

No. 629,343.

Patented July 25, 1899.

H. S. DURAND, R. M. BECK & R. K. McLELLAN.

MECHANICAL MOTOR.

(Application filed Jan. 3, 1898.)

(No Model.)

4 Sheets—Sheet 1.

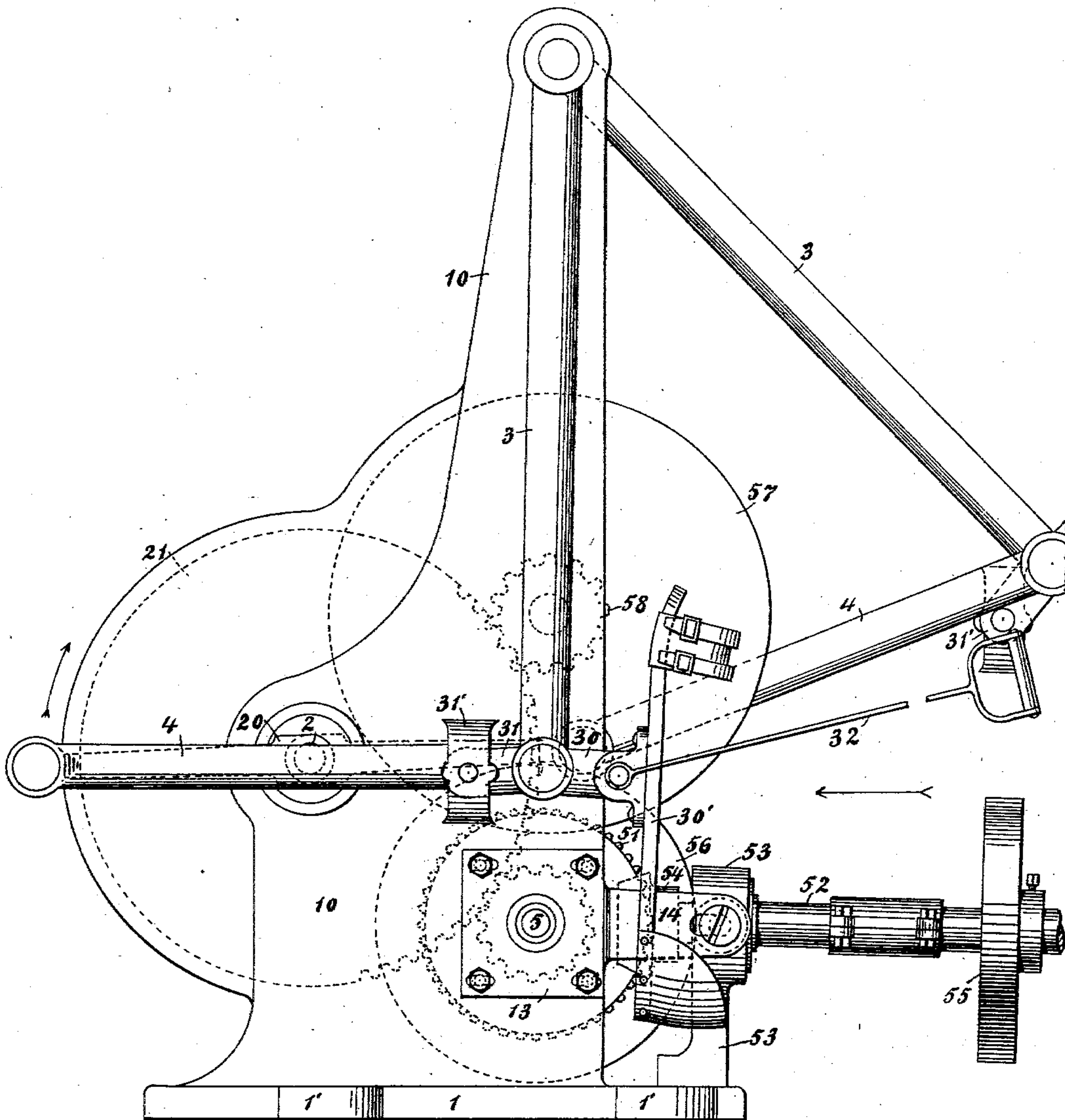


Fig. 1.

WITNESSES:

C. W. Benson  
Arthur F. Thompson.

INVENTORS:

Henry S. Durand.  
Robert M. Beck.  
Robert K. McLellan.  
BY

Daniel A. Carpenter,  
ATTORNEY.

