(No Model.) 2 Sheets—Sheet 1.

A. J. STEVENS.

Power Steering Apparatus for Vessels.

No. 231,505. **Patented Aug. 24, 1880.**

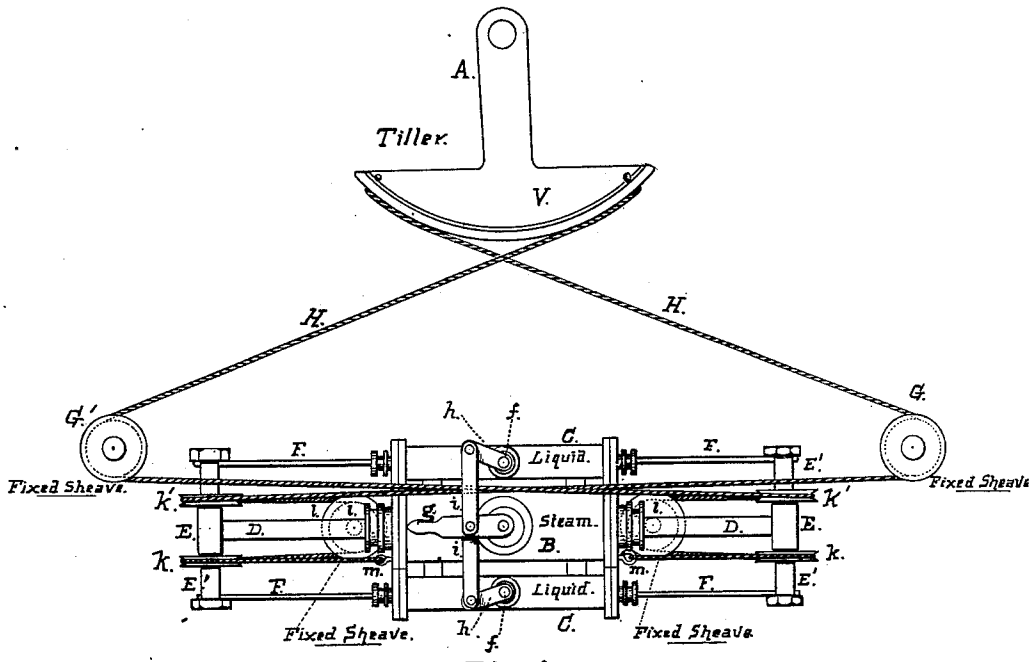


Fig. 1.

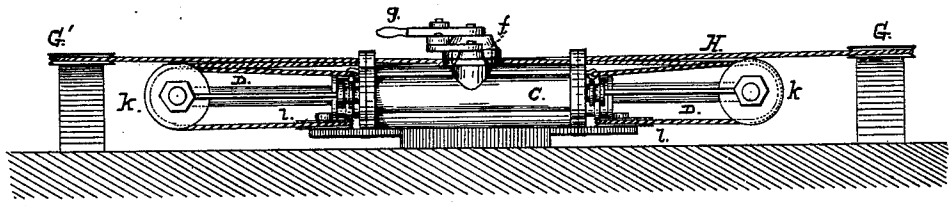


Fig. 2.

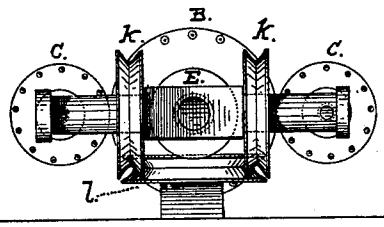


Fig. 3.

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John L. Boone

Inventor:
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N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

A. J. STEVENS.

Power Steering Apparatus for Vessels.

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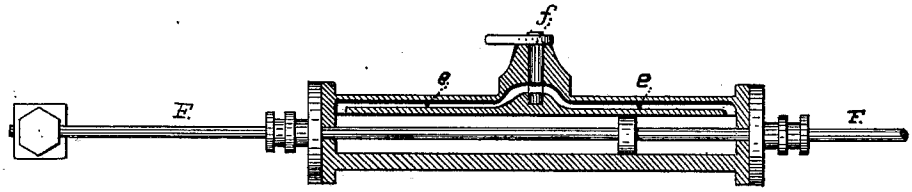


Fig. 4.

