

No. 709,668.

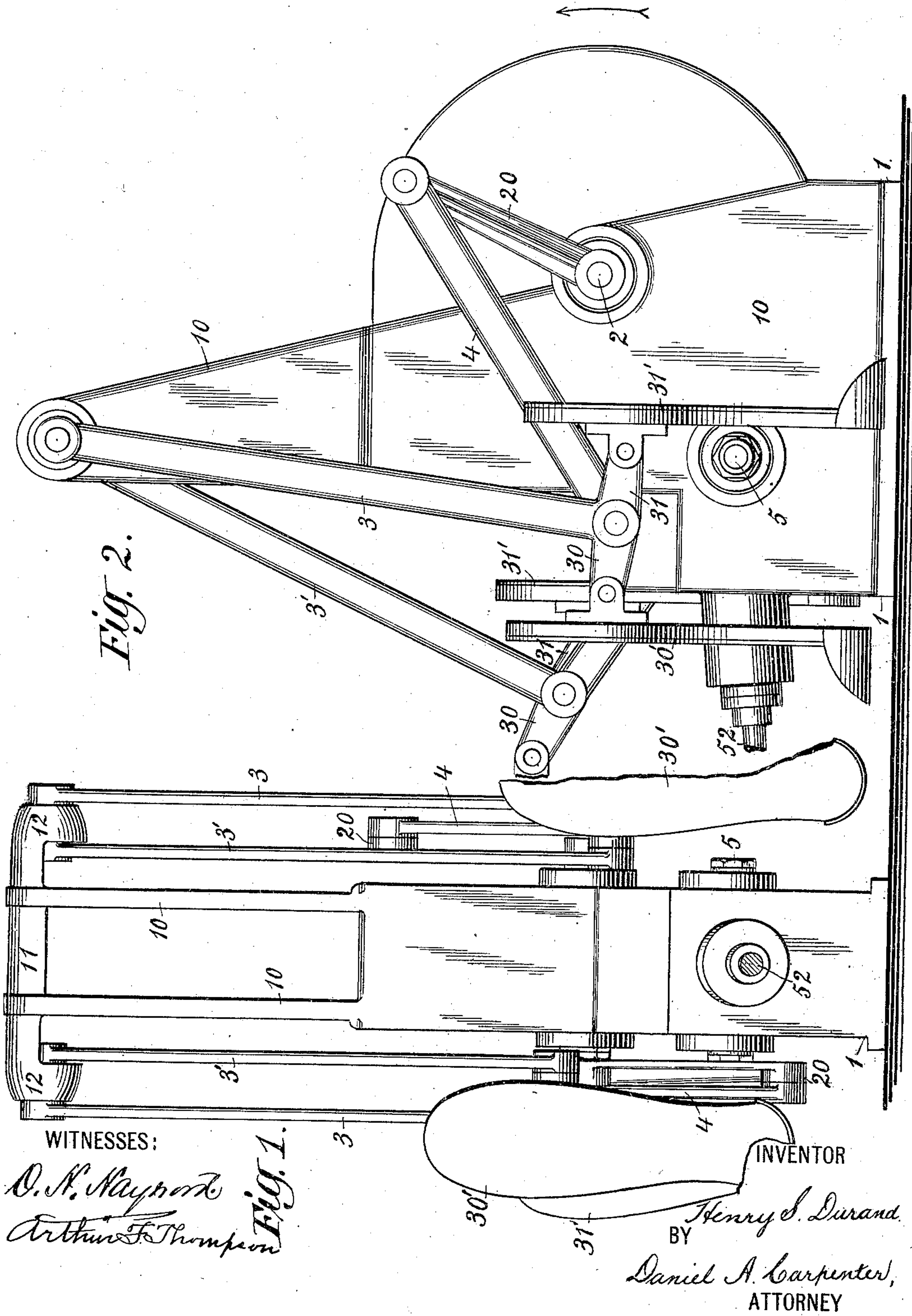
Patented Sept. 23, 1902.

