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J. A. MILLER.

STEERING APPARATUS FOR VESSELS.

No. 393,310. Patented Nov. 20, 1888.

Fig. 2.

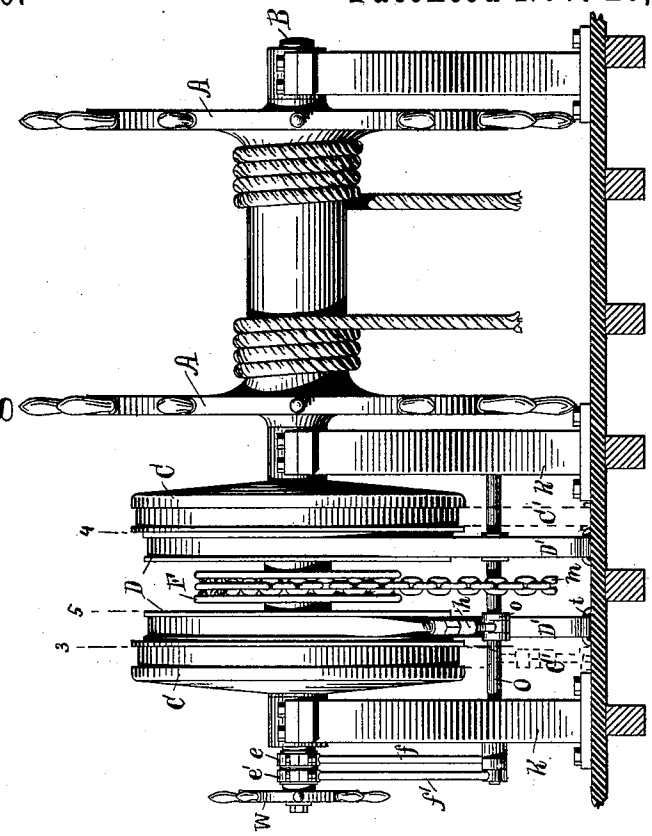
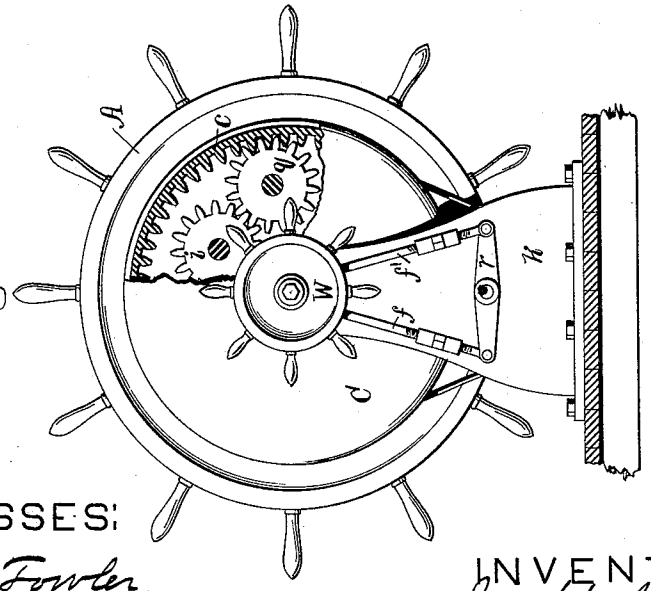


Fig. 1.



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Fig. 5.

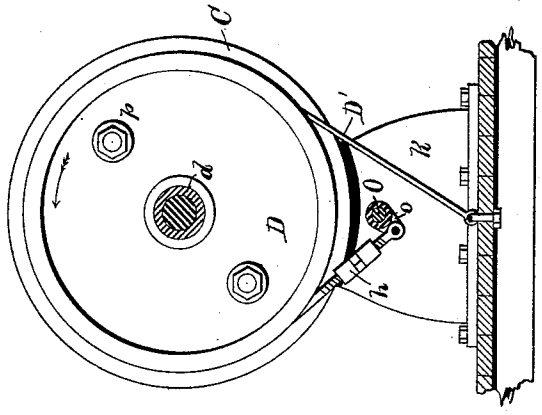


Fig. 4.

