

No. 631,531.

Patented Aug. 22, 1899.

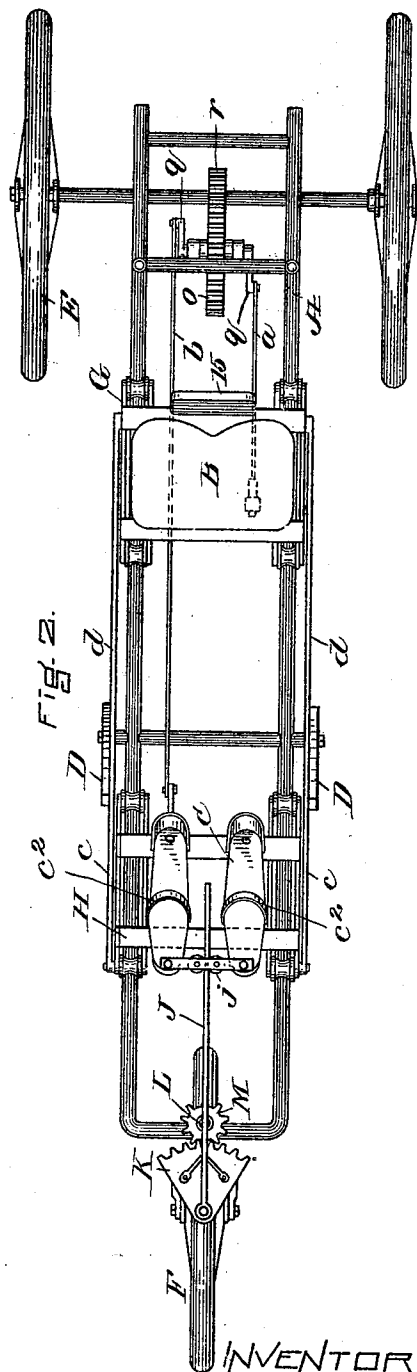
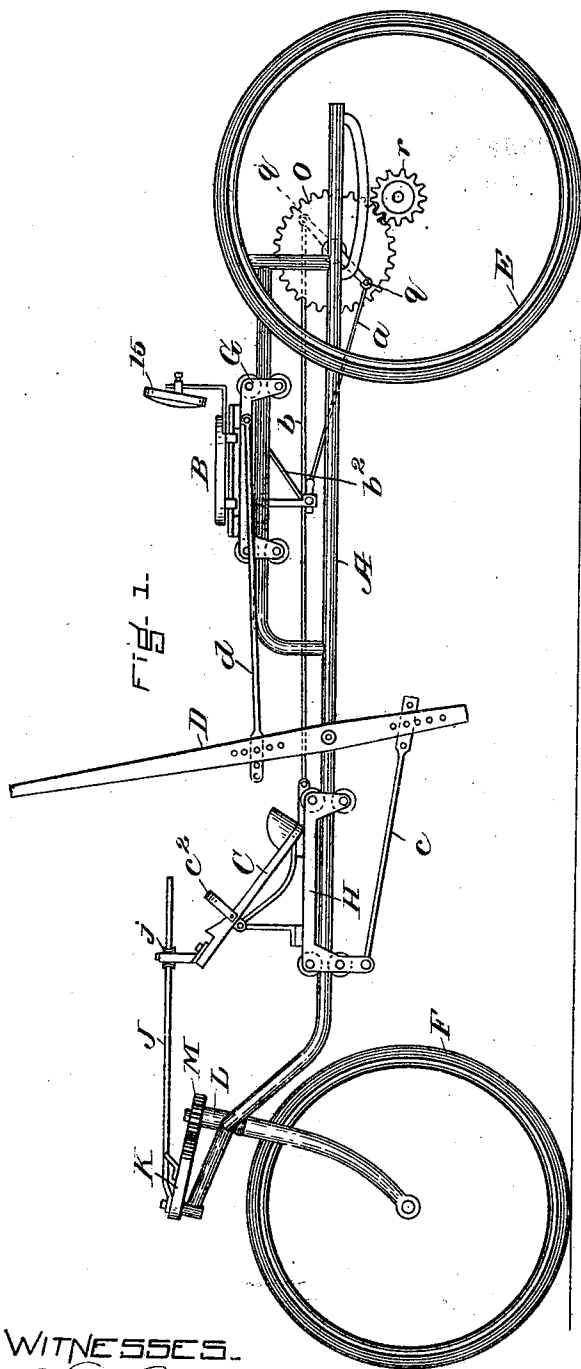
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MECHANISM FOR APPLYING MUSCULAR STRENGTH OF THE HUMAN BODY.

