(No Model.) 3 Sheets—Sheet 1.

V. F. LÄSSOE.

DUPLEX RUDDER FOR VESSELS.

No. 419,780. Patented Jan. 21, 1890.

Fig. 1.

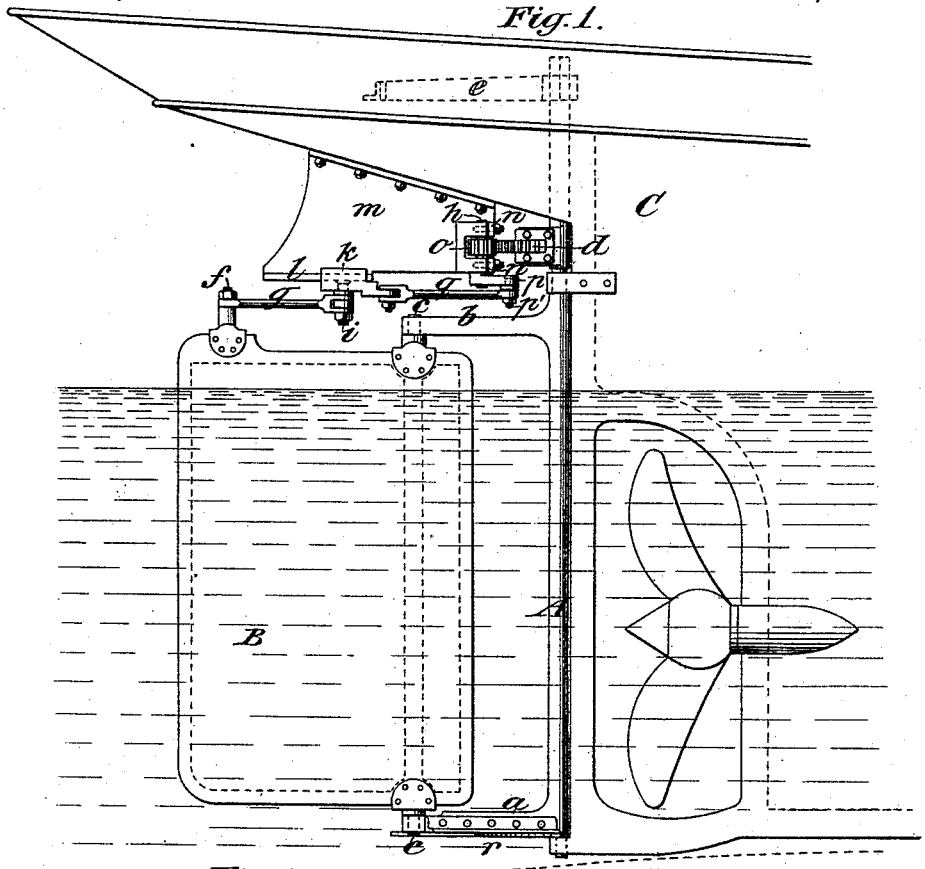

Fig. 2.

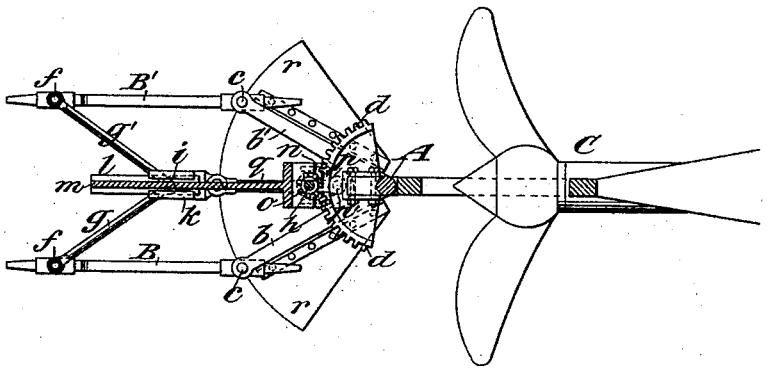

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Fig. 3.

