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F. L. & L. H. DYER.

ELECTRIC STEERING GEAR.

No. 498,160. Patented May 23, 1893.

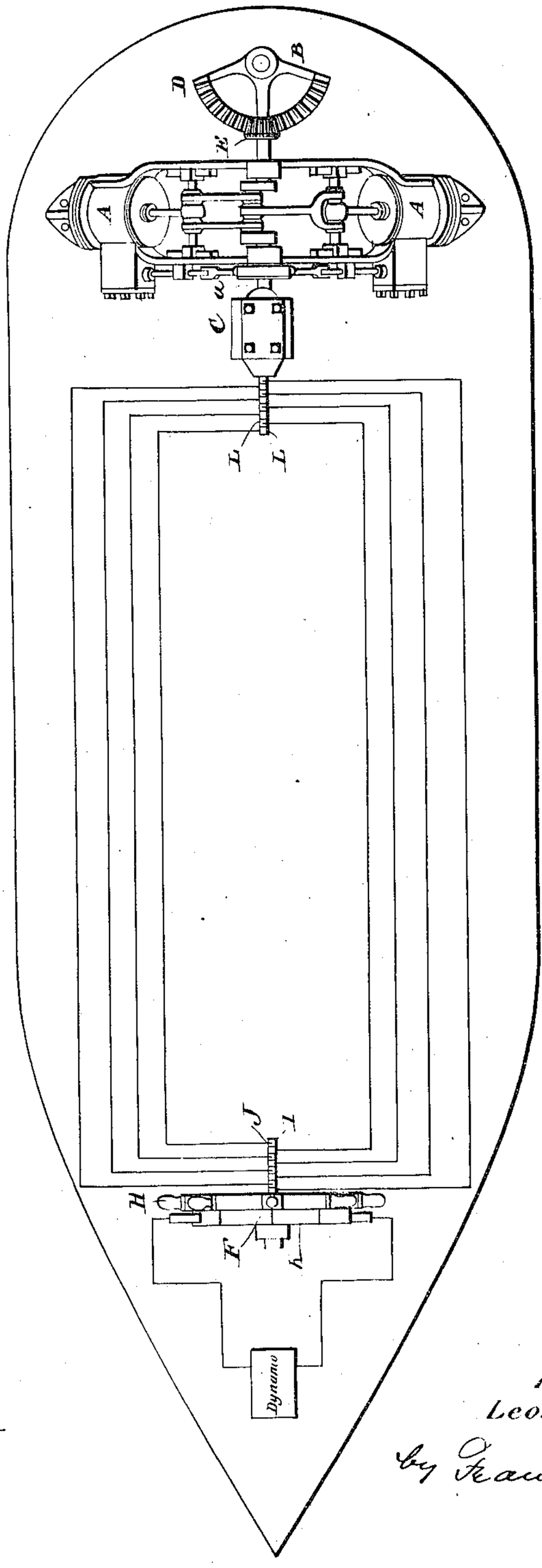

Fig. 1.