(Application filed Jan. 20, 1898.)

(No Model.)

3 Sheets—Sheet 1.



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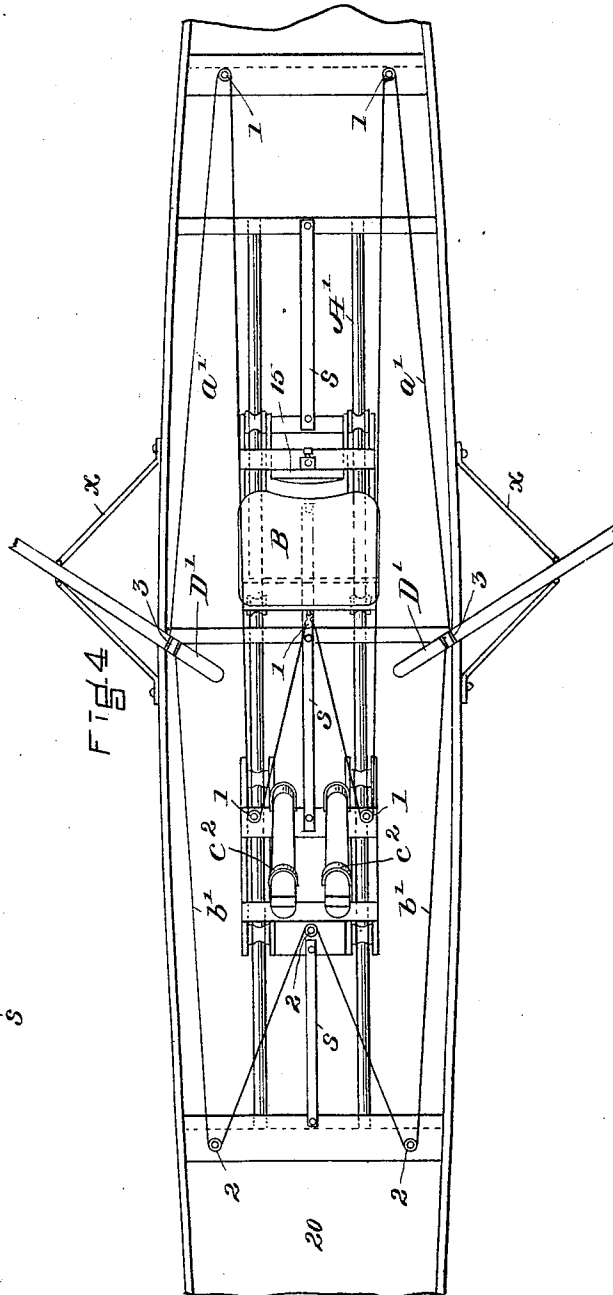
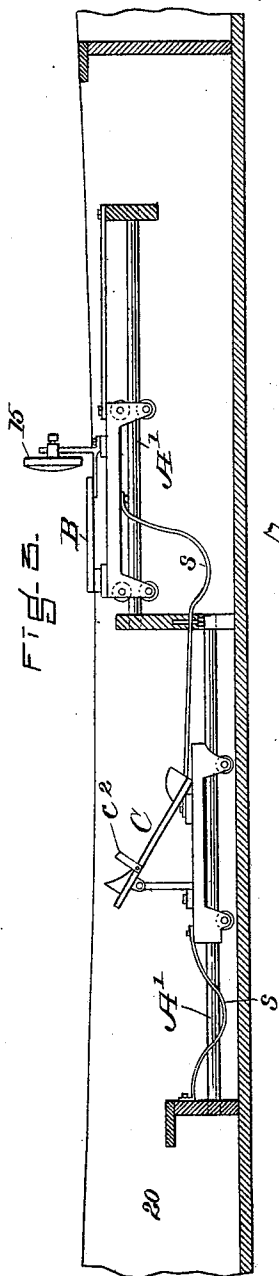