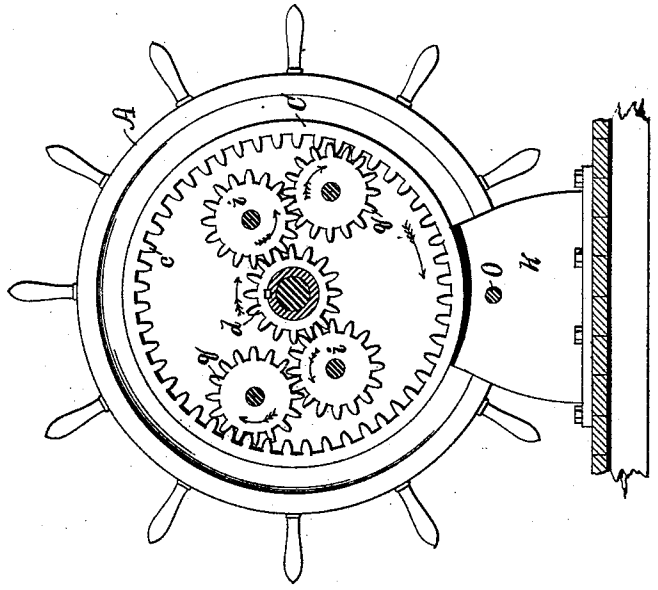
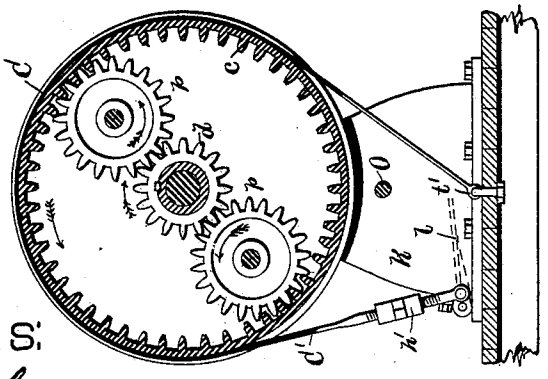


Fig. 3.



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Fig. 8.

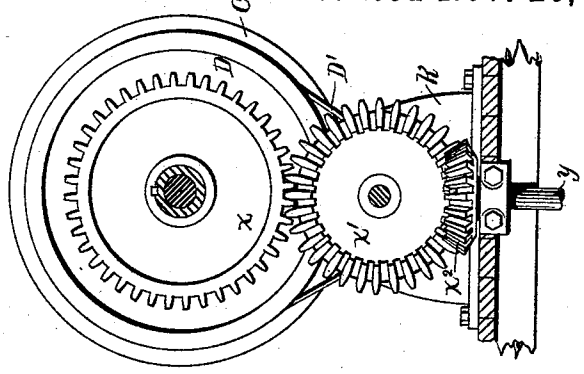


Fig. 7.

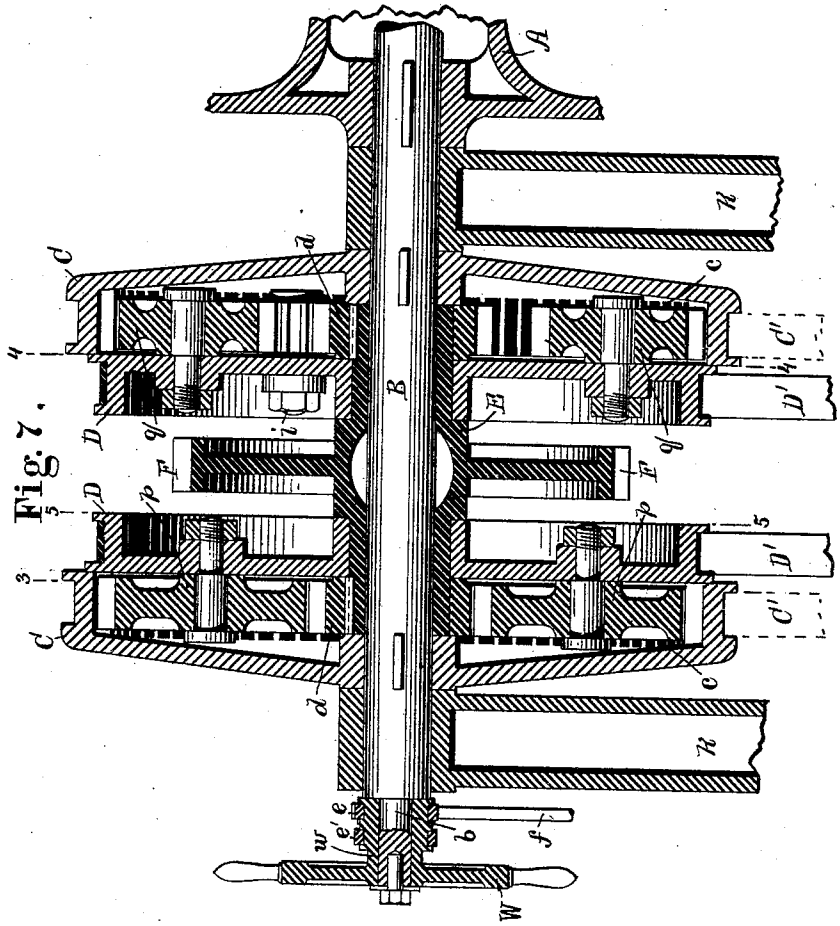
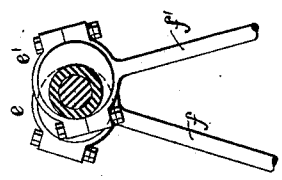