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Fig. 2

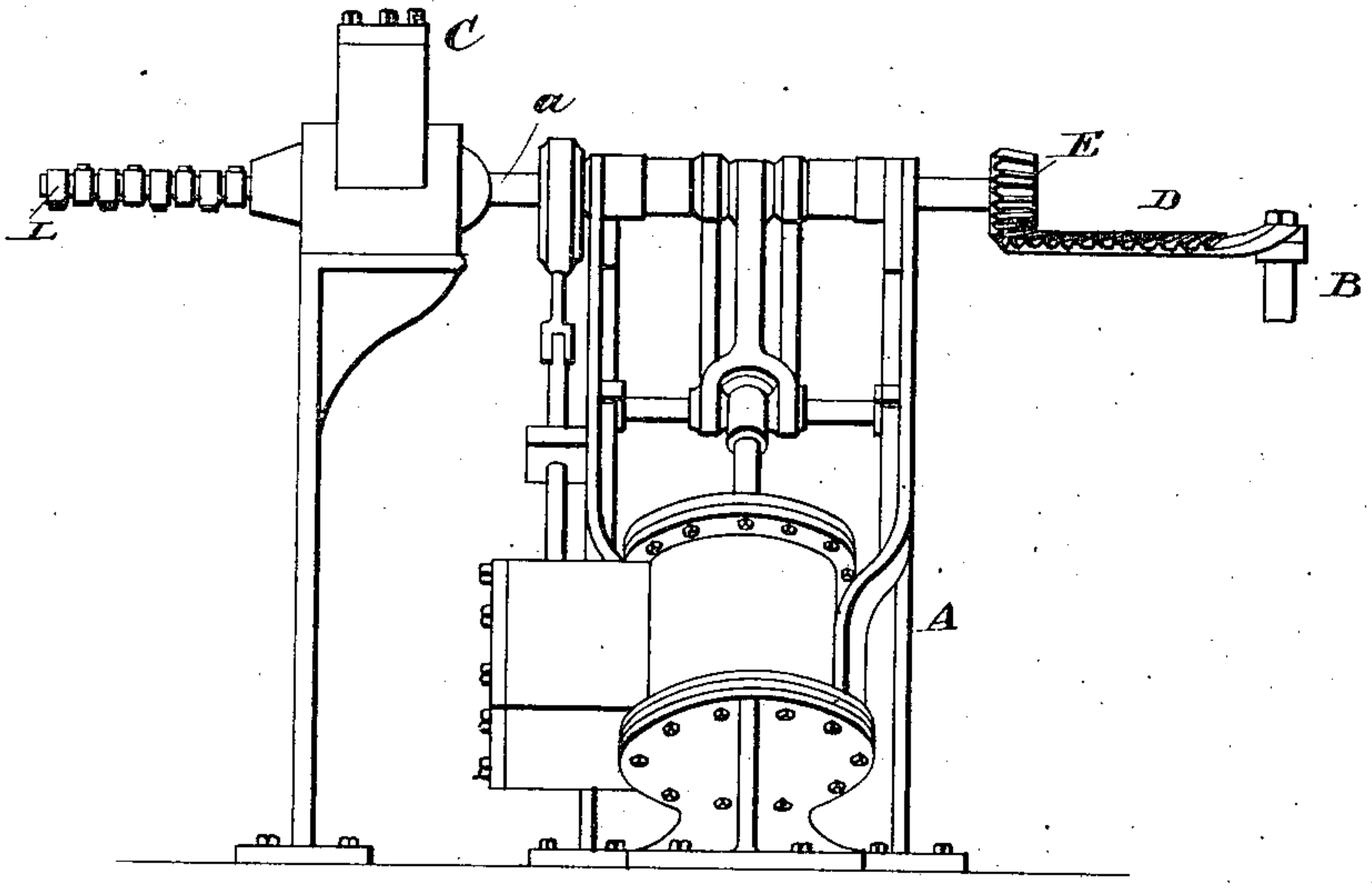

Fig. 3

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Fig. 4