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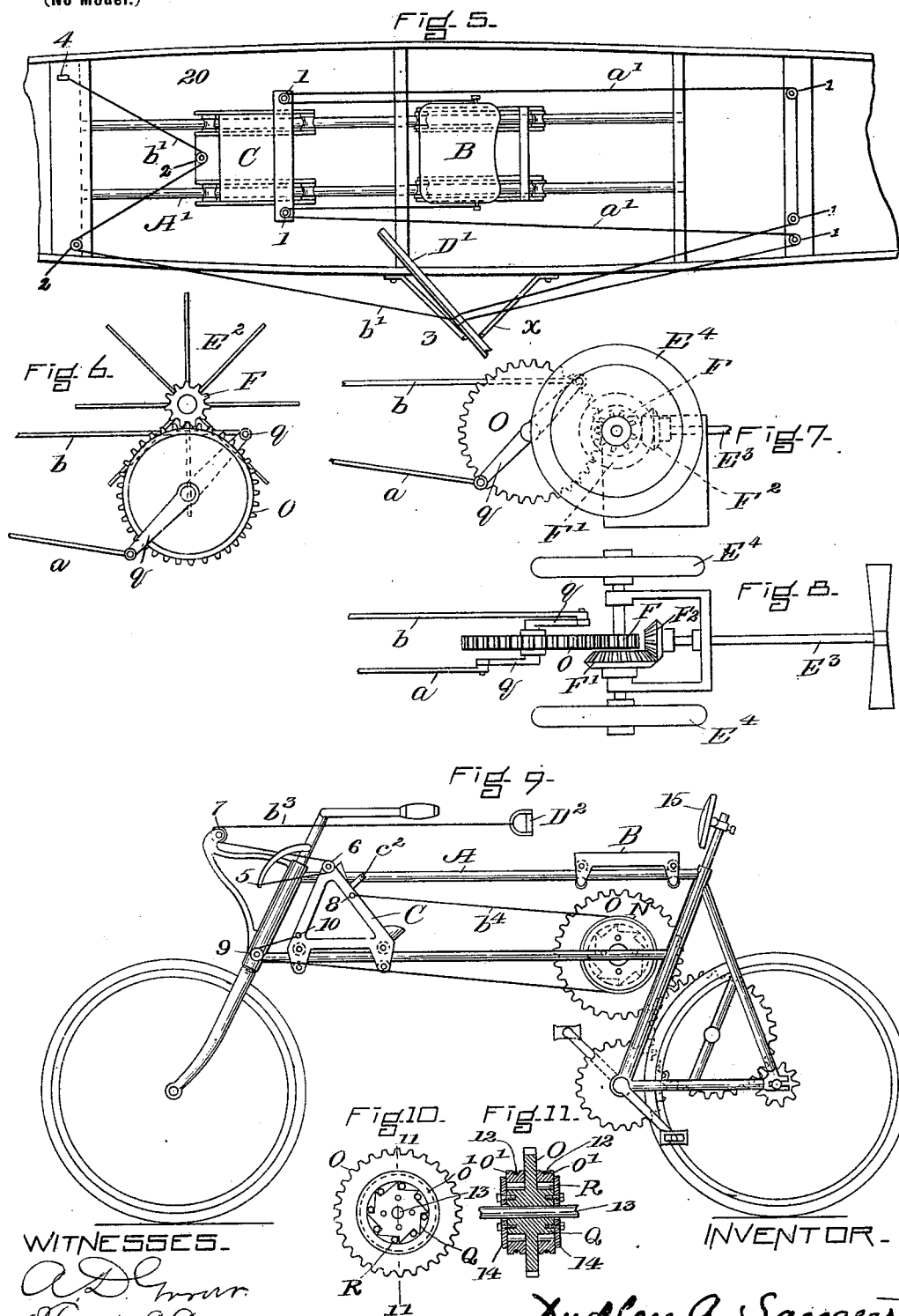
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UNITED STATES PATENT OFFICE.