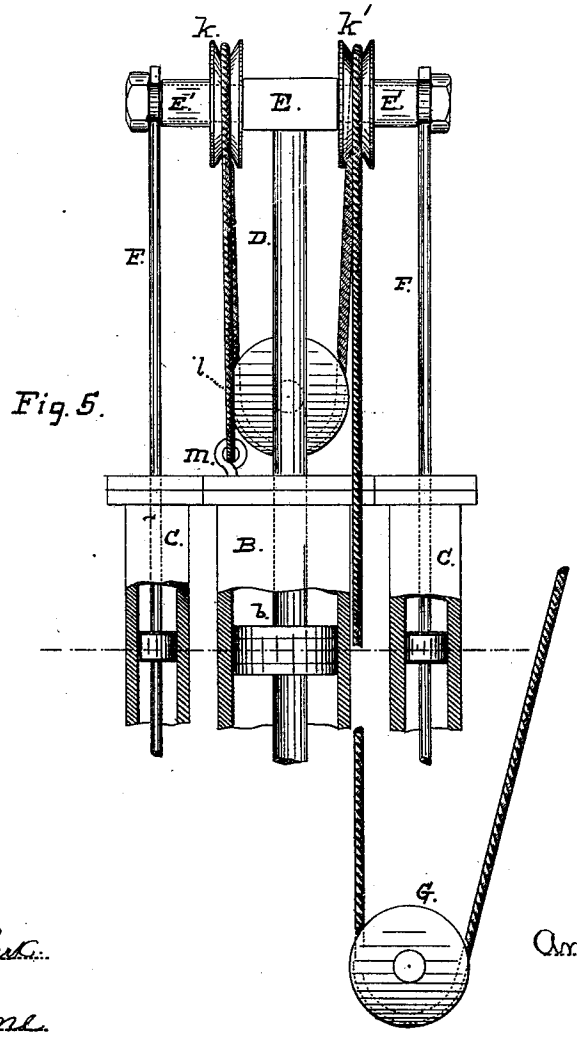


Fig. 5.

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UNITED STATES PATENT OFFICE.

ANDREW J. STEVENS, OF SACRAMENTO, CALIFORNIA.

POWER STEERING APPARATUS FOR VESSELS.

SPECIFICATION forming part of Letters Patent No. 231,505, dated August 24, 1880.

Application filed May 3, 1880. (No model.)

To all whom it may concern:

Be it known that I, ANDREW J. STEVENS, of the city and county of Sacramento, in the State of California, have made and invented certain new and useful Improvements in Power Steering Apparatus for Vessels; and I do hereby declare that the following is a full, clear, and exact description of my said invention, reference being had to the accompanying drawings by figures and letters.

My invention relates to an improved power apparatus for moving, holding, and locking in position the rudder of a vessel during the operation of steering.

It consists in an improved arrangement of a steam-cylinder and multiplying mechanism for obtaining the required extent of motion of the rudder from a piston of short movement, in combination with the piston-rod or other connection through which the motor-cylinder operates upon the tiller, of one or more checking and holding cylinders having pistons which are locked or held at rest by the action of a body of liquid confined within the cylinders, all as hereinafter described.

Referring to the accompanying drawings, Figure 1 shows a plan view of my apparatus. Fig. 2 is an elevation of Fig. 1. Fig. 3 is an enlarged end view of the cylinders and cross-head. Fig. 4 is an enlarged detail view of one of the liquid-cylinders. Fig. 5 is an enlarged detail view of the multiplying-gear at one end of the apparatus.

A represents the tiller of a vessel. At some convenient place, preferably athwart the vessel, I fix the steering apparatus and connect it with the tiller by the usual ropes and chains.

This apparatus consists of a principal motor-cylinder, B, and one or more auxiliary checking and holding cylinders, C C, these essential parts or elements having combined with them a multiplying mechanism for transmitting the movement of the power-piston and suitable valves and valve-operating gear by which the several pistons are simultaneously moved, stopped, and held at rest at any point.

The cylinders B C are placed side by side and parallel with one another, and may be cast on one bed-plate. They need not be more than five or six feet long, and the cylinders C can be much smaller in diameter than the motor-cylinder B. These smaller cylinders contain a body of liquid confined upon both sides of a piston to hold it at rest at any point, while the piston of the main cylinder is operated by the alternate admission and exhausting of steam upon its two sides.

The steam-piston *b* is secured upon or provided with a double or continuous piston-rod, D, that passes through the cylinder from end to end and works through stuffing-boxes in the center of each head *d*. Motion being given to the piston *b*, this rod will be projected at one end of the cylinder, while the opposite end of the rod will be drawn in toward the other cylinder-head, and a reciprocation of the rod is thus produced as the piston is moved.

The piston-rods of the liquid-cylinders are made continuous in the same manner and work through both ends of the cylinders, and by means of a yoke or cross-head, E, I connect the ends of these smaller piston-rods F and the ends of the main piston-rod D together at each end of the apparatus, so that the rods F extend through their cylinders C, and from one yoke, E, to the other on the main piston-rod. These rods are all parallel with one another, and any movement of the main piston will give motion to the auxiliary pistons, while at the same time the auxiliary piston-rods will act to hold and lock the main piston-rod at any point when steam is shut off from the main cylinder.