Fig. 6.



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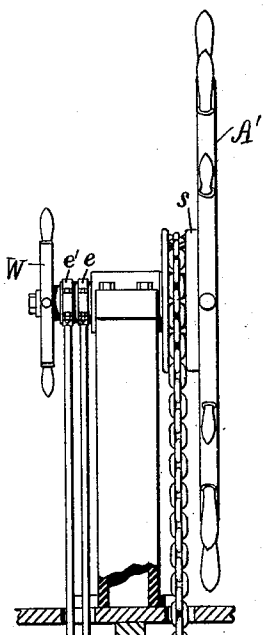


Fig. 10.

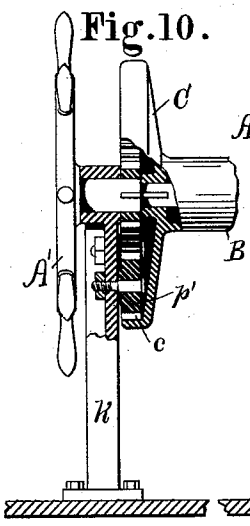
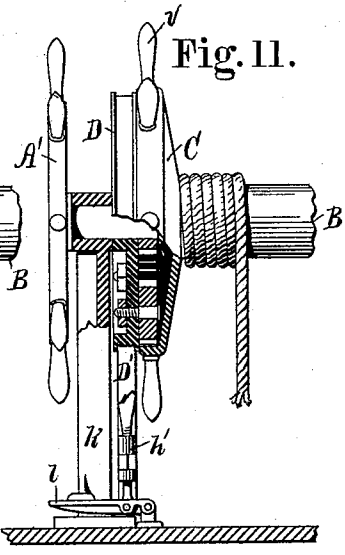


Fig. 11.