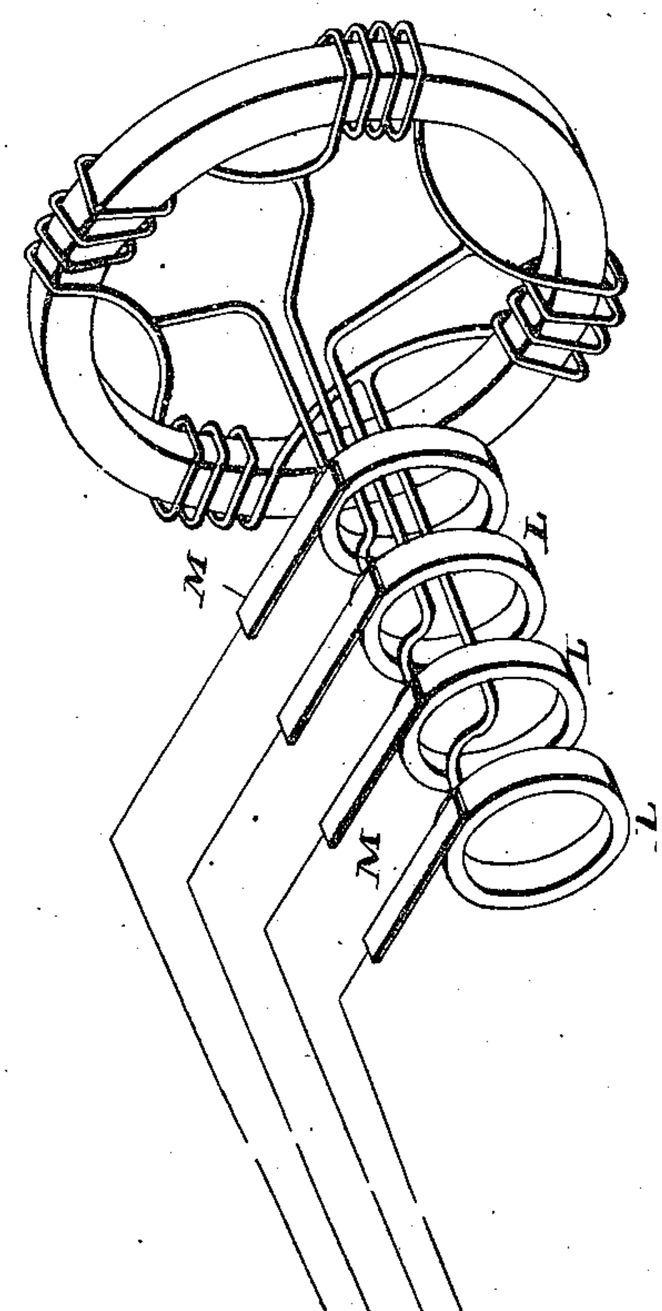
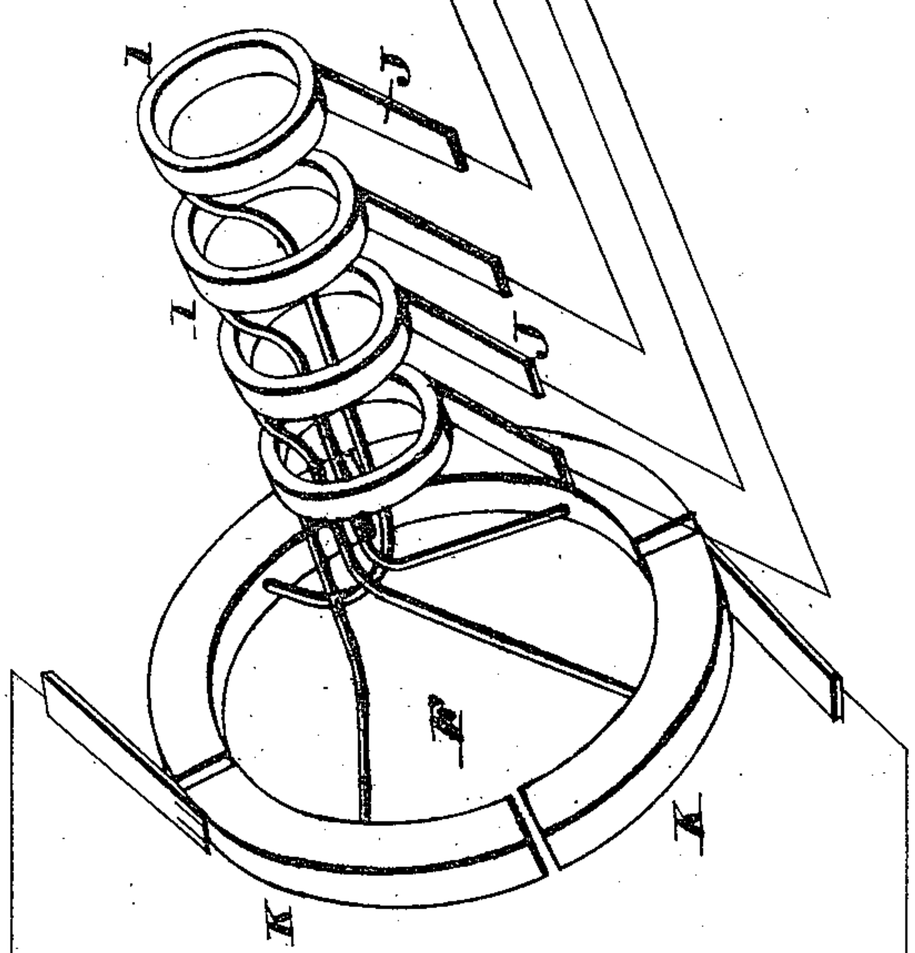


Fig. 5



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UNITED STATES PATENT OFFICE.

