(No Model.) 2 Sheets—Sheet 1.

H. C. HICKS.

SELF PROPELLING MOTOR.

No. 405,553. Patented June 18, 1889.

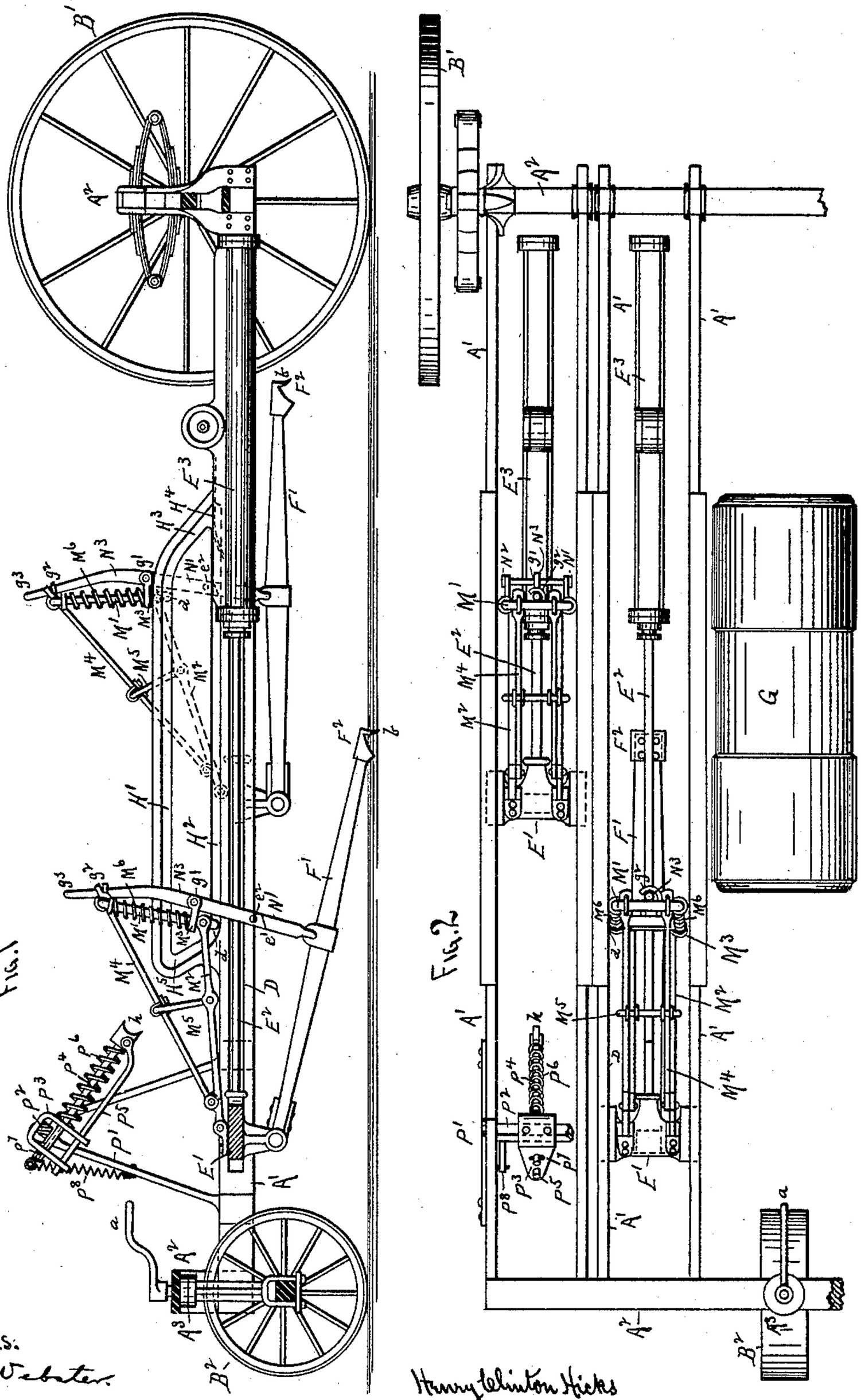

Fig. 1.

Fig. 2.