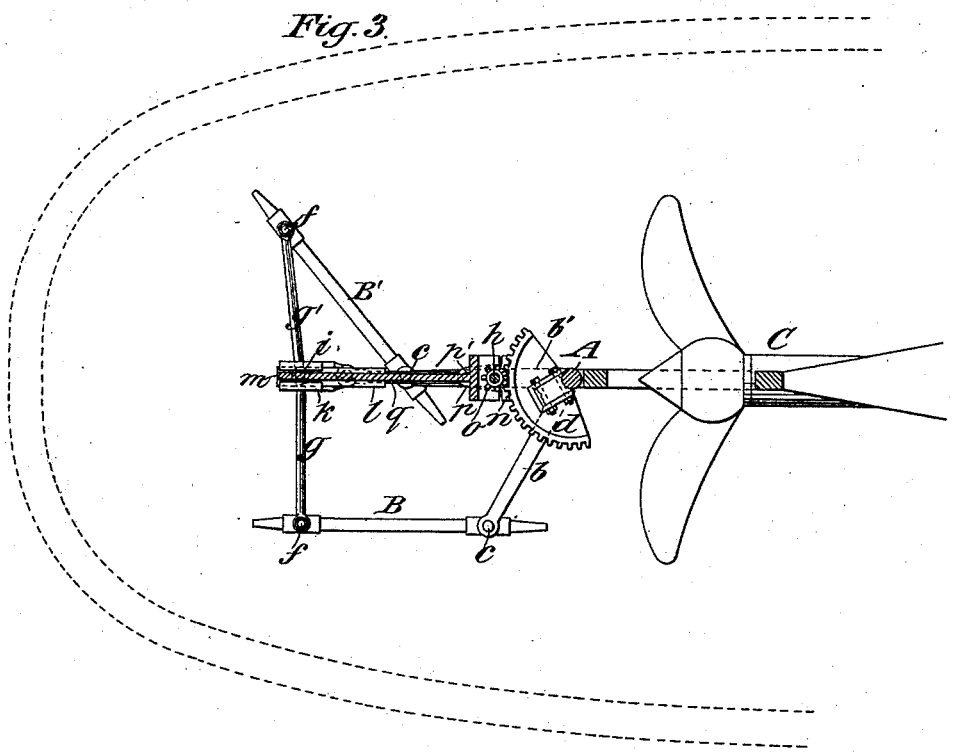

Fig. 4.

