2 Sheets—Sheet 1.

I. N. ELLIS & R. W. RULE.

Mechanism for Converting Reciprocating into Rotary Motion.

No. 216,560. **Patented June 17, 1879.**

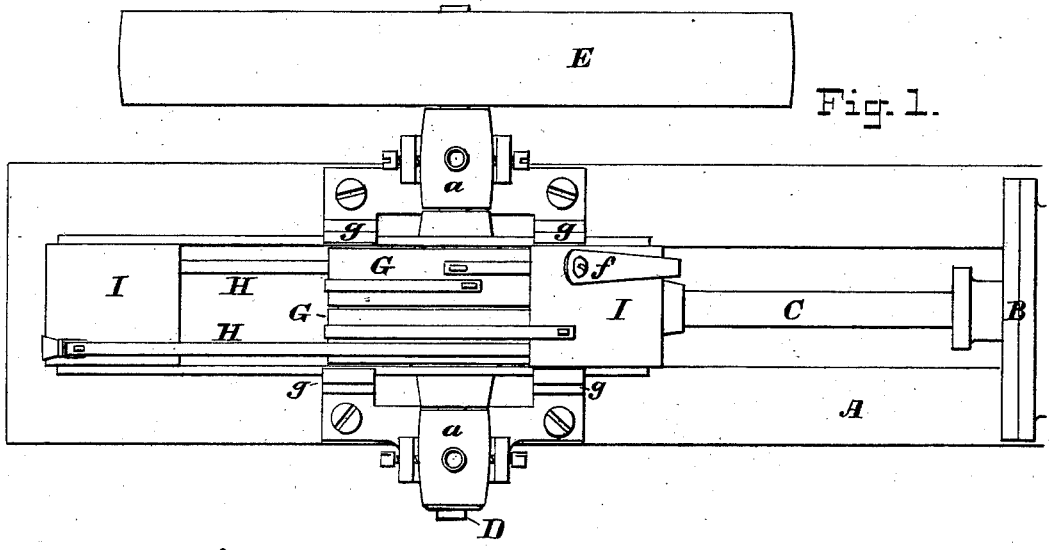
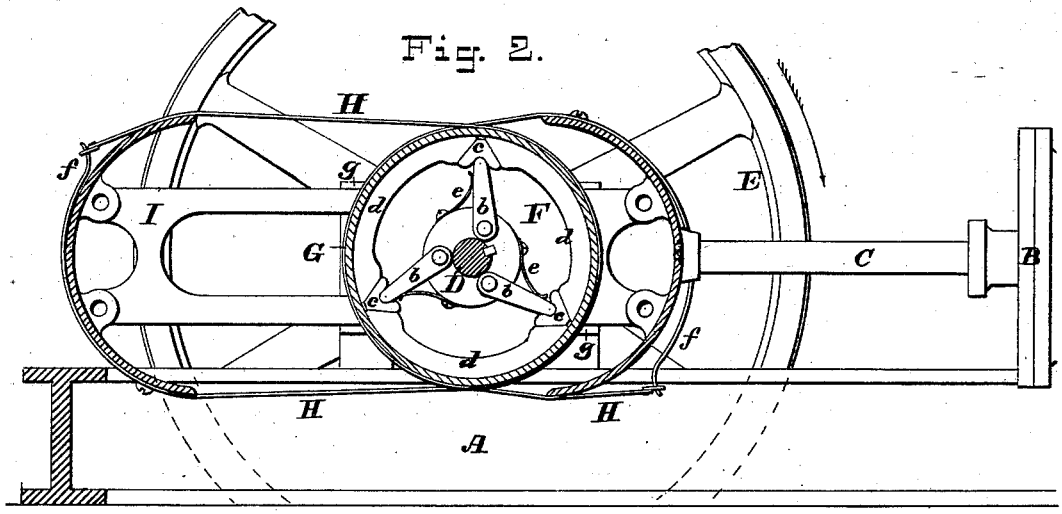


Fig. 1.

Fig. 2.



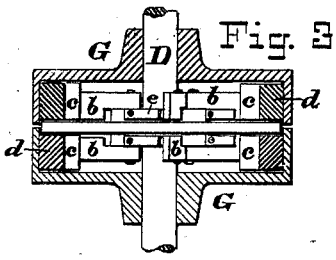


Fig. 3.

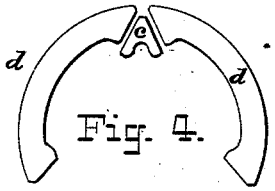


Fig. 4.