FRANK L. DYER AND LEONARD H. DYER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNORS OF ONE-THIRD TO ALEXANDER McDOUGALL, OF DULUTH, MINNESOTA.

ELECTRIC STEERING-GEAR.

SPECIFICATION forming part of Letters Patent No. 498,160, dated May 23, 1893.

Application filed April 18, 1891. Serial No. 389,521. (No model.)

To all whom it may concern:

Be it known that we, FRANK L. DYER and LEONARD H. DYER, citizens of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Electric Steering-Gear; and we do hereby declare the following to be a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to an improved form of electric steering gear for vessels, in which steam or other source of power and electricity are used to operate the rudder or steering device.

The objections attending the use of mechanical steering gears, heretofore, has been the liability of breakage of the connections between the steering wheel and the rudder. As a matter of fact, however, mechanical gears are being superseded by automatic steerers which possess the advantage that but small power is required to operate them, but they are still open to the objection that the connections between the steam engine and the rudder are liable to become broken under sudden and unusual strains. By means of our invention, all of these objections are overcome since there are no movable connections passing from the bow to the stern.

By our invention, we propose to produce a device for steering vessels, that will be of little weight and that will be compact, and at the same time, inexpensive to construct, and easy and positive in its action.

Our invention will be easily attached to any kind or type of vessel, without injury to the same, the only requisite being that the vessel should be provided with a plant in which electricity and steam or other power can be generated.

The invention consists generally in placing a prime motor, such as a steam, hydraulic, pneumatic, spring, or electric motor, near the stern of the vessel and connected to and operating the steering device; in connecting the eccentrics, valves, or equivalent controlling gear of said prime motor, to an electric motor; and in placing the commutator of the motor near the forward part of the vessel, so as to be controlled by the operator; and in connecting the commutator and the armature of the motor by suitable electric conductors, so that as the commutator is moved in one direction or the other by the operator, the electric motor and the eccentrics, valves or equivalent controlling gear of the prime motor, connected thereto, will be moved in a like manner, and the prime motor will partake of the same movements, in a manner depending upon the direction and extent of movement of the electric motor, thus operating the steering gear, and steering the vessel. In this way, we do away with the usual chains, or rods now in use, and place the steering engine adjacent to the rudder, thus reducing the friction of the connections, and admitting the employment of a smaller engine.

For a better comprehension of our invention, attention is to be directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1, is a top view of a vessel, showing our device in operation. Fig. 2, is a side view of the steering engine and electric motor. Fig. 3, is a side view of the commutator and steering wheel. Fig. 4, shows a separate view of the armature coils and connections, and Fig. 5, shows a separate view of the commutator and connections.

In all of the several views, like parts are designated by identical letters of reference.

In the stern of the vessel, is placed a prime motor A, of any variety of construction, (as for instance, steam, hydraulic, pneumatic, spring or electric) connected by suitable gearing to the rudder or other steering apparatus B, so that when the prime motor rotates in one direction or the other the rudder or steering device will be operated accordingly.

Any form of prime motor can be used, although a steam steering engine is preferred, the one illustrated in the drawings being the well known form of steam steering gear known as the "Sickles" gear.

The operation of steam steering gears, is well understood by mechanics, and a lengthy description thereof is unnecessary here. Suffice it to say, that in steam steering engines

of the type shown, the eccentrics, instead of being connected to and operated by the engines, so that the valves will be operated continuously to admit steam successively into the ports, are independent of the movements of the engines, and are under the control of the steersman. In steering engines of this type, therefore, when the eccentrics are moved by the steersman, in one direction or the other (depending on the movements of the steering wheel) the valves moving simultaneously therewith, will cause the steering engine to operate accordingly, thereby steering the vessel. Other steam steering engines are used, in which a slide valve is employed, which when moved in one direction by the steering wheel will cause the steering engine to move in a given direction, and when moved in the opposite direction will cause the steering engine to move in an opposite direction. The said slide valve is generally connected to the driving shaft of the steering engine by a floating lever, or other mechanical connection, so that the movements of the engine itself, will tend to close the valve, as soon as the steering wheel is stopped. A steam steering engine of this type is shown in United States Patent to Joseph P. Manton, No. 350,463, dated October 5, 1886, which clearly describes the construction and operation of the same. The operation of steam steering engines, therefore, being of common knowledge to all, the adaptability of our present invention for use with other forms of prime motors will also be understood, the same principle of operation being carried out with all. That is to say, when a hydraulic, pneumatic, spring, electrical or other prime motor is to be used, the said prime motor is to be provided with an eccentric, valve, commutator or analogous controlling element, operating in such a manner that when the said controlling element is moved in one direction or the other, the said prime motor will partake of a similar movement, and will move for substantially the same time that the controlling element thereof was operated.