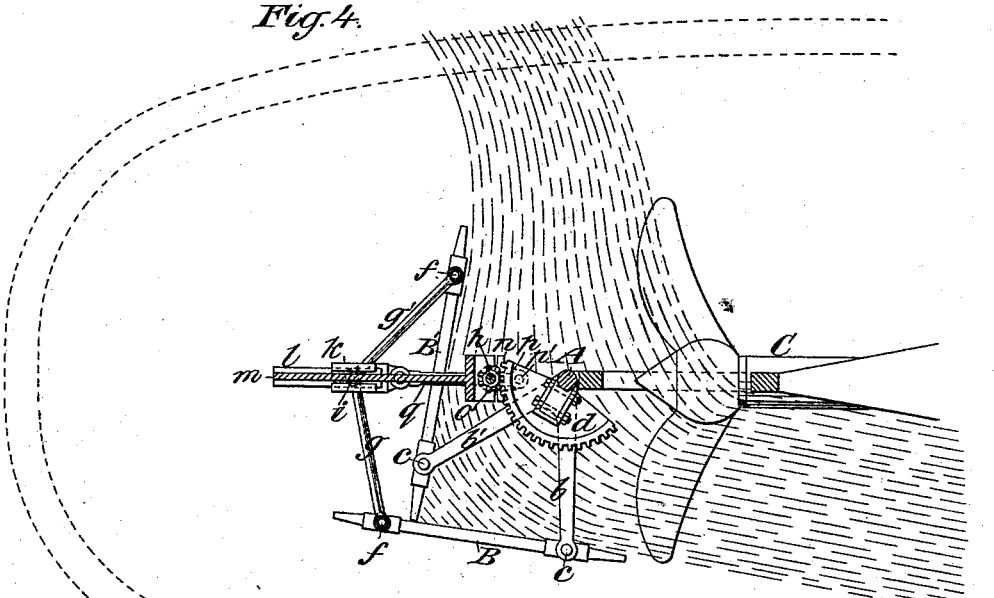

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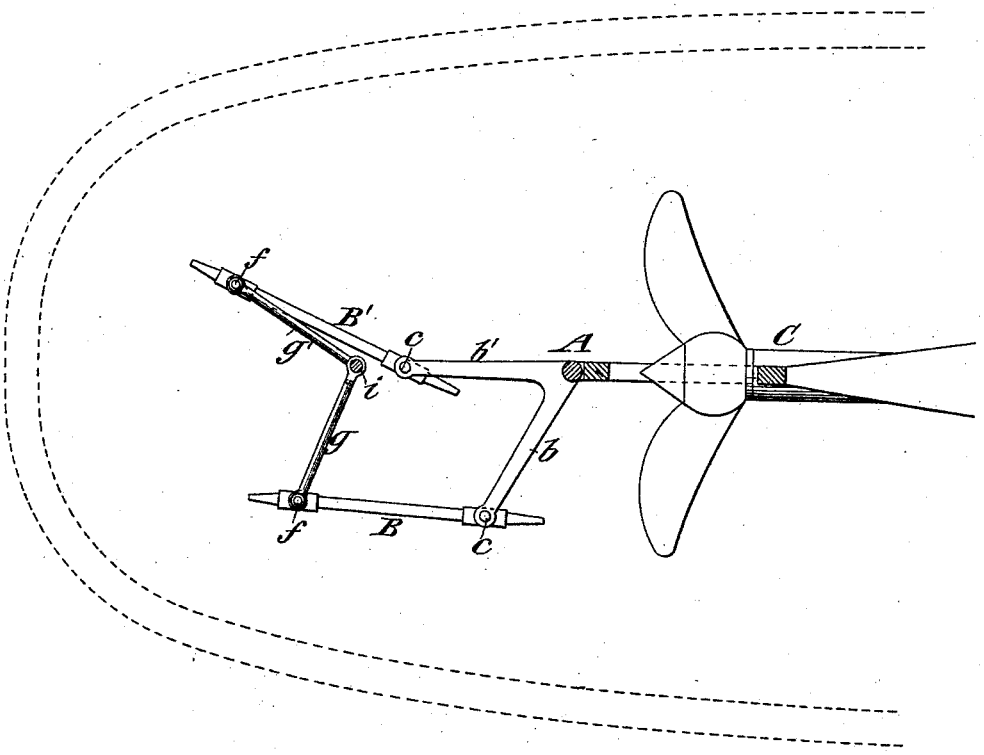
Fig. 5.



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UNITED STATES PATENT OFFICE.

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DUPLEX RUDDER FOR VESSELS.

SPECIFICATION forming part of Letters Patent No. 419,780, dated January 21, 1890.

Application filed August 31, 1889. Serial No. 322,563. (No model.)

To all whom it may concern:

Be it known that I, VALDEMAR F. LÄSSOE, of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Duplex Rudders, of which the following is a specification, reference being had to the accompanying drawings, forming a part of this specification.

This improvement is more especially designed for screw-steamers, and particularly for such as have a single screw. Its object is to produce by changing the relative angular positions of two rudders such divergence of the column of water thrown back by the propeller that this will flow at such at an angle to the line of the keel as by its reaction to turn the vessel very sharply even to the extent, if desired, of making it turn on its center of displacement with a force proportionate to the propelling-power of the engine.

Figure 1 in the accompanying drawings represents a side view of the stern of a screw-vessel having my invention applied. Fig. 2 is a horizontal sectional view corresponding with Fig. 1, but showing the working parts of my invention in plan. Figs. 3 and 4 are views corresponding with Fig. 2, but showing the rudders in different positions. Fig. 5 is a plan view of a modification of my invention.

Similar letters of reference designate corresponding parts in all the figures.

C designates the stern of the vessel.

