaft. A third sliding nut mounted upon the second cylinder at its farther end is driven back and forth by both the rotary and longitudinal motions of the latter, and is connected to a shaft or other suitable transmitting device to utilize the rapid and increased reciprocating motion thus obtained.

In the accompanying drawings, which illustrate my invention, Figure 1 is a plan view of the motor with hand-lever attachment. Figs. 2 to 4, inclusive, are detail views of the device shown in Fig. 1; and Fig. 5 shows a modification of the driving mechanism for rotating the driving-shaft.

A is the motor-frame, upon which is mounted the fixed rotating driving-shaft B. *b* is a beveled gear-wheel keyed to the end of the driving-shaft B, and meshes with any suitable driving mechanism adapted to alternately rotate the shaft to right and left.

C D are two screw-threaded cylinders mounted upon and rotating with the driving-shaft B and having a rectangular central hub or bearing E, which allows them to slide longitudinally thereon.

c and *d* *c'* and *d'* are respectively right and left handed screw-threads on the cylinder-surfaces C and D.

Secured to the motor-frame A is a fixed nut D', in which turns the screw-threaded end *d'* of the screw-cylinder D. Traveling nuts C' C^2 D^2, mounted on the ends *c c' d* of the screw-cylinders C D, are each provided with a groove F, which engages with and slides upon a guide G, secured to the motor-frame A parallel with the axis of the driving-shaft B.

H is a rigid link connecting the traveling nuts C^2 D^2. I is a shaft pivoted to the trunnions *i i* of the traveling nut C'.

The operation of this part of my invention is as follows: On turning the driving-shaft B in the direction of the arrow, the cylinders C and D rotate with the shaft, and cylinder D is forced by the fixed nut D' along the shaft away from the pinion *b*, pushing forward the cylinder C and the traveling nuts D^2 C^2 C'. At the same time the rotation of the shaft B drives the traveling nut D^2 toward the inner end of the screw-cylinder D, causing the traveling nut C^2 on the cylinder C to move in the same direction by means of the connecting-link H, and thus gives an additional forward impulse to the cylinder C, and with it to the traveling nut C'. Simultaneously therewith the rotation of the cylinder C causes the cylinder to advance still in the same direction through the nut C^2. The cylinder C thus partakes of three movements in advance along the shaft, that imparted to it by the rotation of the cylinder D in the fixed nut D', that imparted to it by the sliding motion of the nut D^2 on its rotating screw D, and finally that caused by its own rotation within the nut C^2. The cylinder C imparts this increased longitudinal motion in turn to the traveling nut C', mounted upon it, in addition to that motion of the nut C' obtained by the revolution of the cylinder within it, a motion finally transmitted by the nut C' to the shaft I. On reversing the direction of rotation of the driving-shaft B, a similar action takes place in the opposite direction on the shaft and the nut C' is driven with equal rapidity and to the same distance in the contrary direction.

When it is desired to operate the motor by

hand, I provide the following mechanism, (see Figs. 1 and 4,) in which J J′ are bevel-gears, loosely mounted upon the shaft K, and gearing each with the pinion *b* of the cylinder-driving shaft B. Crank connections L *l* and L′ *l*′ unite the hubs of the bevel-gears J J′, respectively, with the shafts *m m*′ of the upper and lower meshing pinions M M′, by which they are driven. A driving-wheel N, loosely mounted upon the shaft K, is provided with teeth *n* around one-third of its periphery which mesh with the pinion M. The number of teeth on the driving-wheel N are sufficient to impart so many revolutions to the pinion M and its connections as will drive the screw-threaded end *d*′ of the screw-cylinder D its entire length through the fixed nut D′. O O′ are hand and foot levers, also loosely mounted upon the shaft K, one on each side of the driving-wheel N. The levers are provided with the lugs P P′, each terminating in a little roller *p*, which bears upon the convex side of the semicircular guides or bearings Q and Q′, secured to and projecting laterally from the two sides of the driving-wheel N. The lugs P′ on the lever O′, as well as their guides Q′ on one side of the driving-wheel N, are opposed to the lugs P on the lever O and their guides Q on the opposite side of the driving-wheel, so that the lever O turns the driving-wheel to the right and the lever O′ to the left.

The operation of this part of my invention is as follows: On working the levers O O′ the driving-wheel N is alternately given a semi-rotation to left and right. This in turn communicates a complete rotation to the pinions M M′, each in an opposite direction, and through their crank connections to the bevel-gears J J′, turning the driving-shaft B alternately to right and left and lastly imparting to the connecting-shaft I the rapid and extended motion already described.

In Fig. 5 I have shown a modification of the driving mechanism for rotating the driving-shaft B, in which a single bevel-gear J^2 is alternately turned to right and left by the crank-shaft R and its rod connection S. I thus provide a simple and efficient mechanical device which converts reciprocating rotary motion into longitudinal reciprocating motion of extended stroke and increased rapidity, adapted to be applied to the driving of small boats, tricycles, hand-cars, &c., when hand-operated, and to larger vehicles when driven by steam, as well as to other uses where such motion may be required.

It is evident that I may take an increased and translated motion directly from the screw-cylinder C as well as from the traveling nut C′, or from both, if desired, and that the same may be done with one or all of the remaining reciprocating parts, the nuts C^2 or D^2, which have an identical movement, and the screw-cylinder D.

It is also evident that I may omit the bevel-gear J′, its pinion M′, and crank connections L′ *l*′ without interfering with the operation of my invention; neither do I limit myself to the particular mechanism shown for rotating the driving-shaft, as it is immaterial by what means this is done, provided it is alternately turned to right and left, so as to translate and multiply the movement given it.

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

1. The combination of the fixed rotating driving-shaft B, the right and left handed screw-cylinder D mounted thereon and adapted to slide upon and rotate with the shaft, the fixed nut D′ on one end of the cylinder, the traveling nut D^2 on the other end of the cylinder, a guide parallel with the axis of the driving-shaft, means on the nut D^2 to engage with the guide and a device for rotating the driving-shaft, substantially as described.

2. The combination of the fixed rotating driving-shaft B, the right and left handed screw-cylinders D C, mounted thereon and adapted to slide upon and rotate with the shaft, the fixed nut D′ and the traveling nut D^2 on the outer and inner ends of the cylinder D, the traveling nuts C^2 C′ on the inner and outer ends of the cylinder C, the connecting-link H between the nuts C^2, D^2, a guide parallel with the axis of the driving-shaft, means on the traveling nuts C^2 D^2 C′ to engage with the guide, and a device for rotating the driving-shaft, substantially as described.

3. In a translating device having the driving-shaft B, the screw-threaded cylinders C, B, the fixed nut D′, the traveling nuts D^2 C^2 C′, and the guide G engaging with said nuts, the combination of the shaft I mounted on the trunnions *i i*, on the nut C′, the bevel-gear *b* keyed to the head of the shaft B and suitable driving-gear meshing with the gear-wheel *b*, substantially as described.

In testimony whereof I have hereunto signed this specification in the presence of witnesses.

AUGUSTE BOUCHARAT.

Witnesses:
THEO. PAULAIS,
T. J. MCKELVEY.