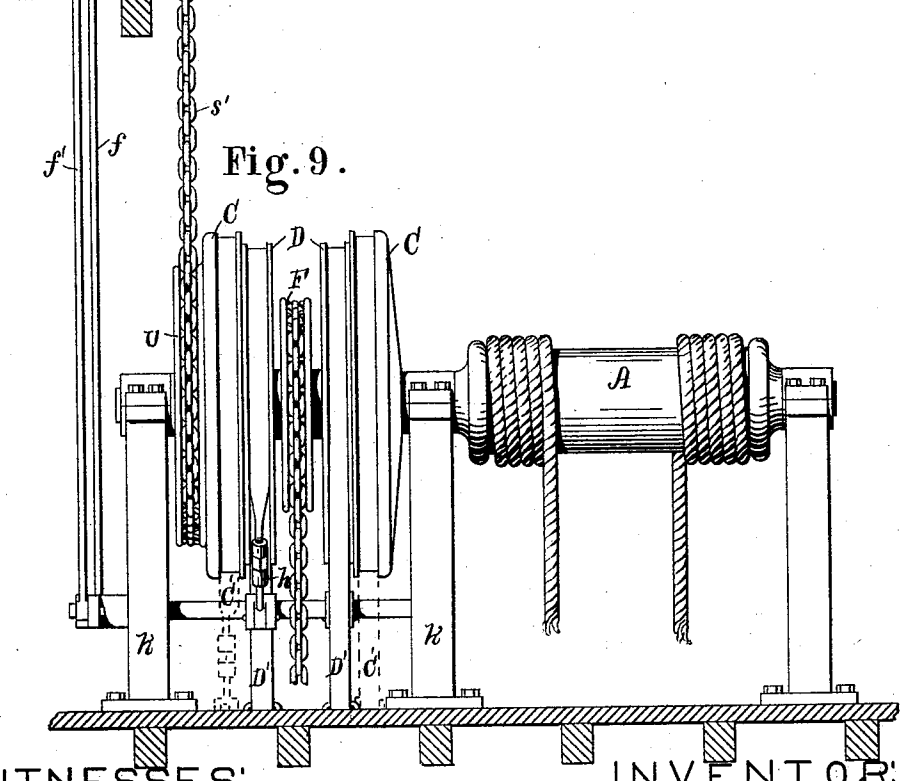


Fig. 9.

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UNITED STATES PATENT OFFICE.

JOSEPH A. MILLER, OF PROVIDENCE, RHODE ISLAND.

STEERING APPARATUS FOR VESSELS.

SPECIFICATION forming part of Letters Patent No. 393,310, dated November 20, 1888.

Application filed March 19, 1886. Serial No. 195,813. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH A. MILLER, of the city and county of Providence, and State of Rhode Island, have invented certain new and useful Improvements in Steering Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to steering apparatus, and has for its object the provision of a steering-gear whereby, from its construction, great increase of power is gained, as hereinafter described and claimed.

My invention has for its object, also, the provision of a steering-gear whereby the alternate use of steam and hand power is permitted.

My invention has for its object, also, the provision of a steering-gear having a yielding quality thereto, whereby the sudden and destructive strains the gear is always liable to are effectually guarded against.

My invention has for its object, also, the provision of a steering-gear whereby the rudder can be held at will in position in any part of its sweep.

In the accompanying drawings, Figure 1 represents an end view of my improved steering-gear partly broken away and attached to an ordinary hand steering-gear. Fig. 2 represents a side elevation of Fig. 1. Fig. 3 represents a sectional view on line 3 3, Fig. 2, showing one of my improved disks and the pinion-gears. Fig. 4 represents a sectional view on line 4 4, Fig. 2, showing the gearing of the annular gear with the pinions and idle-pinions and the pilot-wheel. Fig. 5 represents a sectional view on line 5 5, Fig. 2, showing a pair of the disks with one of the strap-brakes. Fig. 6 represents an enlarged view of the eccentrics *e e*, Fig. 2, with a portion of their rods. Fig. 7 represents in part an enlarged vertical longitudinal sectional view of Fig. 2. Fig. 8 represents a modified form of transmitting the steam-power motion to the steering-gear shaft. Fig. 9 represents a modification of my improved steering-gear. Fig. 10 represents a further modified form of my steering-gear. Fig. 11 represents a still further modification of the same.

In the said drawings like letters designate like parts.

To one side of an ordinary hand steering-gear, A, and on an extension of its barrel-shaft B, is located my improved steering-gear, having suitable supports, *k k*, and bearings thereon, as shown in Figs. 2 and 7.

The sleeve E, loosely incasing part of the barrel-shaft B, bears a fixed wheel or pulley, F, for transmitting indirectly the operating-power to the shaft B.

On each side of the wheel F, and about the ends of the sleeve E, are placed a pair of disks, C and D. The inner and smaller disks, D D, the so-called "loose disks," are loosely placed around the sleeve E, and have disposed on their outer and flat faces the freely-turning pinion-wheels *p p* and *q q*, which have one end of their arbors suitably journaled in the disks D D. These pinions *p* and *q* take into the annular gears *c* on the inner side of the so-called "fixed disks" C C, which are fixedly keyed to the shaft B and located at the ends of the sleeve E. In this construction, when the sleeve E, having the wheel F and fixed pinions *d d*, is turned about the shaft B it operates the pinions *p q* and the idle-pinions *i i*, also journaled to the faces of the disks D D, and thus revolves the loose disks D D only. Again, when the barrel-shaft B is rotated, it revolves the fixed disks C C only, because the compensating motion of the said pinions and annular gear keeps the disks D D and the sleeve E from revolving. The peripheries of the disks C and D are provided with suitable bearings for the strap-brakes C′ and D′, which are placed around said disks, respectively, as shown. The straps C′ are shown in broken lines and D′ in full lines.