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MECHANISM FOR APPLYING MUSCULAR STRENGTH OF THE HUMAN BODY.

SPECIFICATION forming part of Letters Patent No. 631,531, dated August 22, 1899.

Application filed January 20, 1898. Serial No. 667,290. (No model.)

To all whom it may concern:

Be it known that I, DUDLEY A. SARGENT, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful improvements in mechanism for applying the muscular strength of the human body as a motive power to the operation of stationary exercising-machines and to the propulsion of vehicles on land or water for exercise, pleasure, or other purpose, of which the following is a specification.

My invention relates to the use of the body for either exercise or propulsion; and it consists in the mechanism therefor.

I am aware that in some kinds of land-vehicles the power of both arms and legs has been simultaneously applied and that in rowing boats and shells the power of the arms has been obtained and supplemented by the feet being braced and in the case of sliding seats by the flexing of the legs, which permits of a more extended stroke; but my purpose is, primarily, to utilize the entire muscular strength by applying or communicating to various sorts of power-applying levers—such as the wheels of vehicles, balance-wheels, oars, sculls, paddles, paddle-wheels, propeller-shafts, &c.—the power of the trunk, arms, legs, and feet simultaneously by bringing all these parts of the body to bear upon the power-applying lever or levers at the same time. Even if no power be taken from one of these three parts of the body—i. e., trunk, arms, and legs and feet—yet the simultaneous application of the power of the remaining two according to my plan will cause the passive movement of the unemployed part, and so assist the returning circulation, and so will be, so far as I know, novel in the mechanism described by me therefor.

I attain my objects by aid of the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a tricycle-vehicle provided with said mechanism, and Fig. 2 is a plan of the same. Fig. 3 is a sectional elevation of a single-scutt boat provided with said mechanism, and Fig. 4 is a plan of the same. Fig. 5 is a plan view of a boat, showing the application of power to one oar. Figs. 6, 7, and 8 are details to be re-

ferred to later on. Fig. 9 is an elevation of a bicycle provided with said mechanism. Fig. 10 is a detail of the clutch mechanism. Fig. 55 11 is a section on line 11 11 of Fig. 10.

The framework and the supported mechanism will vary according to the variety of vehicle or stationary structure proposed.

In Figs. 1 and 2, A is a supporting frame- 60 work or truss. Traveling structure B is a seat having the seat-truck G, shown as double, to hold it upon the track, and the adjustable seat-back 15. Traveling structure C is a foot-rest having the truck H, like that of 65 the seat-truck, and strap c^2 ; D D, hand-levers; E, the running-wheel or power-applying lever; F, the steering-wheel; J, the steering-rod, having a segment K; L, the steering-head, having the pinion M. The traveling 70 structures composed of a seat and truck and of a foot-rest and truck are shown mounted upon rollers on the track on the framework. Of course the track might be double and single rollers used. The back 15 is strong enough 75 to brace against, so as to apply the power of the trunk to the seat. The hand-levers D D are loosely pivoted to the framework. To the hand-levers are loosely pivoted in a proper location the connecting-rods $c c$, running to the 80 traveling foot-rest, and the connecting-rods $d d$, running to the traveling seat. The connecting-rod a runs from said seat to one crank q , and the connecting-rod b from said foot-rest to the other crank q upon the gear O, 85 which meshes with the pinion r on the axle of the power-applying lever or wheel E, which is tight on the axle. A clutch or chain-and-sprocket mechanism could be used instead of the described gears O and r . Intermediate 90 between the feet the steering-rod J plays between rolls j . The segment K connects with the pinion M on the steering-head L, which is socketed in the forked standard carrying the forward and steering wheel F. The seat 95 should have a strengthening-brace b^2 , and the back 15, to brace against, is adjustable vertically and horizontally. The operation of this apparatus is as follows: The occupant grasps the hand-levers and, the feet being 100 confined upon the foot-rest by strap c^2 and the body braced against the seat-back 15 as he leans back, exerts the strength of the arms, legs, and body to carry the hand-levers with