No. 629,343.

Patented July 25, 1899.

H. S. DURAND, R. M. BECK & R. K. McLELLAN.

MECHANICAL MOTOR.

(Application filed Jan. 3, 1898.)

(No Model.)

4 Sheets—Sheet 2.

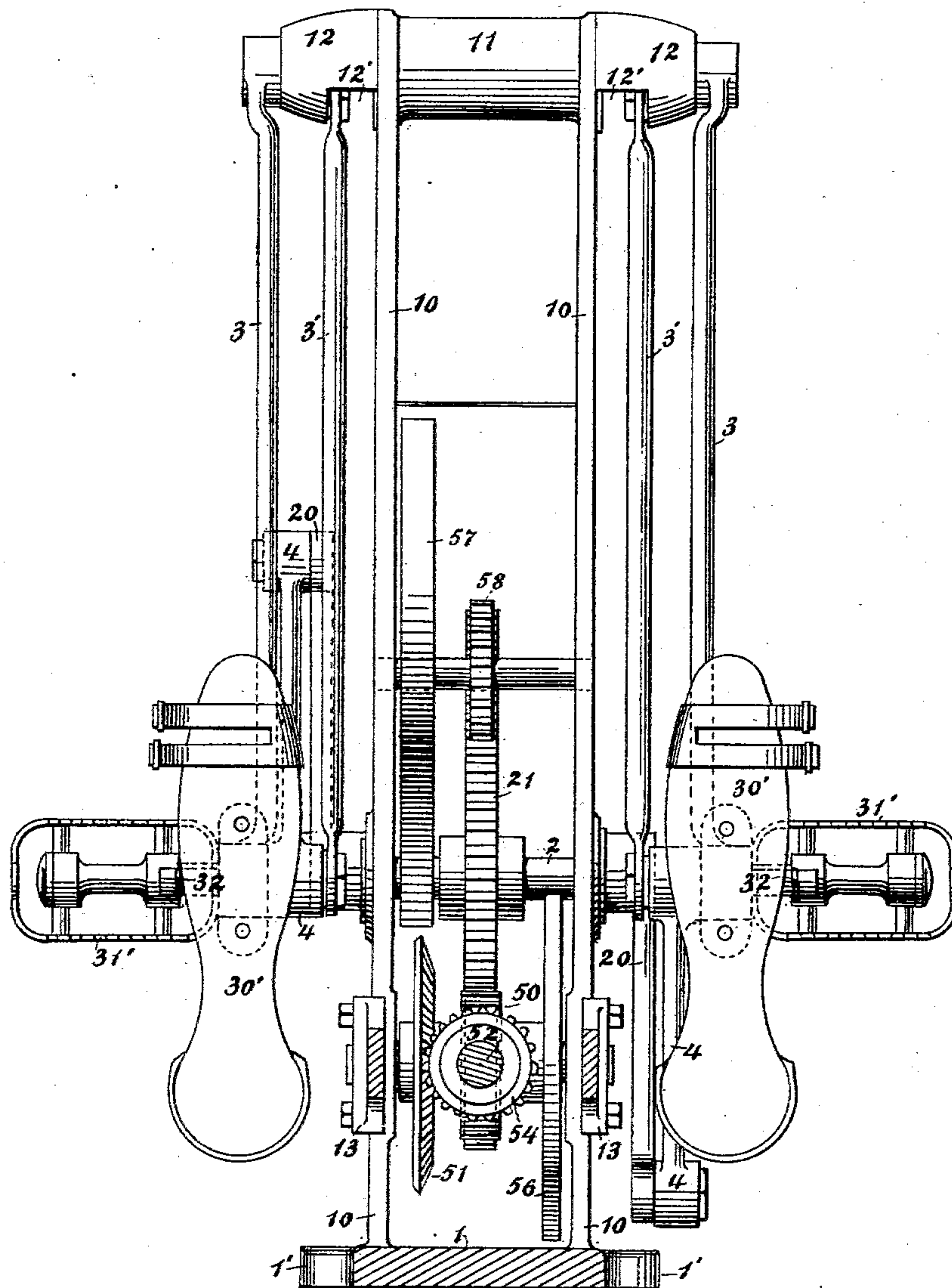


Fig. 2 .