ATTEST:

H. Anderson Jr
Geo. H. Fraser

INVENTORS:

Isaac N. Ellis and Robert W. Rule,
By their Attorneys:
Burke, Fraser & Connett

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

2 Sheets—Sheet 2.

I. N. ELLIS & R. W. RULE.

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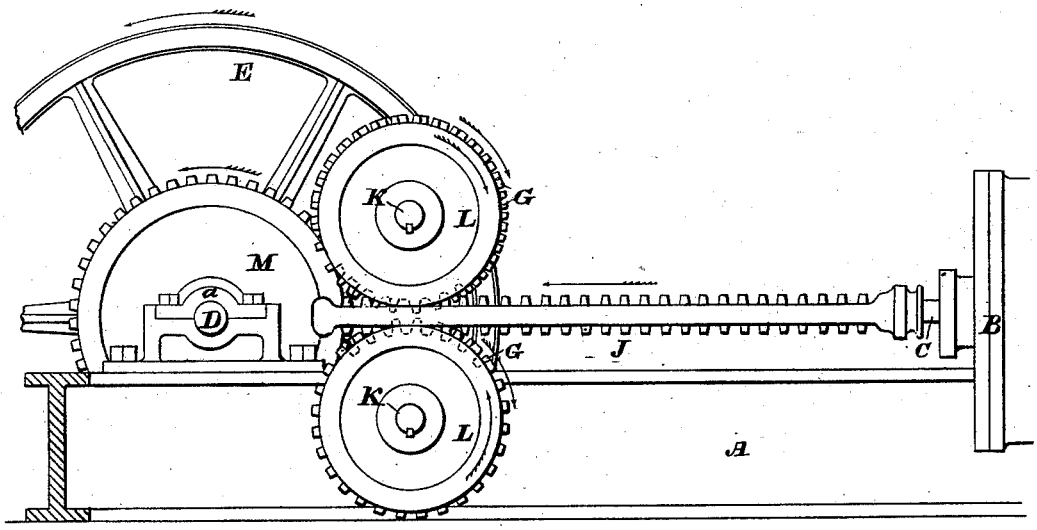
Fig. 5.



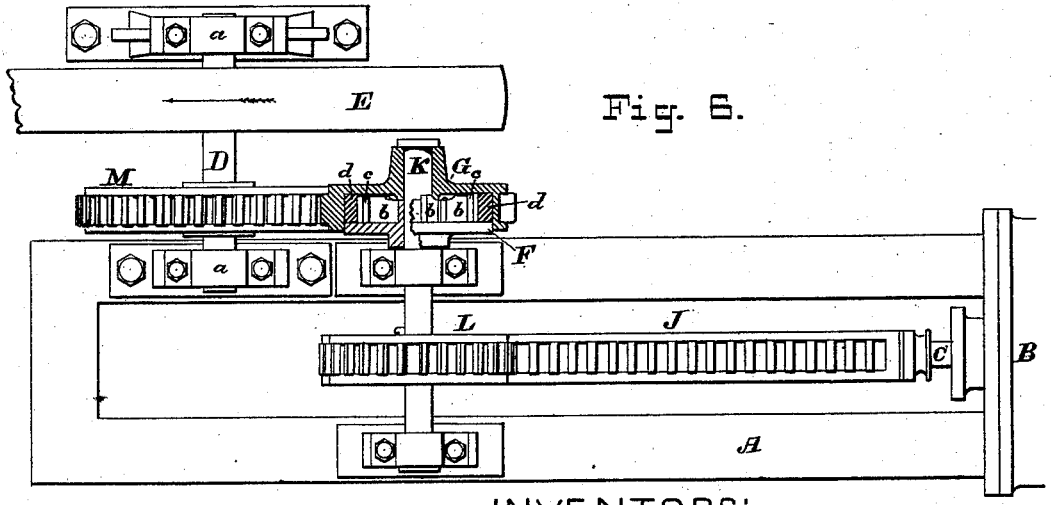


Fig. 6.

ATTEST:

H. Anderson, Jr.
Geo. H. Fraser.

INVENTORS:

Isaac N. Ellis. and Robert W. Rule.
By their Attorneys:
Burke, Fraser & Connett

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ISAAC N. ELLIS AND ROBERT W. RULE, OF AYLMER, ONTARIO, CANADA.

IMPROVEMENT IN MECHANISMS FOR CONVERTING RECIPROCATING INTO ROTARY MOTION.

Specification forming part of Letters Patent No. **216,560**, dated June 17, 1879; application filed October 19, 1878.

To all whom it may concern:

Be it known that we, ISAAC N. ELLIS and ROBERT W. RULE, both of Aylmer, in the county of Elgin and Province of Ontario, Canada, have jointly invented an Improved Device for Converting Motion, of which the following is a specification.

This invention relates to a device or mechanism for converting alternate reciprocating into rotary motion; the object being to dispense with the crank and avoid centers.

In the drawings, Figure 1 is a plan of our invention as applied to the piston-rod of a reciprocating engine. Fig. 2 is a sectional elevation of the same, arranged to show the interior parts. Fig. 3 is a horizontal section of the drums, showing the interior mechanism in plan. Fig. 4 is a detail view of the clamping segments and wedge. Figs. 5 and 6 are, respectively, an elevation and plan of a modification of our device.