A *a a' b b'* designate a frame consisting of the shaft A, substantially similar to the rudder-stock of a common rudder, having forged to it or otherwise secured upon it two arms *a a'* at the bottom and two other arms *b b'* at or near the load line, each pair of arms being set at an angle resembling a V. The said arms are provided with suitable holes or bearings for the reception of the pivots *c*, pivoted at the top and bottom of the duplex rudders B B' near their forward edges. One of the said rudders B is pivoted in the arms *a b* and the other B' is pivoted in the arms *a' b'*. The distance of the two rudders from each other is preferably such that the angle formed by center lines from the center of the stock to the center of the trunnions *c* is nearly sixty degrees.

The rudder frame or stock A *a a' b b'* may be hinged to the rudder-post in any suitable manner, either by pintles and gudgeons or bands. In vessels without a rudder-post the stock or frame can be stepped in a shoe projecting from the foot of the stern below the propeller. At a suitable distance above or below the arms *b b'* there is fastened to the said frame or stock the tiller-yoke *e*. (See Fig. 1.) Below this yoke, but above the arms *b b'*, there is represented as secured to the said stock or frame a concentric toothed sector *d*. The rudders B B' are connected at their upper parts near their rear edges by links or swinging arms *g g'*—one for each rudder—with a pivot *i*, the connection of each link or swinging arm of each rudder being made by a pivot *f* at the top of the rudder. In the example of my invention represented in Figs. 1, 2, 3, and 4 this pivot *i* is attached to a slide *k*, which works on a fixed horizontal guide *l*, arranged longitudinally and centrally to the vessel. This guide is represented as formed on a hanging bracket *m*, bolted to the overhanging stern of the vessel, the configuration of the said bracket depending on the shape of the stern. There are also provided forward of this guide *l* two stationary pillow-blocks *n* for the reception of the journals of a short upright shaft *h*, which has at its lower end a crank *p*. These pillow-blocks are in the center line of the vessel and are represented as formed upon or attached to the hanging bracket *m*. The crank *p* has its crank-pin *p'* connected by a rod *q* with the slide *k*. The crank-shaft *h* has fast upon it a pinion *o*, gearing with the toothed sector *d*, hereinbefore mentioned as attached to the rudder frame or stock. The proportion between the pinion and sector might be varied; but it is preferable, for reasons to be hereinafter explained, that the said proportion should be such that by turning the tiller-yoke, with which the sector moves, sixty degrees the pinion *o* makes one full revolution.

At the bottom of the rudder frame or stock there is represented as fastened to the lower arms *a a'* a horizontal sector-shaped plate *r*, the object of which is to prevent the water thrown back from the propeller from passing under the rudders and thereby reducing their efficiency. This plate, however, would hardly be necessary except in cases where the pro-

peller-shaft has considerable inclination downward toward the stern, as in torpedo-boats.

In the example represented in Fig. 5 the parts are all the same as in the examples represented in Figs. 1, 2, 3, and 4, except that the crank p and its shaft, the pinion o and sector d, and the rod q and the slide k are all dispensed with, and the pivot i is supposed to be secured in a fixed position to the stern of the vessel.

I will now describe the operation with reference to Figs. 1, 2, 3, and 4. The normal position of the two rudders is parallel with each other and with the center line of the vessel, as shown in Fig. 2. When the rudder stock or frame is turned by the tiller in one direction or the other, the rudder on that side toward which the said frame or stock is turned remains nearly parallel with the side of the vessel, as shown in Fig. 2; but the rudder on the other side is given an inclination at a very considerable angle to the vessel, as shown in Figs. 3 and 4. For example, if it be desired to turn the vessel's head to port the tiller is turned in a direction to throw the rudder frame or stock slightly to starboard, thereby giving the port rudder an inclination with its front to starboard, while the starboard rudder retains a position almost parallel to the vessel's center line. The vessel will now commence to turn to port, and as the rudder frame or stock is moved more to starboard the port rudder will increase its angle, while the starboard one still nearly retains a parallel position. Having turned the tiller through thirty degrees, the position of the rudders is as shown in plan, Fig. 3. In this position the action of the rudders is similar to that of a common or single rudder, the vessel moving to port in a circle of considerable diameter and its headway being but slightly checked. By moving the tiller farther to starboard the port rudder keeps on increasing its angle until, as shown in Fig. 4, it has passed ninety degrees, the starboard rudder still occupying, approximately, a fore-and-aft position. The speed of the vessel under this last-described part of the operation is gradually checked, and after awhile entirely lost, the column or body of water thrown back by the propeller being so deflected by the angle of the rudders as to produce in a direction lateral to the vessel, as illustrated by the broken lines in Fig. 4, a stream, the reaction of which tends to turn the vessel, but not to drive it ahead. The vessel will then pivot around a point at or near its center of displacement with the rudders in this position. By turning the tiller to port the action of the rudders will be reversed. The vessel will finally pivot to starboard if the tiller is brought fully over to port.