H. S. DURAND.  
MECHANICAL MOTOR.

Application filed Feb. 5, 1900.)

(No Model.)

2 Sheets—Sheet 1.



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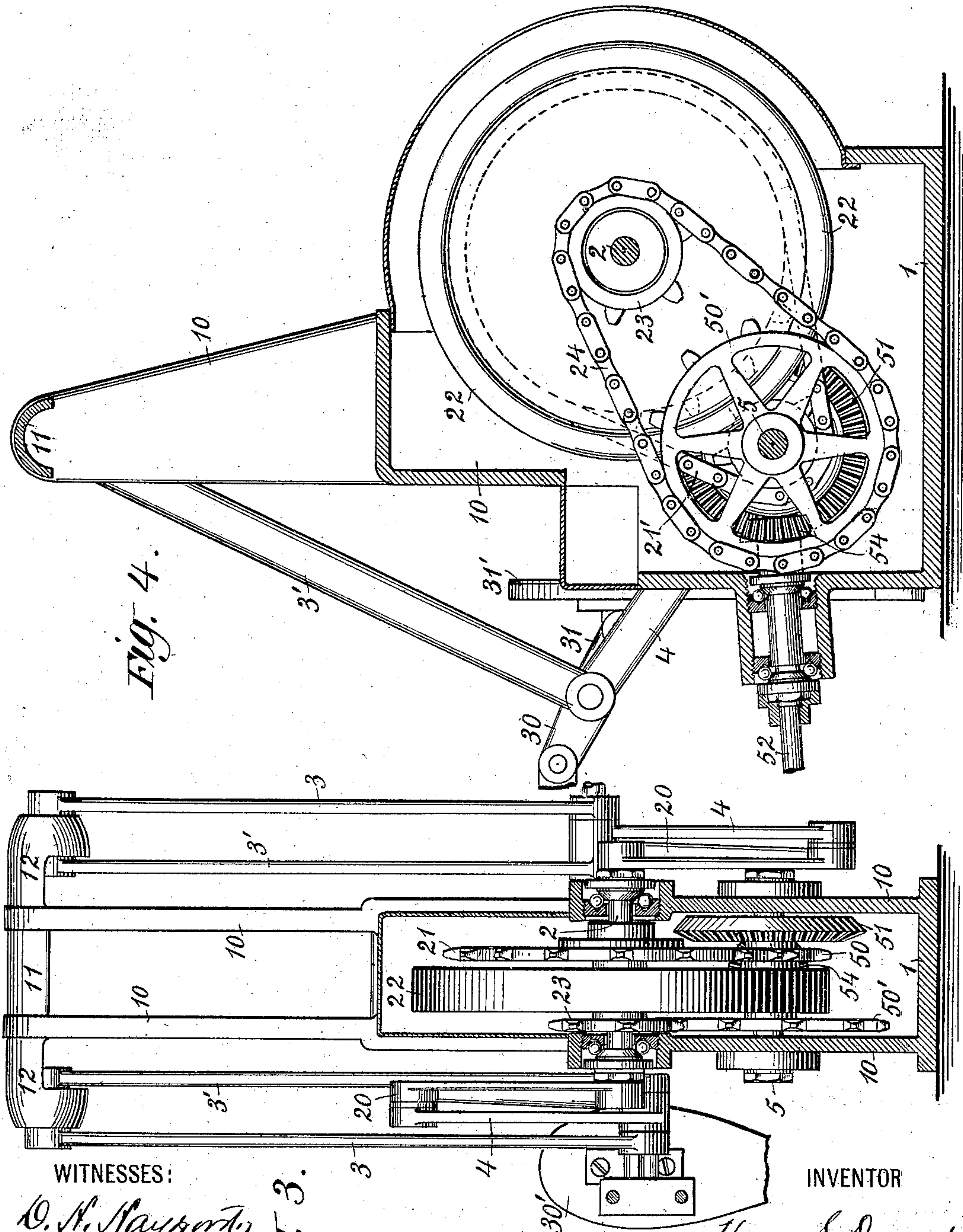
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2 Sheets—Sheet 2.