WITNESSES:

C. W. Benjamin  
Arthur P. Thompson.

INVENTORS:

Henry S. Durand.  
Robert M. Beck  
Robert K. McLellan.  
BY

Daniel A. Carpenter

No. 629,343.

Patented July 25, 1899.

H. S. DURAND, R. M. BECK & R. K. McLELLAN.

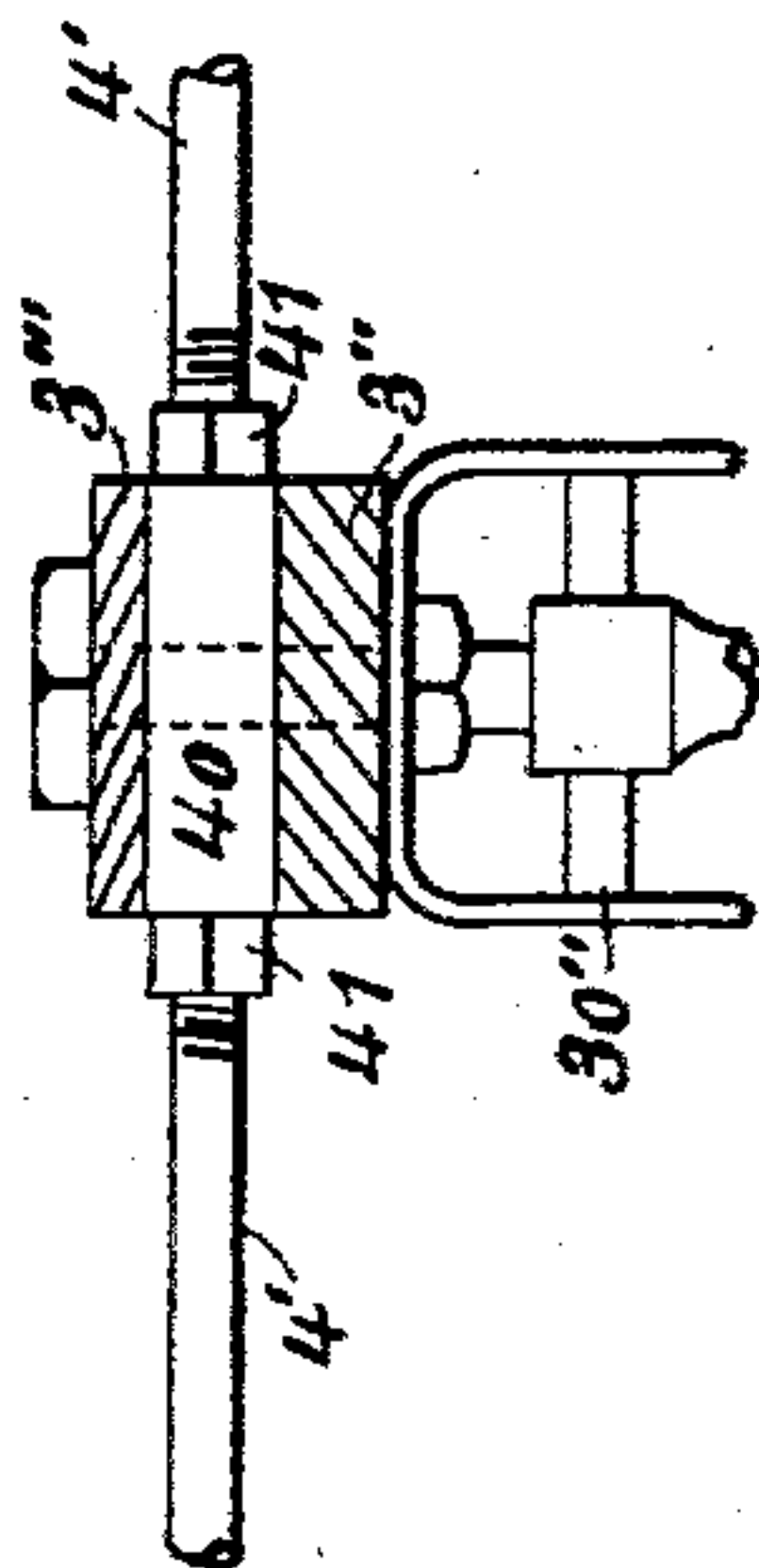
MECHANICAL MOTOR.

(Application filed Jan. 3, 1898.)

(No Model.)

4 Sheets—Sheet 3.

Fig. 4.