In backing the most advantageous position of the rudders for turning the vessel short is an intermediate position between that shown in plan in Fig. 3 and plan in Fig. 4, produced by a forty-five-degree motion of the tiller to either side. The vessel will, with the rudders in this position, back around in a sharp curve better than a vessel with a single rudder, but will not pivot, as to attain this would necessitate the rudders being swung round on the forward side of the propeller.

In the above-described operation the movement of the active rudder, which in the illustration given by the drawings is the port rudder B′, is produced, mainly, by the movement of the forward end or side of the said rudder in a direction transverse to the center line of the vessel, produced by the turning of the rudder frame or stock; but this movement is also produced in part and is always controlled by the links or swinging arms $g\,g'$. The nature of the movement of these arms depends in part on the fixity or mobility of the pivot i. In the operations of the rudders hereinbefore described with reference to Figs. 2, 3, and 4 the slide k, and with it the pivot i, are moved toward and from the center of the rudder frame or stock by the rotation of the crank, produced through the sector d and pinion o, and by this means the arms or links $g\,g'$ are caused to exert an effective leverage on the after parts of the rudders, and thereby to assist in turning them, and it is for the purpose of this effective leverage that I give the said pivot i the movement fore and aft. The comparative effect of making the pivot thus movable and making it fixed may be understood by comparing Figs. 3 and 5, which both represent the rudder frame or stock in the same position. The advantage of the movable pivot will be then apparent, for it will be seen that the movement of the rudder B in Fig. 5 is much less than in Fig. 3, and the leverage exerted by the link or swinging arm g' in the position represented in Fig. 5 is of very little effect. For very small vessels, on account of their greater simplicity, the fixed pivot i might be adopted; but for vessels of any considerable size I prefer to make the said pivot movable, as described with reference to Figs. 1, 2, 3, and 4.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, substantially as herein set forth, with a vessel, of two rudders, a stock or frame which is pivoted to the vessel and in which said rudders are separately pivoted at a distance apart near their forward ends, and links or swinging arms each connected with one of the rudders and pivoted, substantially as herein described, to the stern of the vessel.

2. The combination, with a vessel and two rudders, of a rudder stock or frame which is pivoted to the vessel and in which said rudders are separately pivoted at a distance apart, links or swinging arms each connected with one of the rudders, and a sliding pivotal con-

nection between the said links or arms and the stern of the vessel, substantially as and for the purpose herein set forth.

3. The combination, with a vessel and two rudders, of a rudder stock or frame in which rudders are separately pivoted, links or swinging arms each connected with one of the said rudders, a pivot common to both of said links or arms, a slide carrying said pivot, a fixed slideway on the vessel, arranged lengthwise thereof and centrally thereto, for the said slide to run on, and a crank geared with the rudder-stock and connected with said slide, all substantially as herein set forth.

4. The combination of the rudder stock or frame consisting of a shaft A and V-shaped arms *a a'* and *b b'*, the two rudders B B', pivoted in said arms, the fixed slideway *l*, attached to the stern of the vessel, the slide *k* and pivot *i*, attached thereto and movable on said slideway, the links or swinging arms *g g'*, connecting the rudders with the pivot *i*, the crank *p* and crank-shaft *h* and the fixed bearings *n n* therefor, attached to the stern of the vessel, the rod *q*, connecting said crank with the slide *k*, the pinion *o* on the crank-shaft *h*, and the sector *d* on the rudder-stock, gearing with said pinion, all substantially as and for the purpose herein set forth.

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