him and push the foot-rest forward and the seat backward at the same time, thus straightening the body backward, flexing the arms, and straightening the legs. At the next movement the occupant straightens the arms, bends forward the body, and flexes the legs, whereby the hand-levers are pushed forward, the seat, which is hollowed, is drawn forward, and the foot-rest is drawn backward, the entire strength of the body being exerted upon the hand-levers, the seat, and the foot-rest. The connecting-rods $c c d d$ connect the hand-levers, seat, and foot-rest. As the connecting-rod b runs from the foot-rest to one crank q and the connecting-rod a from the seat to another crank q upon the gear O , which connects with the running or power-applying lever-wheel E , this forward-and-backward motion will apply the entire muscular force of the trunk, legs, and arms to the revolution of the lever-wheel and thereby propel the vehicle. Of course one of the traveling structures may be made immovable; but this will subtract so much from the power applied. The steering is accomplished by the rod J , whose segment K gears with a segment on the steering-rod L and plays between rollers j in such a position as to come normally between the feet of the occupant. The foot-rest C is so constructed and arranged as to be capable of a vibratory movement, so as to move the rod J by the feet, as desired. With a different vehicle the foot-rest may be divided, as shown later on.

In Figs. 3 and 4 my invention is applied to a single scull and in Fig. 5 is applied to one oar. The framework A' is placed on or part of the boat 20, having the outriggers $X X$. The oar-handles are $D' D'$, and the blades or power-applying levers E' . (Not shown.) To these handles at 3 are attached two cords— a' connecting the oars with the foot-rest and seat by playing around rollers 1, and b' connecting the oars with the foot-rest and playing around rollers 2. Straps S , (not shown;) Fig. 5, limit the distance which the seat and foot-rest can travel. The seat, seat-back, foot-rest, and rollers are so substantially like those of Figs. 1 and 2 as to require no further description. The operation employing the body, arms, and legs will be understood from the description of Figs. 1 and 2. Figs. 3 and 4 show the boat and oars in a position to make a stroke, the legs being flexed and the arms being straight and the body bent forward. The oarsman leans back as he makes his stroke, thus pushing the seat toward the bow and the foot-rest toward the stern. On the recovery as he leans forward the seat is pulled toward the stern and the foot-rest toward the bow, while the arms are straightened and the legs and body are flexed to enable repetition of the stroke. The application of the power of the frame, the foot-rest, and seat to the oars or lever-handles through the cords will be evident, and it will be seen that the power of the body and legs applied to and through

these traveling structures contributes to returning the oar to position, as well as to moving the blades or power-applying levers E' on making the stroke, and also that the movement of the foot-rest controlled by the cords is such as to avoid the tendency to drive the boat astern, which occurs when the ordinary stationary foot-rest is used. In Fig. 5 the boat 20 constitutes or supports the framework A' , having outrigger X , supporting the handle of the oar D' with its lever-blade E' . (Not shown.) Cord a' , attached at 3, connects the handle of the oar with the seat by running around rollers 1 on the framework and foot-rest and being fastened to the sides of the seat, and the cord b' , fastened to the oar-handle at 3, runs around rollers 2 on the framework and foot-rest and is fastened to the framework at 4. The seat and foot-rest are substantially as already described, and the operation will be understood without further description.

I show in details 6, 7, and 8 some additional and slightly-different adaptations of my invention to different power-applying levers. Thus in Fig. 6, E^2 , the power-applying lever, is a paddle-wheel having the pinion F , which meshes with the gear O , having the cranks q , to which run the connecting-rods $a b$, as described in describing Figs. 1 and 2. In Figs. 7 and 8 I show the same levers, cranks, and gear O , meshing with pinion F , and two beveled gears F' and F^2 , which turn the propeller-shaft E^3 as the power-applying lever and balance-wheels E^4 to carry the cranks by the dead-centers. In Figs. 7 and 8 the connecting-rods $a b$, cranks $q q$, and gear O may be applied simply to the turning of heavy balance-wheels E^4 , (the remaining parts F' , F^2 , and F^3 being omitted,) thus furnishing a stationary exercising-gymnasium apparatus which as a whole is substantially like the mechanism shown in Figs. 1 and 2 except that balance-wheels (or, if preferred, friction-wheels) replace power-applying lever-wheels. Figs. 7 and 8 both show the adaptation of the mechanism to a propeller and also to a stationary exercising-machine by omitting the parts F' , F^2 , and F^3 .