WITNESSES:  
C. W. Benjamin  
Arthur F. Thompson

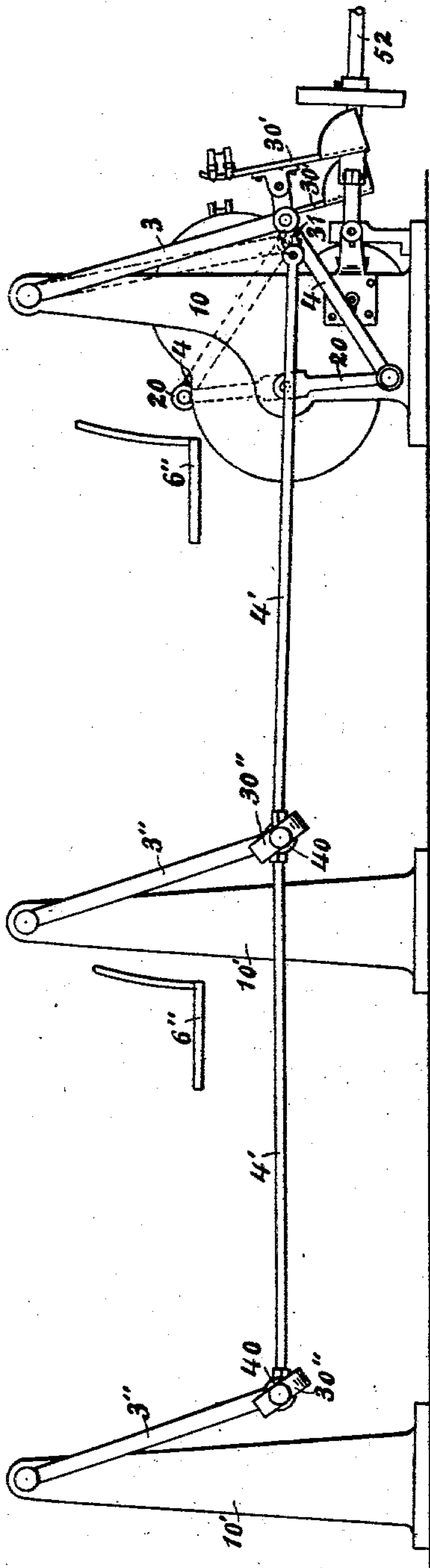


Fig. 3.

INVENTORS:  
Henry S. Durand,  
Robert M. Beck,  
Robert K. McLellan,  
BY

Daniel A. Carpenter,  
ATTORNEY



No. 629,343.

Patented July 25, 1899.

H. S. DURAND, R. M. BECK & R. K. McLELLAN.

MECHANICAL MOTOR.

(Application filed Jan. 3, 1898.)

(No Model.)

4 Sheets—Sheet 4.

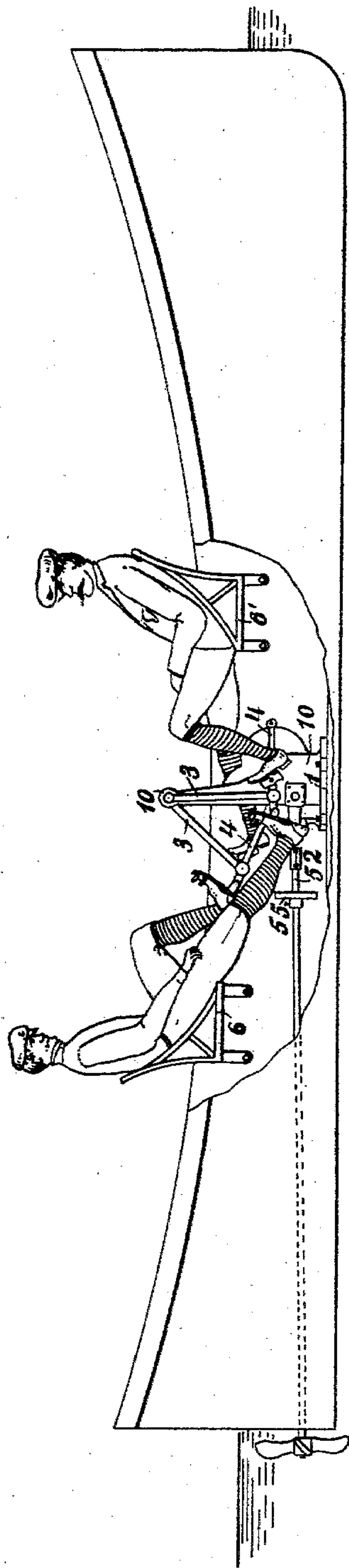


Fig. 5.