A is an ordinary engine bed-plate. B is an engine-cylinder mounted thereon, and C is the piston-rod of the same. These may be of the ordinary kind, and are here introduced to illustrate the application of our invention.

D is the main or fly-wheel shaft, mounted in bearings *a a* on the bed-plate, and E is the fly-wheel. F is a disk, keyed or fixed to the main shaft, and *b b* are short levers or arms hung on opposite sides of the same, so as to play on pins or in sockets in a boss on the disk. The outer ends of these levers take into recesses in wedge-pieces *c c*, arranged between segments *d d*. These form the clamping mechanism.

The segments *d d* fit the curve of the inner periphery of drums G G, which are mounted on the shaft, but arranged to turn loosely thereon. The arms *b b* are set a little out of a radial line, or obliquely thereto, and springs *e e* are arranged to press against them, so as to impart to them a normal tendency to assume a radial position. The result of this arrangement is, that the drums G G will turn freely on the segments in one direction; but an effort to turn them in the other direction causes the segments to clamp upon their inner peripheries and produce rotation in the shaft D. The springs *e e* are necessary to insure this result, as if they were omitted the action would not be so positive. To guard against lost motion, the segments should fit the drums snugly, and the arms *b b* should stand only a very little out of a radial line. Their inner ends may rest in recesses, instead of being hung on pins.

In the construction shown in Figs. 1 and 2 to each drum G are secured two straps, belts, or chains, H H. These are wound in opposite directions on the drum, and secured at their free ends to a sliding frame, I, attached to the piston-rod C. To insure the tension of the belts, one or both ends are attached to take-up springs *f f*. The form of the frame I is not essential; but it should be mounted so as to reciprocate in guides, as at *g g*, or be otherwise guided in its movement.

When the frame I is caused to reciprocate by the action of the piston-rod, the chains or straps H H rotate the drums G G in opposite directions simultaneously. As the clamps "bite" only when the drums rotate in one direction, it follows that the alternate rotary movement of the drums causes continuous rotary movement of the shaft D and fly-wheel E. With the clamp arranged as shown in Fig. 2 the fly-wheel will revolve in the direction of the arrow.

As there are no ratchets used the movement is practically noiseless, the wear on the clamp is almost nothing, and the same mechanism will serve with any stroke of piston—that is, the fly-wheel will revolve the same, whether the piston travel through the entire length of the cylinder or only a part of it. Moreover, as the main shaft and fly-wheel may be freely revolved in a forward direction without affecting the clamping device, it will be seen that in stopping the engine the momentum of the fly-wheel is not encountered.

The arrangement just described is, we believe, the best for small or light engines; but for those adapted for heavy work we would prefer that shown in Figs. 5 and 6, which we will now describe.

The arrangement of the cylinder, piston-rod, main shaft, and fly-wheel is substantially the same as that shown in Figs. 1 and 2. To the extremity of the piston-rod is attached a double rack, J, which meshes with oppositely-arranged pinions L L, above and below it. These pin-

ions are fixed on shafts K K, mounted in suitable bearings, and to each shaft is also secured a disk, F, with its pawls *b b*. A drum, G, is mounted on each shaft, being free to rotate thereon, and is provided with teeth to gear with a toothed wheel, M, fixed on the main shaft D. Reciprocating motion of the rack J produces alternate rotary motion of the pinions L, shafts K, and pawl-disks F, and continuous rotary motion of the drums G, gear M, main shaft D, and fly-wheel E.

We wish it understood that we do not confine ourselves to the precise construction and arrangement of parts herein set forth, as many alterations might be made without material departure from our invention; but

What we do claim is—

1. The combination of the drums G G, their inclosed clamping mechanism consisting of the arms *b b*, wedges *c c*, and segments *d d*, the shaft D, to which the arms are pivoted or connected, the frame I, or its equivalent, arranged to be reciprocated, and the chains or belts H H, all arranged to be operated substantially as set forth.

2. The combination of the drums G G, the shaft D, on which they rotate loosely, the arms *b b*, pivoted to the shaft or otherwise properly connected therewith, the segments *d d*, the springs *e e*, and a reciprocating part arranged to give the drums an alternate rotary or semi-rotary movement on the shaft D, substantially as shown.

3. The combination of the frame I, or its substantial equivalent, the chains or belts H H, the drums G G, and the take-up springs *f f*, all arranged to operate substantially as set forth.

In witness whereof we have hereunto signed our names, each in the presence of two subscribing witnesses.

ISAAC N. ELLIS.
ROBERT W. RULE.

Witnesses to signature of Isaac N. Ellis:
W. A. GLOVER,
L. D. TEEPLE.

Witnesses to signature of Robert W. Rule:
C. A. COOK,
JOSEPH S. JONES.