It will be seen that for a shell, paddle-wheel, or propeller boat the required steering apparatus may be substantially like that of Figs. 1 and 2 by simply adding a cross-bar and cords to run from it back to the rudder-bar.

The application of my invention to bicycles is shown in Fig. 9. The principle is the same. The mechanical differences arise only from a two-wheeled vehicle being used. The chief differences are in the connecting mechanism for applying the power of the handles and cords to the lever-wheel; but mechanically the general mechanism therefor is equally well known. The seat B' is shown as stationary (but may be movable, as hereinafter explained) upon the upper part of truss A and the foot-rest as traveling upon the upper and lower truss. The ordinary bicycle-pedals

enable the rider to mount and start the bicycle, as usual, the pedals being connected, as shown, by an intermediate gearing with the driving or lever wheel. The bicycle having been started, however, the rider can grasp the handles D^2 on cords b^3 , which are fastened at the arms 5 on the steering-bar socketed in the forward standard, play over a pulley 6 on the foot-rest and a pulley 7 on an arm from the forward standard, while cords b^4 , fastened at pins 8 on the foot-rest, run around and are fastened to the free pulleys $O' O'$ at 12, Fig. 11, and then run over pulleys 9 on the forward standard and are fastened at pins 10 on the foot-rest. The clutch N has the gear O and ratchet Q solid on shaft 13, the revolving disks or pulleys $O' O'$ free to move in one direction to turn the shaft and in the other without turning the shaft, and cylinder-rolls R. In operation, when the bicycle is propelled through the pulleys, the rider, drawing back upon the pulleys, pushes the foot-rest forward. As he bends forward the foot-rest is pulled backward and pulls the cords and handles forward, and thus the rider takes a position to repeat the stroke. The steering is accomplished by adjusting the pull upon the arms 5.

The foot-rest in Fig. 9 may be (although not so shown) constructed in two parts, and then the movements of the arms and legs may both alternate—that is, as the right leg goes forward the right arm is drawn back, and vice versa. In such case there must be two cords b upon two pulleys $O' O'$, Fig. 11. Figs. 10 and 11 show the bicycle-clutch and ratchet mechanism, by which when the rider bends forward and the foot-rest is drawn backward (or half the foot-rest is drawn backward, if it be constructed in two parts) the free pulley is allowed to revolve in the opposite direction without affecting the gear. The plate 14 is omitted in Fig. 10 to show the roller-clutch.

The seat B in Fig. 9 may, as above said, be made movable by attaching a cord (not shown) to seat B to run over a pulley on the head-bar and be attached to the foot-rest, or such cord may be fastened to the seat and foot-rest, as in the apparatus of Fig. 5. In such case the back 15 should be adjustable and part of the seat, in order to brace against it; but such arrangement will be readily understood from the seat and seat-back of Figs. 1 and 2.

It will now be seen that my invention enables accomplishing the proposed purposes by the means described and indicated, which are of course capable of modification. The apparatus as I have shown and described the same, with such equivalents or modifications as will be within the scope of mechanical skill, is fitted to carry out my purpose to enable the simultaneous application of the muscular power of the trunk, arms, and legs and feet, or of the trunk and arms, or of the trunk and

legs, or of the legs and arms, as I propose, either in stationary exercising-machines or in vehicles of various sorts for land and water navigation, including sculling, paddling, and also ice and snow navigation, to which my invention can be readily applied by adapting the power-applying-lever mechanism to the nature of the particular surface which is to be traveled or navigated.