WITNESSES:
H. S. Webster.
D. Bell

Henry Clinton Hicks
INVENTOR By
Charles N. Woodward Atty.

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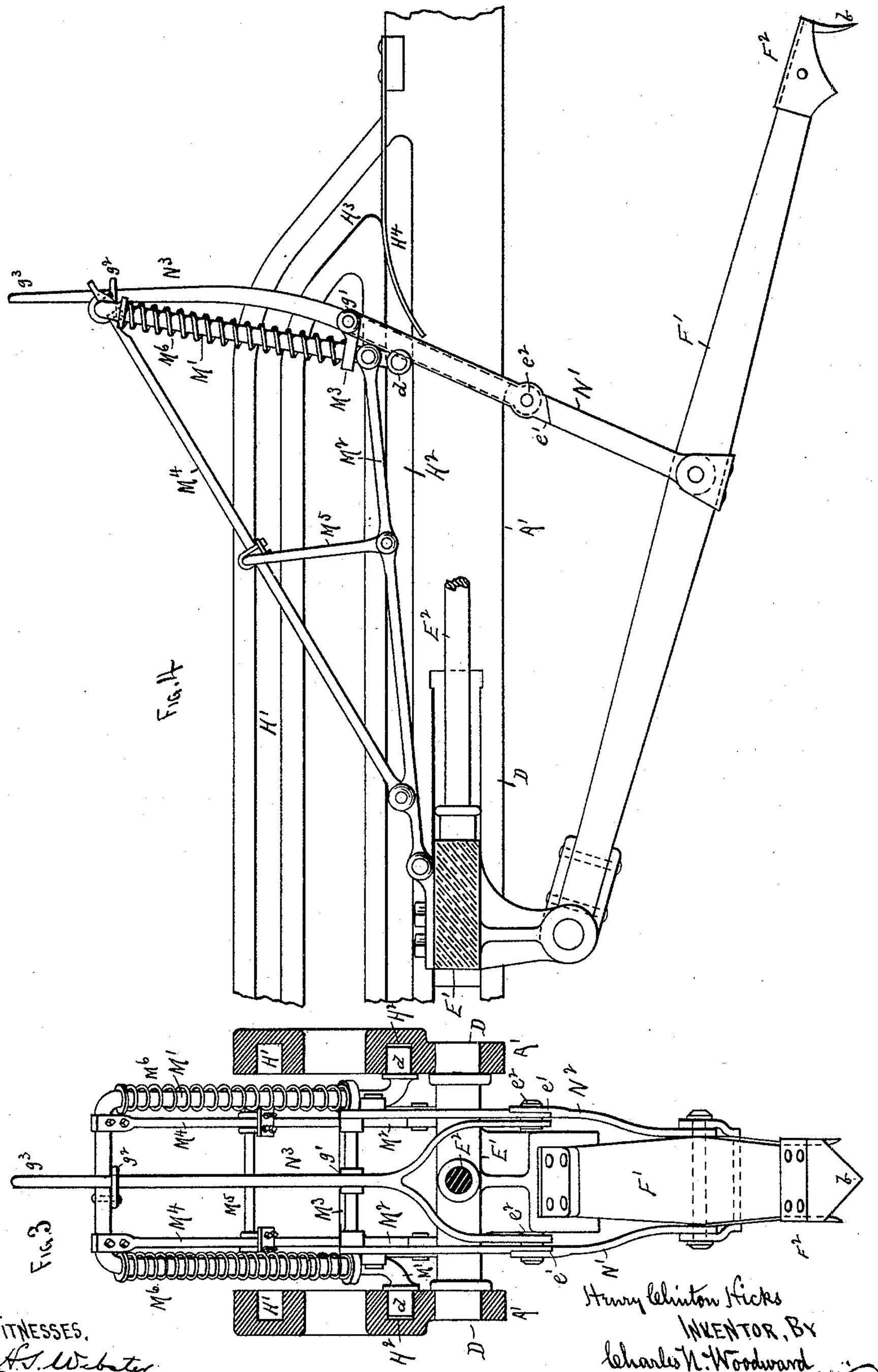

WITNESSES.
H. J. Webster
D Bell

Henry Clinton Hicks
INVENTOR, BY
Charles N. Woodward
Atty.