WITNESSES:

*C. W. Benjamin*  
*Arthur D. Thompson*

INVENTORS:

*Henry S. Durand*  
*Robert M. Beck*  
*Robert K. McLellan*  
By *Daniel A. Carpenter*,  
ATTORNEY.



# UNITED STATES PATENT OFFICE.

HENRY S. DURAND, OF ROCHESTER, AND ROBERT M. BECK AND ROBERT K. McLELLAN, OF NEW YORK, N. Y., ASSIGNORS TO THE PHILLIPS MANUFACTURING COMPANY, OF NEW YORK, N. Y.

## MECHANICAL MOTOR.

SPECIFICATION forming part of Letters Patent No. 629,343, dated July 25, 1899.

Application filed January 3, 1898. Serial No. 665,341. (No model.)

*To all whom it may concern:*

Be it known that we, HENRY S. DURAND, of Rochester, in the county of Monroe, and ROBERT M. BECK and ROBERT K. McLELLAN, of New York city, in the county of New York, State of New York, citizens of the United States, 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 motors which are actuated by foot-power and which are adapted to impart to the shaft of a screw-propeller of a small boat the proper motion to enable the boat to be driven by means of such a motor, in connection with the propeller and its shaft, by a person sitting in the boat; and the invention consists of a mechanical motor constructed and adapted to be operated substantially as is shown by the accompanying drawings and as is hereinafter described and claimed.

On the accompanying sheets of drawings, Figure 1 is a side elevation of the motor; Fig. 2, a rear elevation, being a view in the direction indicated by the arrow near the right of Fig. 1; Fig. 3, a side elevation of the motor with supplementary means adapting it to be operated by two persons sitting before it as well as by the person naturally sitting behind it; Fig. 4, a detail of particular parts which appear in Fig. 3; and Fig. 5, a view of the motor as it appears when in use in a boat, a portion of the boat being broken away to expose the motor and the feet and legs of the persons operating it.

Similar reference-numerals designate like parts in different views.

The object of this invention is to produce a motor which may be operated by a person sitting on a seat like an ordinary chair, the motor being stationed in front of him and being driven by the legs acting as toggles, their force being exerted against the back of the seat and against pedals which move alternately forward and backward from and toward the seat-back in courses which are fol-

lowed naturally by the feet as the legs are straightened and bent.

The frame of the motor is composed of a base 1 and uprights 10, the base being provided with ears 1', through which bolts or screws may be passed. The tops of the uprights are connected together by a cross-bar 11, and on each upright is a projection 12, in which is a recess 12'. In the lower and forward part of the frame is a shaft 2, which projects from the sides of the frame and on which are crank-arms 20, extending in opposite directions from the shaft. Each crank-arm is connected to a beam 3 by a link 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 one-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 less 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 backward during each revolution imparted to the shaft 2 along arcs whose rear extremities are nearer to a horizontal plane containing their forward extremities than to a vertical plane also containing their forward extremities.

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 upper ends of the bars 3' are contained in the recesses 12' in the projections 12. 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 foot rests or pedals 30' and 31' are attached to these projections. A cord or strap 32, provided at its rear end with a handle, is sometimes attached, as shown, to each of the pins on which the foot-rests 30' are mounted, and such cords or straps might be attached to pins projecting from the pedals 31'. 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 gear-wheel 21, which is tight on the shaft. Below and behind this shaft is another shaft 5. The latter shaft is parallel to the shaft 2 and has its bearings in blocks 13, which are bolted to the uprights 10. It carries a pinion 50 and a bevel-gear 51, having a common hub, by which they are keyed to the shaft. The gear 21 engages the pinion 50. A shaft 52—for example, a propeller-shaft having one of its bearings in the block or bracket 53, fixed on the base 1—carries a small bevel-pinion 54, with which the bevel-gear 51 engages. The bolt-holes in the bearing-blocks 13 are slots, and on these blocks are arms 14, which extend to the block 53 and are attached thereto by screws passing through slots in the arms. The slots mentioned facilitate the adjustment of the gears 50 and 51 to bring them into proper relations with the gears 21 and 54.