Connected in any suitable manner, as by chains and wheels, or by gearing, to the eccentrics, valve gear, or other suitable parts of the prime motor is an electric motor C, of any desired construction so connected and arranged, that, as it rotates in any direction, the prime motor will rotate in a like direction. Any form of electric motor may be used. The said electric motor, however, is to be of such a construction, that it will be entirely under the control of the steersman, so that it will be actuated in one direction when the steering wheel is turned in a given direction, and will be turned in an opposite direction when the motion of the steering wheel is reversed, and will stop, when the steering wheel is stopped.

We prefer to connect the prime motor to the rudder, by securing a crown cogged segment D, to the rudder stock, and meshing a pinion E, on the prime motor shaft, in engagement with the same.

The electric motor, and its connections for controlling the same, illustrated in the drawings, constitute a convenient device whereby the eccentrics, valves, or equivalent parts of the prime motor may be controlled.

The commutator F, of the electric motor, is preferably placed in the forward part of the vessel, in the pilot house, or on the bridge, or, in the case of ships of war, within the conning tower, or it can be placed on the after deck, in the case of a sailing vessel. It is to be connected to the steering wheel H, or its equivalent, either directly or indirectly. Ordinary brushes bear on the segments K, K, of the commutator and are connected with the source of electrical energy. (See Fig. 1.)

If the vessel is provided with an electric-light plant, a very convenient source of electricity can be obtained, but if not, a small isolated plant may be placed within the boiler or engine room, so as to receive steam from the boiler of the boat. It will also be seen that primary or secondary electric batteries may also be conveniently used.

Rigidly secured to the same shaft that the commutator is mounted upon, are a number of insulated rings or disks I, I, equal in number to the segments of the commutator. Each of these rings is electrically connected to one of the segments K in any suitable manner, such as by an insulated wire so that each shall be in circuit with a particular section of the commutator F. Bearing on these rings I are a number of brushes J, J, of the ordinary form, and each brush J is connected electrically with a particular coil of the armature of the electric motor at the stern of the vessel. This arrangement is made use of to avoid the twisting of the wires which would result if rigidly secured to the commutator, but this is not absolutely necessary, as the wires can be twisted to a small extent without injury. In order to avoid a like twisting of the wires at the electric motor we secure a number (as many as there are coils in the armature) of insulated rings L, L, to the armature shaft *a*, and connect the wires from the brushes J, J, to these rings L by brushes M as shown. Each of these rings L is connected to a particular coil of the armature in precisely the same manner as each section of the commutator F is connected to the rings I. In order to avoid this complicated arrangement of rings and brushes at the motor and at the commutator, the commutator can be stationary, and the brushes caused to revolve around it; and the armature of the motor can be stationary while the field may be revolved within or around the same. It will be seen that the electric motor is analogous to an ordinary electric motor, except that the commutator is independently mounted in respect to the armature, and it will also be seen that as the commutator is revolved, the electro-magnetic field of the armature will be shifted accord-

ing to the direction and extent of movement of the commutator and the armature will be rotated accordingly.

The above modification, and the construction and operation of the above electrical elements, are fully and clearly described in an application for Letters Patent, filed by us, November 10, 1890, and numbered serially 370,940, said application being for an improvement in electrical steering gears. The said electrical elements are claimed in said prior application as an independent device, and while we do not limit ourselves herein to the same, we will make claims to said electrical elements as one form of device for controlling the prime motor. For a full and entire explanation of the principle of operation of said electrical device, attention is directed to said prior application.

Before we claim our invention we desire it to be understood that we do not limit ourselves to any form of prime motor, or electric motor, the ones shown being merely for the purpose of illustrating our invention. We also desire it to be understood that we do not limit ourselves to a steam engine or a motor operated by steam, as any form of hydraulic, pneumatic or other motor can be used.