UNITED STATES PATENT OFFICE.

HENRY CLINTON HICKS, OF MINNEAPOLIS, MINNESOTA.

SELF-PROPELLING MOTOR.

SPECIFICATION forming part of Letters Patent No. 405,553, dated June 18, 1889.

Application filed March 8, 1889. Serial No. 302,410. (No model.)

To all whom it may concern:

Be it known that I, HENRY CLINTON HICKS, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Self-Propelling Motors, of which the following is a specification.

This invention relates to self-propelling vehicles or motors; and it consists in the construction, combination, and arrangement of parts, as hereinafter shown and described, and specifically pointed out in the claims.

In the drawings, Figure 1 is a sectional side elevation on the line *x x* of Fig. 2, and Fig. 2 is a plan view of the apparatus complete. Fig. 3 is an enlarged cross-sectional view, and Fig. 4 is an enlarged semi-sectional side view of the pusher-bar operating mechanism.

The frame of the machine consists of a series of two or more parallel plates or bars A′, connected by frames A^2 or other suitable means, and mounted on wheels B′ B^2. The bars A′ are provided with guides D, in which the ends of cross-heads E′ are adapted to work. Piston-rods E^2 are connected by one end to the cross-heads, and also by their other ends to piston-heads in cylinders E^3, the latter attached to the frames A′, as shown. As many of the cylinders, with their piston-rods and cross-heads, may be employed as required, although four of each set will generally be the minimum.

Pivoted to each of the cross-heads E′ is a "pusher-arm" F′, adapted to extend backward and downward, and with the free end of each arm provided with a pointed or other shaped "shoe" F^2, by which the free ends of the pusher-arms will grip the ground when drawn back by the piston-rods and force the vehicle forward upon its wheels or other supports.

The forward wheel B^2 is mounted upon a swivel-frame A^3, connected to the forward cross-frame A^2 or some other part of the main frame, so that the machine may be guided in any desired direction by turning a hand-lever *a*.

The swivel-frame A^3 may be constructed to be revolved in any suitable manner, either by a hand-lever *a*, as shown, or by being connected to some part of the mechanism for operating the push-bars; but for the purpose of illustration I have shown a simple hand-lever connected to the swivel-frame for operating the steering-wheels.

The shoes F^2 will be formed with their points *b* trending backward, so that when pushed against the ground they will engage therewith and not slip, the backward trend of the teeth also enabling them to drag easily forward over the ground at the return-stroke of the piston.

I have not attempted to show the valve mechanism connected with the cylinders E^3 or other parts, as they form no necessary part of the present invention, and their construction is so well known.

Any well-known form of valve construction and any form of generator may be employed in connection with the cylinders; but for the purpose of illustration I have shown in Fig. 2 a generator G, mounted upon the frame A′, which will be the means ordinarily employed to supply the cylinders with steam.

An apparatus constructed as thus far described would be a complete and operative machine; but in order to render its operation still more complete and perfect I arrange in each of the frames A′ a cam-groove H′ H^2, in which the ends of the arch-shaped frame M′ runs, the ends *d* of the frame M′, which run in the grooves H′ H^2, being usually provided with anti-friction rollers to reduce the friction.

Two or more rods M^2 are arranged to connect a cross-plate M^3, embracing the lower part of the arch-frame M′, with the cross-head E′, while similar rods M^4 connect the upper part of the arch-frame with the rods M^2 near the cross-head; or, if preferred, the rods M^4 may be connected directly to the cross-head in the same manner as the rods M^3. The rods M^2 and M^4 are still further connected by a bent rod M^5, which performs the double functions of a brace to the rods and also a stop, to be acted upon by a spring-trip to throw the frame M′ and its attachments positively downward into the grooves H′ H^2 at the ends of the return-stroke, the action of this trip to be hereinafter described.

Pivotally connected by their upper and lower ends to the central part of the push-levers F′ and the cross-plate M^3 on the arch-

frame M′ are two jointed rods N′ N², the joint in the rods having back-stops *e′*, so that they will operate only in one direction, as shown.