Beyond the disks, and at the outer end of the shaft B, on a diminished portion, *b*, of the same, is placed the hand brake-wheel W, to the hub *w* of which are fixed the eccentrics *e e′*, having the connecting-rods *f f′*, and the rocker-beam *r*, connecting with the brake-rod O, which extends beneath the disks C and D parallel to the shaft B, and has suitable bearings in the supports of said shaft B. On the brake-rod O are oppositely disposed the cranks *o o*, to which are pivoted the heads *h h* of the movable ends of the brake-straps D′ D′, the fixed ends of said straps being fastened to the staples *t t*. By turning the brake-wheel W the brake-straps are readily operated by al-

ternately depressing first one end then the other of the rocker-beam *r*, as desired, for the purpose of binding and holding the disks D D.

The disks C C are provided with the brake-straps C′ C′. (Shown in Figs. 2, 7, and 9 in broken lines and in Fig. 3 in full lines.) These straps C′ C′ are made fast to the staples *t′ t′*, and their movable ends carry the heads *h′ h′*, which are fastened to foot-treadles *l l*, and in their operations they bind and hold the disks C C, for the purpose hereinafter described.

The steam-power may be transmitted to the sleeve E in any usual manner. As shown in Figs. 2 and 9, a chain connection, *n*, is used, and in Fig. 8 a cog-wheel gear, *x x′ x²*, is used with a shaft, *y*.

One of the loose disks D D is provided with two pinions, *p p*, as shown in Fig. 3, and the other with four pinions, *q* and *i*. This is for the well-known purpose of causing the said disks to rotate in opposite directions, as hereinafter described.

It is obvious that the ordinary form of hand steering-gear A can be operated, as usual, with my above-described improvement attached to its barrel-shaft B, the said operation merely rotating the fixed disks C C and the connected pinions of the loose disks.

When desired, the steam-power is made to rotate constantly the wheel F of sleeve E, which motion, as above explained, gives no motion to the barrel-shaft B, but rotates the loose disks. The steam-power can now be called into use, when required, by the operation of my steering-gear, as follows: To rotate the shaft B in the direction of the motion of the hands of a clock, (relative to view in Fig. 1,) the brake-wheel W is turned in that direction, thereby thrusting downwardly the eccentric-rod *f′*, which puts the brake D′ on the left-hand (Fig. 2) loose disk, D. This binds and holds said disk, causing its fellow disk C to be rotated with the sleeve E, and thereby rotating the barrel-shaft B in the required direction. If the opposite rotation is desired, the brake-wheel is operated reversely, thereby binding and holding the right-hand (Fig. 2) loose disk, D, and giving the required motion to the barrel-shaft B.

The barrel-shaft B can be held in any desired position of its revolution by the office of the brake-straps C′ C′, which are operated by foot to bind and hold their respective disks, according to the direction of the rotation of shaft B. By this means the position of the rudder is held under control. Of course one of these brake-straps C′ can perform the work alone, but two are preferable. All the brake-straps are arranged so that their disks revolve in a direction away from their fixed ends, thus bringing all the strain on the said fixed points and also increasing the frictional function of the brakes.

I have shown in Fig. 9 a modified form of my improved steering-gear, wherein only the brake-wheel W, the eccentrics *e e′* and part of their connections *f f′*, together with a pilot-wheel, A′, and its hub *s* for the reception of the chain *s′*, appear in the pilot-house. The remainder of the apparatus is placed below in any convenient place in the hold of the vessel. In this modification there is also introduced the extra wheel *u*, mounted on the shaft B, for the chain *s′*. The operation here is similar to that explained above.

In the modification shown in Fig. 10 I employ, virtually, a single pair of disks—*i. e.*, a loose and fixed disk—in which the loose disk D of Fig. 7 is replaced by journaling the pinions *p′ p′* directly to the support *k* and securing the pinion *d′* directly to the barrel-shaft B of wheel A′. The fixed disk C and its shaft are similar to those in the primary form. On turning the hand-steering wheel A′, the pinion *d′* operates successively the pinions *p′* and *p′*, one of which, taking into the annular gear *c* of disk C, rotates the disk. In this operation the well-known increase of power is gained through the office of the said pinions and annular gear.