It will be seen that the auxiliary piston-rods are held at rest by the resistance of a body of liquid upon both sides of the pistons in the cylinders C; but during the movements of the main piston toward one end or the other of its cylinder this resistance must be removed from one or the other side of the smaller pistons, according to the direction of travel of the principal piston. In order to accomplish this I connect the two spaces within the cylinder C, that are separated by the piston, by providing a passage, *e*, along the cylinder from one end to the other, which I control by a valve, *f*, so that when the valve is open the liquid can circulate and pass around the piston from one side to the other. At such time the movement of the piston will force the liquid in front of it through the passage *e* to the space behind the piston; but whenever the valve *f* is

closed all further motion of the liquid is prevented and the piston is held at rest by the resistance of the liquid upon both sides of it.

I connect these valves *f* with the valves governing the steam and exhaust openings of the main cylinder, so that they shall act simultaneously with the main cylinder valve-gear and be opened or closed whenever the main piston is moved or stopped at any point in its travel. In the present instance I have shown the principal valve as being operated by a simple lever, *g*, and the two valves *f f* of the liquid-cylinder as being connected with this lever by the arms *h* and links *i*.

When the lever *g* stands in line with the cylinder B, as shown in Fig. 1 of the drawings, the ports are all closed and the pistons are held at rest by the resistance of the liquid upon both sides of the smaller pistons of the cylinders C; but when the lever *g* is moved a short distance, either to the right or to the left, the steam-port at one end of the main cylinder and the exhaust-port on the opposite side will be opened and the piston *b* caused to move in its cylinder. This same movement of the lever *g* also opens the valves controlling the liquid-passages *e* and allows the smaller pistons to travel with the main piston *b*. As long as the lever *g* holds this oblique position the piston-rods will continue to move until their limit of motion is attained, and as often as the lever is brought back to its first position the power will be shut off and the main piston-rod be held at the desired point. By moving the lever over to the extreme right or left the arrangement of the steam-ports in the main cylinder causes the valve *g* to shut off the steam and the exhaust-ports to be thrown open, while by the same movement the lever opens the valves of the liquid-cylinders. This leaves all the pistons free to move in their respective cylinders when pressure is applied at either end of the piston-rod.

By this arrangement the ropes or chains of the tiller can be connected with a hand steering wheel or apparatus, or an independent hand steering apparatus can be applied directly to the tiller or to the cross-heads of the power piston-rods, so that the tiller can be worked by hand at any time.

As before stated, the cylinders B C are made quite short, so that the pistons travel only a short distance as compared with the required movement to be given to the rudder, and it is necessary also to have the tiller respond quickly and readily to the motions of the piston-rods in the operation of steering. As the power derived from the piston, however, is sufficient to admit of the motion being multiplied to any required extent so as to give any desired length of stroke, in the present instance I have represented the speed of motion as being multiplied fourfold.

The mechanism employed for transmitting the motion is the same for both ends of the power piston-rod. Therefore a description of one end will serve to explain the arrangement for both.

The cross-head E carries two vertical sheaves, *k k'*, that run freely upon bearings provided on the cylindrical parts or arms E' of the head. These sheaves are carried by the head toward and away from a fixed horizontal sheave, *l*, fastened either to the end of the cylinder bed-plate or to the deck of the vessel. Around these three sheaves *k l* is carried the tiller-rope H, which is fastened at one end to an eyebolt, *m*, on the end of the steam-cylinder, runs thence over and around the sheave *k*, around the fixed horizontal sheave *l*, and, after passing over and around the sheave *k'*, runs across the cylinder to the opposite side of the vessel, where it passes around a fixed horizontal sheave, G, and thence to the end of the tiller.

In order to prevent the ropes or chains from getting slack, I attach an arc, V, to the end of the tiller; but this is not new, and is applied herewith only as a matter of convenience.

I thus provide an exceedingly simple and effective power apparatus for steering vessels, by which the tiller is readily operated and is held at rest or locked in a perfect manner. It thus possesses every requirement of a steering power. It is compact and occupies but little space, and can be placed in any desired position. It also allows the vessel to be handled with the ordinary steering apparatus when the power-cylinder cannot be supplied with steam, or when it may be injured or any of the parts broken.

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

In a power steering apparatus for vessels, the combination, with the steam-cylinder and water or liquid cylinders and their pistons, provided with double-ended piston-rods D F, connected together by cross bars or shafts E, provided with pulleys *k k'*, of the valves *f*, arranged in the passages *e* in the liquid-cylinders communicating with the piston-chambers of said liquid-cylinders, and connected by the arms *h* and links *i* to the steam-valve of the steam-cylinder, rope or chain H, fixed pulleys *l* and G G', arranged in a parallel plane to each other and in a right-angled plane to the pulleys *k k'* on the connecting-bars of the piston-rods, and the tiller A, as and for the purpose specified.

In witness whereof I have hereunto set my hand.

ANDREW J. STEVENS.

Witnesses:
EDWARD E. OSBORN,
WILLIAM F. CLARK.