When a hydraulic or pneumatic motor is used the electric motor is connected so as to operate the valves thereof. An ordinary steam pump is considered to be the equivalent of an ordinary hydraulic motor. When an electric motor is used as a prime motor, the secondary electric motor is mounted so as to operate the commutator of the prime motor. If this construction is made use of, the commutator of the prime motor may be independently mounted in precisely the same manner as the commutator of the secondary electric motor described above.

Having now described our invention, what we claim as new therein, and desire to secure by Letters Patent, is as follows:

1. In a steering gear, the combination with a prime motor, connected to and operating the rudder of a vessel, and valves or equivalent parts for said prime motor, by which the direction and extent of movement of said prime motor will be controlled or governed; of an electric motor connected with said valves, or equivalent parts, whereby the said electric motor will govern or control said valves or equivalent parts.

2. In a steering gear, the combination of an electric motor, having its moving parts connected to and operating the valves or equivalents, of a prime motor; and an independent commutator, connected with the coils of the armature of the electric motor.

3. In a steering gear the combination of a prime motor connected to and operating the rudder, and an electric motor, connected to and operating the valves or equivalent parts of the prime motor, an independently mounted commutator, and electric conductors connecting the commutator and the armature of the electric motor, substantially as set forth.

4. In a steering gear, the combination with a prime motor connected to and operating the rudder of a vessel, having valves or equivalent parts, by which the direction and extent of movement thereof will be governed or controlled; of an electric motor controlled both as to the direction and extent of movement, connected with the said valves or equivalent parts, whereby the said electric motor will govern or control said valves or equivalent parts.

5. In a steering gear, the combination with a prime motor connected to and operating the rudder of a vessel, having valves or equivalent parts, by which the direction and extent of movement thereof will be governed or controlled; of an electric motor, controlled, by hand, both as to the direction and extent of movement, connected with the said valves or equivalent parts, whereby the said electric motor will govern or control said valves or equivalent parts.

6. In a steering gear, the combination with a prime motor connected to and operating the rudder of a vessel, of an electric motor, controlled or governed both as to the direction and extent of movement, said electric motor controlling or governing the direction and extent of movement, of said prime motor.

7. In a steering gear, the combination with a prime motor connected to and operating the rudder of a vessel, of an electric motor, controlled or governed by hand, both as to the direction and extent of movement, said electric motor controlling or governing the direction and extent of movement of the prime motor.

8. In a steering gear, the combination with a prime motor connected to and operating the rudder of a vessel; of an electric motor, controlled or governed both as to the direction and extent of movement, said electric motor controlling or governing the direction and extent of movement of the prime motor; and a controlling device, operated by hand, for controlling or governing both the direction and extent of movement of the electric motor.

9. In a steering gear, the combination with a prime motor, placed near the stern of the vessel, and connected with and operating the rudder; and valves or equivalent parts, by which the direction and extent of movement of said prime motor will be governed or controlled; of an electric motor, placed near the stern of the vessel, and connected with said valves or equivalent parts; a controlling device, operated by hand, placed near the bow of the vessel, for controlling or governing both the direction and extent of movement of said electric motor, and connections from said controlling device, to said electric motor.

10. The combination with a prime motor for controlling the vessel, and located near the stern of the vessel, of an electric motor

for controlling the prime motor, located near the stern of the vessel, an independent commutator located near the bow of the vessel, for controlling the electric motor, and connections between the said commutator and the electric motor.

11. In a steering gear, the combination with a prime motor, connected to and operating the rudder of a vessel, and valves, or equivalent parts, for said prime motor, by which the direction and extent of movement of said prime motor will be controlled or governed; of an electric motor, having a rotating or revolving element, which is connected with said valves or equivalent parts, whereby the said electric motor will govern or control said valves or equivalent parts.

12. In a steering gear the combination with a prime motor, connected to and operating the rudder of a vessel and valves, or equivalent parts, for said prime motor, by which the direction and extent of movement of said prime motor will be controlled or governed; of an electric motor, having a revolving or rotating element, which is connected with said valves, or equivalent parts, whereby the said electric motor will govern or control said valves or equivalent parts; and a controlling device, operated by hand, placed near the bow, of the vessel, for controlling or governing both the direction and extent of movement of said electric motor, and connections from said controlling device to said electric motor.

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LEONARD H. DYER.

In presence of—
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ARTHUR D. BENNETT.