Balance-wheels 55 and 56 are secured on the shafts 52 and 5, respectively, and on a shaft journaled in the uprights above and behind the shaft 2 another balance-wheel 57 is keyed, together with a pinion 58, which is engaged by the gear 21. The mechanism between the uprights is inclosed in a case, portions of which are shown in Figs. 1 and 2.

The direction of the forward motion of the cranks is indicated by the arrow near the left of Fig. 1. 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'. The effective resultants of the power applied by the legs to the pedals 30' are transmitted by the links 4 to the crank-arms 20, causing the shaft 2 and gear 21 to rotate and to impart motion to the shaft 52 through the gears 50, 51, and 54.

If it is desirable to provide for the operation of the motor by several persons all facing in the same direction, so that, for example, a boat may be propelled by a crew operating the motor, that is done by the addition to the machine described of the means illustrated in connection with it in Fig. 3. In front of the motor and at suitable distances from it and from each other are stationed standards 10', whose height is the same as that of the frame of the motor. Beams 3'', similar to the beams 3, are pivoted to each of these standards, there being such a beam on each side

of every standard, and each of the beams 3'' is reinforced by a bar 3''', similar to the bars 3', the beams and bars being connected together at their ends by the bearing-pins, as are the beams and bars 3 and 3'. The beams 3'' are a little farther apart than are the beams 3 of the motor, each of the beams 3'' and its reinforcing-bar 3''' being so arranged that the outer face of the bar and that of the projection 31 on the corresponding beam of the motor are in the same vertical plane. Between the lower end of each of the beams 3'' and that of its reinforcing-bar 3''' is a block 40, mounted loosely on the bearing-pin, these blocks being provided with nipples 41. The beams on the forward standard are connected with those of the standard behind it and with those of the motor by rods 4'. These rods are composed of sections which are screwed into the nipples 41 of the blocks 40 and which are of proper lengths to keep the beams of each series, or those which are connected together by each rod, substantially parallel to one another. The rear sections of the rods 4' are provided with eyes by which they are pivoted on studs on the projections 31 of the beams 3, the studs being affixed to the projections 31 in place of the pedals 31'; but the bars 4' might be pivoted to the lower ends of the beams 3 proper instead of to the projections 31. The bearings at the ends of the beams 3'' and those at the ends of the rods 4' are ball-bearings. At the lower end of each of the beams 3'' is a pedal 30'', which is secured to the beam, as represented in Fig. 4, and behind the motor and behind each of the standards 10' a seat is fixed in the proper position to enable a person occupying it to exert power most effectively upon the pair of pedals next in front of him.

To provide for the operation of the motor by four or more persons, the supplementary means above described is extended by the addition of other similar means.

The rods 4' are made in sections to render it easy to lengthen or shorten them, as may be desired; but a single continuous bar might be substituted for each of these rods.

The motor is represented in Fig. 5 in its proper position in a boat. It is fastened to the bottom of the boat or a foundation close to the bottom or keel by screws or bolts passing through the ears 1' of the base. The seat 6 behind the motor is preferably so arranged that the seat proper is a little above the axis of each of the pedals 30' when the pedal is in its highest and most backward position and that the leg of the person operating the motor, he sitting on the seat with his back against the seat-back, shall be straight, or nearly so, when the pedal is in its most forward position. He sits then well down in the boat, about as near to the bottom as a person commonly sits in a small row-boat, so that his weight tends to keep the boat steady, and, besides, his seat and its arrangement with respect to the motor are such that he can exert the full strength of his legs, acting as



toggles, against the back of the seat and the pedals of the motor. The motion of each of the pedals 30' being forward and downward at the beginning of each stroke, it is particularly favorable to the leg, since the force then exerted on the pedal acts on a line drawn from the knee to the pedal, or in a direction which is nearly the same as that of the pedal's motion. When the motor is provided with the cords or straps 32, effective power may also be exerted by pulling on these with the arms during the backward movements of the pedals.

Another person may act on the pedals 31' from a seat 6', placed in front of the motor, as represented in Fig. 5. This seat is so arranged that the seat proper is about level with the axis of either pedal, and the leg of the person is straight, or nearly so, when the pedal is in its highest position.

The relation of each of the seats 6'' to the pair of pedals next in front of it is the same as that of the seat 6 to the pedals 30'. The force exerted on the pedals 30'' is transmitted by the rods 4' to the beams 3, and thus acts upon the cranks in conjunction with that applied to them by the person sitting behind the motor.