WITNESSES:

*O. N. Mayhew*  
*Arthur F. Thompson*

*Fig. 3.*

INVENTOR

*Henry S. Durand.*  
BY

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# UNITED STATES PATENT OFFICE.

HENRY S. DURAND, OF ROCHESTER, NEW YORK.

## MECHANICAL MOTOR.

SPECIFICATION forming part of Letters Patent No. 709,668, dated September 23, 1902.

Application filed February 5, 1900. Serial No. 4,012. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY S. DURAND, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Improvement in Mechanical Motors, of which the following is a full, clear, and exact description, reference being made to the accompanying drawings, forming part of this specification.

This invention relates to improvements in mechanical motors which embody certain parts of the mechanism patented in Letters Patent of the United States No. 629,343; and the invention consists of a motor comprising a fly-wheel mounted on the main shaft and combined therewith and with other parts of the motor, as hereinafter described and claimed.

On the accompanying sheets of drawings, Figure 1 is a rear elevation of the motor; Fig. 2, a side elevation thereof; Fig. 3, a front sectional elevation thereof; and Fig. 4, a side sectional elevation thereof, except that the pedals are not fully shown in any of the figures.

Similar reference-numerals designate like parts in the different views.

The main object of this invention is to improve the motor described in the patent above designated, so as to render the mechanism of the improved motor peculiarly compact, simple in construction, and regular in its motion.

The frame herein shown is similar to that of the patented motor, it being a casting comprising the base 1 and the uprights 10, connected together at their upper ends by the cross-bar 11 and provided with the projections 12 on their outer faces at the ends of the cross-bar. In the lower and forward part of the frame is the shaft 2, which projects from the sides of the frame and on which are the crank-arms 20, extending in opposite directions from the shaft, the crank-arms being connected to the beams 3 by the links 4. The beams 3 are pivoted on the projections 12 of the frame, the length of each beam being preferably a little more than two and a half times the length of one of the crank-arms and the elevation of the axis of the beams above that of the shaft 2 being a little more than the length of one of the beams. The

length of the links 4 is such that when the crank-arms are parallel to the base that one of the beams 3 which is connected to the forward crank-arm is nearly vertical. The relations to each other of the crank-arms, beams 3, and links 4 being as described, the lower ends of the beams and rear ends of the links travel forward and downward toward and backward and upward from the shaft 2 during each revolution imparted to that shaft, their forward-and-backward motion being greater than their downward-and-upward motion.

Between each of the beams 3 and the adjacent upright 10 of the frame is a bar 3', which is attached at its ends to the beam 3 by means of the bearing-pins of the beam, these pins and those of the other beam extending through the outer portions of the projections 12 and through the rear ends of the links 4. The function of these bars is to reinforce the beams 3, so as to help prevent them from springing or from exerting an improper strain on the bearings. These bearings, as well as those of the crank-arms and links 4 and of the shaft 2, are ball-bearings.

Each of the beams 3 is provided at its lower end with projections 30 and 31, and pedals 30' and 31' are attached to these projections. The pedals 31' are intended to be used only when two persons operate the motor, although one person might operate it by means of these pedals instead of the others mentioned.

The shaft 2 carries a large sprocket-wheel 21, which is tight on the shaft. Below and behind this shaft is another shaft 5, which is parallel to the shaft 2 and has bearings on the frame similar to those of the shaft 2. It carries a sprocket-ring 50, a sprocket-wheel 50', and a bevel-gear 51, which are fast on the shaft, the bevel-gear being close to one of the uprights, the sprocket-ring being near the inner face of the bevel-gear, and the sprocket-wheel 50' being close to the other upright. On the sprocket-wheel 21, which is in alinement with the sprocket-ring 50, and on this sprocket-ring, is a chain 21', whereby motion is communicated from one sprocket to the other. A shaft 52—for example, a propeller-shaft having a bearing at the back of



the frame—carries a bevel-pinion 54, which extends behind the sprocket-ring 50 and engages with the bevel-gear 51.