Pivoted at *g′* to the frame M′ in line with the upper pivots of the jointed bars N′ N² is a rod or lever N³, the part below the pivot *g′* being forked or branched, each branch being pivoted to the pivots *e²* of the joints in the rods, while the part above the pivot *g′* is carried upward alongside the arched frame M′ and supported thereon by a hooked catch *g²*. The object of forming the lever N³ in a bifurcated or forked shape is threefold: To secure a stronger form of lever, to enable it to be connected to both of the bars N′ N² with only one portion to operate at *g³*, and, lastly, to enable the bars N′ N² and lever N³ to pass beyond the stuffing-box ends of the cylinders E³ for a short distance at the backward stroke, so that the machine may be made shorter than if the entire mechanism were at all times between the cylinders and the front of the machine. By this means so long as the lever N³ is held by the hooked catch *g²* the jointed bars N′ N² will be held rigidly, as in Fig. 1, and cause the push-bars F′ to rise and fall with the arched frame M′; but when it is desired to elevate the push-bars at any part of the stroke between the ends of the cam-groove, it can be easily done by releasing the lever N³ from the catch *g²* and drawing it away from the arch-frame, which will cause the bars N′ N² to bend at the joints *e′ e²*, and thus elevate the push-bars.

Springs M⁶ are arranged upon the sides of the arch-frame M′, between the cross-plate M³ and the upper part of the arch-frame, to receive the upward strains upon the push-bars, and serve as cushions thereto, so that the strains to which the push-bars are subjected will be first imparted to the springs and thence gradually imparted to the frame of the machine. Another advantage gained by the use of the springs M⁶ is that any side movement of the push-arms will also cause the springs to be compressed, and thus relieve the frame and other part from undue side strains.

The rear end H³ of the lower channel H² of the cam-grooves will be provided with spring-switches H⁴, adapted to permit the rollers on the ends *d* of the arch-frame M′ to freely pass when the push-arms are moved backward, and will cause the ends to run up into the upper section H′ of the cam-groove when the push-arms are drawn backward, and thus, through the connecting-rods, raise the free ends of the push-arms from the ground and carry them backward in an elevated position until the ends *d* drop down into the lower section of the cam-groove, as before. Thus the backward movement of the cross-heads will cause the push-arms to be compressed upon the ground and push the vehicle forward, while at the return movement of the cross-heads the free end of the push-arms will be elevated and carried in that position to the starting-point. Thus the shoes will not be permitted to "drag" upon the ground at the return-stroke of the push-arms. The push-arms will be arranged to be operated alternately, one or more of the arms being in operation all the time, so that the motion of the vehicle will be continuous and uninterrupted.

The pointed shoes F² may be arranged to be displaced or covered by broad-surfaced flat plates when the machine is to be operated on soft or wet soil. This form of construction may also be employed to advantage in propelling vessels, either in canals or shallow streams, where the free ends of the push-arms can run in contact with the ground, or in deeper water by attaching paddles to the ends of the push-arms, the frames A′ being in that case mounted upon or forming part of the boat.

Journaled in standards P′ across the forward end of each pair of the frames A′ is a shaft or bar P², each carrying a small hanger-frame P³, through which a rod P⁴ is journaled, and held thereby at an angle to the line of movement of the cross-head E′ and horizontal portions of the grooves H′ H². The lower or inner ends of these rods P⁴ are enlarged and formed with concave surfaces *h*, and each rod will be provided with a brace-rod P⁵, pivoted at one end to the lower end of the rod P⁴ and passing loosely through the lower part of the hanger P³, as shown. Each of the rods P⁴ is surrounded by a spring P⁶, which keeps the rods P⁴ and P⁵ pressed downward and backward, the rod P⁴ being provided with a stop P⁷ on its upper end to keep it from being forced out of the hanger P³.