Each of the seats should be adjustable forward and backward and vertically to render it easy to change its position, if necessary, to that which would best suit the person who is to occupy the seat.

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

1. A mechanical motor comprising the combination of: a shaft 2; shaft-driving mechanism composed of a pair of cranks, a pair of beams, and a pair of links; and a pair of pedals on the shaft-driving mechanism; the cranks being fixed on the shaft, the beams being equal in length and being mounted on an axis parallel to and above and behind the shaft and at an elevation above the axis of the shaft greater than the distance of their axis behind that of the shaft, the links being equal in length and each being pivoted at its front end to one of the cranks and at its rear end to one of the beams, each of the pedals being connected with one of the beams at the lower end of the beam, and the relations between the cranks, beams and links rendering the motion of the pedals a reciprocating motion forward and downward toward and backward and upward from the shaft, substantially as described.

2. A mechanical motor comprising the combination of: a shaft 2; shaft-driving mechanism composed of a pair of beams and means of imparting motion from the beams to the shaft; and a pair of pedals; the beams being equal in length and being mounted on an axis parallel to and above the shaft and at an elevation above the axis of the shaft greater than the distance of their axis from a verti-

cal plane containing the axis of the shaft, each of the pedals being connected with one of the beams at the lower end of the beam, and the relations between the beams and other parts of the shaft-driving mechanism rendering the motion of the pedals a reciprocating motion forward and downward toward and backward and upward from the shaft, substantially as described.

3. A mechanical motor comprising the combination of: a shaft 2; shaft-driving mechanism extending behind the shaft; and a pair of pedals; the pedals being connected behind the shaft with the shaft-driving mechanism and having a reciprocating motion forward and downward toward and backward and upward from the shaft, their forward and backward motion being greater than their downward and upward motion, substantially as described.

4. A mechanical motor comprising the combination of: a shaft 2; shaft-driving mechanism comprising a pair of cranks fixed on the shaft and extending in opposite directions therefrom; a pair of pedals, each pedal being connected with one of the cranks and having a reciprocating motion forward and downward toward and backward and upward from the shaft, its forward and backward motion being greater than its downward and upward motion; and cords or straps 32 connected with the cranks and provided with handles; substantially as described.

5. A mechanical motor comprising the combination of: a shaft 2; shaft-driving mechanism composed of a pair of cranks 20, a pair of beams 3, and a pair of links 4; and a pair of pedals; the motor having its frame composed of a base and the uprights 10, the shaft being journaled in the lower and forward part of the frame, the cranks being fixed on the shaft and extending in opposite directions from the same, the beams 3 being pivoted to the frame at the tops of the uprights 10 above and behind the shaft, each of the links 4 being pivoted at its front end to one of the cranks and at its rear end to one of the beams, the pedals being connected with the beams at the lower ends of the beams, and the relations between the cranks, beams and links rendering the motion of the pedals a reciprocating motion forward and downward toward and backward and upward from the shaft, substantially as described.

6. A mechanical motor combined with supplemental operating mechanism, the combination comprising: a motor having shaft-driving mechanism composed of a pair of beams 3 and means of imparting motion from the beams to the shaft, the beams being pivoted at their upper ends to the frame and their lower ends having a reciprocating motion forward and downward toward and backward and upward from the shaft; a pair or pairs of beams 3'' pivoted to a standard or standards in front of the motor; rods or bars con-



necting the pairs of beams 3 and 3'' together; and pedals at the lower ends of the beams 3''; substantially as described.

7. A mechanical motor comprising the combination of: a shaft 2 journaled in the sides of a frame; a gear 21 on the shaft; a shaft 5, pinion 50 and bevel-gear 51 below and behind the shaft 2; a shaft 52, and bevel-pinion 54 engaged by the bevel-gear 51; a balance-wheel or balance-wheels in operative connection with the shaft 2; shaft-driving mechanism connected with the shaft 2; and pedals connected with the shaft-driving mechanism, and having a reciprocating motion forward and downward toward and backward and up-

ward from the shaft, their forward and backward motion being greater than their downward and upward motion; substantially as and for the purpose described.

HENRY S. DURAND.  
ROBERT M. BECK.  
ROBERT K. McLELLAN.

Witnesses as to signature of H. S. Durand:

JOHN E. DURAND,  
ROBERT K. McLELLAN.

Witnesses as to signatures of R. M. Beck and R. K. McLellan:

CHAS. COLEMAN MILLER,  
WM. J. HANDOVER.