Having described my invention, what I claim is—

1. In apparatus for applying the muscular force of the body to exercise or locomotion, operating hand-levers, power-applying lever or levers, a traveling foot-rest, and connections running therefrom to the operating hand-levers and to the power-applying lever or levers; substantially as described.

2. In apparatus for applying the muscular force of the body to exercise or locomotion, the combination of a framework adapted to receive the operator and to sustain the connected mechanism; a traveling seat provided with a back, running upon and normally undetachable from said framework; a traveling foot-rest provided with a foot-holding strap, running upon and normally undetachable from said framework; hand-levers fulcrumed upon said framework and adapted to be grasped by the hands of the operator; a power-applying lever or levers; and connections running from said traveling seat to the hand-levers and to the power-applying levers, and connections running from the foot-rest to the hand-levers and to the power-applying lever or levers; substantially as described and shown.

3. In apparatus for applying the muscular force of the body to exercise or locomotion, in combination with a supporting-framework, a seat traveling upon and normally undetachable from said framework; operating hand-levers fulcrumed upon said framework; a power-applying lever or levers; and connections running from said seat to said operating hand-levers and to said power-applying lever or levers; substantially as described and shown.

4. In apparatus for applying the muscular force of the body to exercise or locomotion, in combination with a supporting-framework and a seat thereon, a foot-rest traveling upon and normally undetachable from said framework; operating hand-levers fulcrumed upon said framework; a power-applying lever or levers; and connections running from said traveling foot-rest to said operating hand-levers and to said power-applying lever or levers; substantially as described and shown.

5. In an apparatus for applying the muscular force of the body to exercise or locomotion, the combination of the steering-wheel F; two running wheels, on one of which, the power-applying wheel E, is the pinion r ; the gear O and cranks $q q$; the framework A; the traveling foot-rest C, truck H, whose double roll-

- ers normally hold the same upon the track, and foot-retaining strap c^2 ; the traveling seat B, double rollers G, and adjustable back 15; the hand-levers D fulcrumed upon the framework A; the connecting-rods d loosely pivoted to said seat and to said hand-levers; the connecting-rod a loosely pivoted to said seat and to a crank q ; the connecting-rod b loosely pivoted to said traveling foot-rest and to a crank q ; connecting-rods c loosely pivoted to said foot-rest and to said hand-levers; the standard I carrying the wheel F; the pinion M and quadrant K gearing with said pinion; and the steering-bar J j adapted to be oscillated through the foot-rest C; all substantially as described.
6. In apparatus for applying the muscular force of the body to exercise or locomotion, in combination with the framework A, the traveling seat B, normally undetachable rollers G, and adjustable back 15; the traveling foot-rest C, normally undetachable rollers, and the foot-holding strap c^2 ; the hand-levers D fulcrumed upon the framework A; the power-applying lever-wheel E; the small gear r and the gear O, to which is attached the cranks q q ; the rod a running from said traveling seat to one of said cranks q ; the rods d running from said seat to the handle-lever D; the rod b running from said traveling foot-rest to one of said cranks q ; and the rods c running from said foot-rest to said handle-

levers D; all substantially as described and shown.

7. In apparatus for applying the muscular force of the body to exercise or locomotion, in combination with the framework A, the traveling seat B, normally undetachable rollers G, and adjustable back 15; the hand-levers D fulcrumed upon the framework A; the power-applying lever-wheel E; gear r ; gear O, and a crank q attached to gear O; a rod a running from said traveling seat to crank q ; and the rods d running from said seat to the operating hand-levers D; substantially as described and shown.

8. In apparatus for applying the muscular force of the body to exercise or locomotion, in combination with a framework and a seat, the traveling foot-rest C and rollers G therefor normally undetachable from the framework; the hand-levers D; the lever-wheel E, pinion r , gear O, and a crank q ; the rod b connecting said foot-rest with crank q ; and rods c c connecting said traveling foot-rest with said operating-levers D; substantially as described.

In witness whereof I hereunto subscribe my name, in presence of two witnesses, this 15th day of January, 1898.

DUDLEY A. SARGENT.

Witnesses:

L. C. SARGENT,
CHARLES H. HANSON.