P⁸ is a spring connected to the shaft P², to hold the latter in the position shown and return it to that position when released. The function of the rod P⁴ is to throw the ends *d* of the arch-frame M′ downward into the groove H⁵ at the end of the return-stroke and insure a certainty of action. When the cross-head E′ is making its return-stroke with the ends *d* of the arch-frame M′ in the upper portion H′ of the cam-grooves, the cross-brace M⁵ will strike the concave end *h* of the rod P⁴ and compress the springs P⁶, this action causing the rods P⁴ P⁵ to oscillate the shaft P² by reason of the concave end *h* of the rod P⁴ being below its center, and thereby causing the springs to exert a downward pressure upon the arch-frame and cause it to move downward with certainty into the lower portion of the grooves H². When the next stroke of the cross-head begins, the cross-brace M⁵ will be released from the rod P⁴ and permit the spring P⁶ to return it to its normal position ready for the next stroke.

A great advantage arises from arranging the cylinders, cross-heads, and push-arms so that the piston-rods are pulling the cross-heads and push-bars toward the cylinders when they are subjected to the greatest strains, as a much smaller piston-rod can

thereby be employed and no danger exists of "buckling" the piston-rod, as there would be if the relative positions were reversed.

A great advantage also arises from arranging the push-rods so that each has its own independent cylinders and cross-head, as a more direct action is thereby secured and less liability of disarrangement by unequal strains between the parts.

Having thus described my invention, what I claim as new is—

1. In a self-propelling motor, a frame mounted upon bearing-wheels or other supports and provided with guides D, one or more cylinders E^3, borne by said frame and having piston-rods connected to cross-heads with their ends running in said guides, push-arms F′, pivoted by one end in said cross-heads and free to run upon the ground by their other ends, substantially as and for the purpose set forth.

2. In a self-propelling motor, a frame mounted upon bearing-wheels or other supports and supporting one or more cylinders E^3, having piston-rods and cross-heads, the latter working in guides D in said frame, push-arm F′, journaled by one end in said cross-heads, cam-groove H′ H^2, having spring-switch H^4, formed in said frame, arch-frame M′, with its ends running in said cam-grooves and connected by rods N′ N^2 to said push-arm and by braces M^2 M^4 to said cross-head, substantially as and for the purpose set forth.

3. In a self-propelling motor, a frame mounted upon bearing-wheels or other supports and supporting one or more cylinders E^3, having piston-rods and cross-heads, the latter working in guides D in said frame, push-arm F′, journaled by one end in said cross-heads, cam-groove H′ H^2, having spring-switch H^4, formed in said frame, arch-frame M′, with its ends running in said cam-groove, cross-plate M^3, embracing the sides of said arch-frame and actuated by spring M^6, rods N′ N^2, connecting said cross-plates to said push-arm, and braces M^2 M^4, connecting said arch-frame to said cross-heads, substantially as and for the purpose set forth.

4. In a self-propelling motor, a frame mounted upon bearing-wheels or other supports and supporting one or more cylinders E^3, having piston-rods and cross-heads, the latter working in guides D in said frame, push-arm F′, journaled by one end in said cross-heads, cam-grooves H′ H^2, having spring-switch H^4 formed in said frame, arch-frame M′, with its ends running in said cam-grooves, cross-plate M^3, embracing the sides of said arch-frame and actuated by springs M^6, rods N′ N^2, jointed at e^2 and connecting said cross-plate and push-arm, and a lever N^3, pivoted to said cross-plate and said rods, and adapted to be connected to and disconnected from said arch-frame, whereby said push-arm may be elevated and depressed, substantially as and for the purpose set forth.

5. In a self-propelling motor, a frame mounted upon bearing-wheels or other supports and supporting one or more cylinders E^3, having piston-rods and cross-heads, the latter working in guides D in said frame, push-arm F′, journaled by one end in said cross-heads, cam-groove H′ H^2, having spring-switch H^4 formed in said frame, arch-frame M′, with its ends running in said cam-groove and connected by rods N′ N^2 to said push-arm and by braces M^2 M^4 to said cross-head, spring trip-rod P^4, pivoted to said frame above and in advance of the line of said cam-grooves, and a stop-rod M^5, connected to said arch-frame and adapted to strike said trip-rod at the end of the return-stroke of the piston, whereby the arch-frame and push-rod are forced downward, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HENRY CLINTON HICKS.

Witnesses:

C. M. WOODWARD,

H. S. WEBSTER.