The fly-wheel 22 is loosely mounted on the shaft 2 next to the inner face of the sprocket-wheel 21. A sprocket-ring 23 is attached to the fly-wheel, which is so arranged that the ring 23 is in alinement with the sprocket-wheel 50', and the fly-wheel is geared to the shaft 5 by means of these sprockets and the chain 24, extending around and engaging with them. The diameter of the fly-wheel is preferably such that the rim of the wheel just clears the shaft 5 and extends in front of and below the level of that shaft, as shown.

The direction of the forward motion of the cranks is indicated by the arrow at the right of Fig. 2. When the motor is operated by one person only, he naturally sits behind it, pushing against the pedals 30', his position there being more favorable than another which he might occupy in front of the motor with his feet on the pedals 31'. Power applied by the legs to the pedals 30' is transmitted by the links 4 to the crank-arms 20, causing the shaft 2 and sprocket-wheel 21 to rotate and to impart motion to the shaft 5 through the chain 21' and sprocket-ring 50 and thence to the shaft 52 through the bevel-gear and pinion and to the fly-wheel through the sprocket-and-chain gearing 50', 23, and 24, the motion of the fly-wheel being in the same direction as that of the crank-shaft. If two persons operate the motor together, one of them sits behind it and pushes against the pedals 30' and the other sits in front of it and pushes against the pedals 31'.

By arranging and combining as described those parts of the mechanism which are between the uprights not only is the motor provided with a suitable fly-wheel mounted on the main shaft, where it is inconspicuous and where its weight is well utilized to impart stability to the motor, but the mechanism is thus rendered extremely compact and regular in action, while a motor constructed as described herein may be made ready at the shop where it is built to be put into use without the trouble of mounting or adjusting any of its parts after it leaves the shop.

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

1. In a mechanical motor comprising: a stationary frame having upright sides; a driving-shaft in the forward part of the frame; a

counter-shaft behind the driving-shaft; bearings for these shafts secured immediately to each of the upright sides of the frame; and gearing connecting said shafts between their bearings; the combination of: a fly-wheel loosely mounted on and supported by the driving-shaft within the frame and at one side of said gearing; and other gearing connecting the counter-shaft with the fly-wheel between the bearings of the shafts, the latter gearing being at one side of the fly-wheel and between it and the frame; substantially as described.

2. In a mechanical motor comprising: a stationary frame having upright sides; a driving-shaft in the forward part of the frame; a counter-shaft behind the driving-shaft; bearings of these shafts secured immediately to each of the upright sides of the frame; a bevel-gear on the counter-shaft between the sides of the frame and near one of those sides; and gearing connecting said shafts between their bearings; the combination of: a fly-wheel loosely mounted on and supported by the driving-shaft within the frame and at one side of said gearing; other gearing connecting the counter-shaft with the fly-wheel between the bearings of the shafts, the latter gearing being at one side of the fly-wheel and between it and the frame; and a bevel-pinion extending behind the gearing that connects the shafts, and engaging with the bevel-gear; substantially as described.

3. In a mechanical motor comprising: a stationary frame having upright sides; a driving-shaft 2 in the forward part of the frame; a shaft 5 behind the driving-shaft; bearings for these shafts secured immediately to each of the upright sides of the frame; and a bevel-gear 51 on the shaft 5 between the sides of the frame and near one of those sides; the combination of: a fly-wheel loosely mounted on and supported by the driving-shaft within the frame; gearing on one side of the fly-wheel, composed of sprockets 21 and 50 on the shafts 2 and 5 respectively and a chain 21'; gearing on the other side of the fly-wheel, composed of sprockets 50' and 23 on the shaft 5 and fly-wheel respectively and a chain 24; and a bevel-pinion 54 extending behind the sprocket 50 and engaging with the bevel-gear 51; substantially as described.

HENRY S. DURAND.

In presence of—

ARTHUR F. THOMPSON,  
WILLIAM J. HANDOVER.