In the modification shown in Fig. 11 I employ a pair of disks, C and D, of the primary construction, having, in addition thereto, the handles *v* on disk C and the foot-operated brake on disk D. In this form the disk C is operated like an ordinary pilot-wheel, and when an increase of power is required the strap-brake D′ is put on its disk D, binding and holding the same, and then the wheel A′ is operated, thereby gaining the increased power by virtue of the pinions and annular gear before described.

The peculiar construction of my steering-gear admits of various modifications without departing from the essential construction of the same. As shown in Fig. 9, the greater part of the gear can be put below—for instance, in the engine-room—and there controlled and cared for. The steam-power can be brought from a remote point, or an engine can be placed beside the apparatus and controlled by the pilot. Again, the power may be transmitted from the propeller-shaft.

An important advantage presented by my improved steering apparatus is that it is free from the rigid gearings, whereby a rupture of the apparatus is likely to be caused by sudden strains exerted on the rudder. On the contrary, all the brakes I use afford a yielding medium that will effectually protect the apparatus from such destruction; and, further, in reversing the rotation of the barrel-shaft I do not have to reverse the engine, as is usual.

Any desired number of pinions may be employed in the gearing according as the power is desired to be increased.

My improved steering-gear presents a very compact and durable apparatus and one not easily deranged.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a steering-gear, the combination, with a sleeve provided with a pinion, of the disk provided with the intermediate gear or gears,

and the disk C, provided with an annular gear co-operating with said intermediate gear or gears to operate the steering apparatus, substantially as herein shown and described.

2. In a steering-gear, the combination, with a sleeve provided with a pinion and bearing a loose disk, D, provided with freely-turning pinions and having a frictional brake, of the disk C, provided with an annular gear co-operating with said pinions of disk D to operate the barrel of the steering apparatus with increased power, for the purpose described.

3. A steering apparatus consisting of a sleeve provided with fixed pinions and loosely mounted on the pilot-wheel shaft, said sleeve having loosely secured thereto disks provided with brakes, said disks having pinions co-operating with the pinions on said sleeve and with the annular gear located on disks fixedly secured to said shaft, for the purpose described.

4. A steering apparatus consisting of a sleeve provided with an operating-wheel and fixed pinions and loosely mounted on the pilot-wheel shaft, said sleeve having loosely secured thereto disks provided with brakes, said disks having pinions co-operating with the pinions on said sleeve and with the annular gear located on disks fixedly secured to said shaft, and these fixed disks provided with brakes, for the purpose described.

5. The combination, with a steering apparatus consisting of a sleeve having fixed pinions thereon and loosely mounted on the pilot-wheel shaft, said sleeve having loosely secured thereto disks provided with brakes, said disks having pinions co-operating with the pinions on said sleeve and with the annular gear located on disks fixedly secured on said shaft, of a brake-rod running transversely of said disks and having cranks connecting with said disk-brakes and operated by a pair of eccentrics connected with said brake-rod, for the purpose described.

6. The combination, with the shaft B, of the loosely-mounted sleeve E, having the pinions *d d*, and the disks D D, provided with brakes D′ D′ and provided with pinions *p*, *q*, and *i*, and the disks C C, fixedly secured to the shaft B and provided with the annular gears *c c*, for the purpose described.

7. The combination, with the shaft B, the loosely-mounted sleeve E, having the pinions *d d*, and the disks D D, provided with the brakes D′ D′, and provided with pinions *p*, *q*, and *i*, the fixed disks C C, having annular gears *c c*, of the brake-rod O, provided with cranks *o o*, and having the rocker-beam *r* and rods *f f*′, connecting with the eccentrics *e e*, mounted on the portion *b* of shaft B, and the wheel W, substantially as described.

8. The combination, with the hand steering-gear A, of the sleeve E, mounted on the shaft B and provided with pinions *d d*, and the disks D D, provided with brakes D′ D′, and provided with pinions *p q r*, and the fixed disks C C, having brakes C′ C′ and having annular gears *c c*, and the brake-rod with its herein-described connection for operating said brakes D′ D′, for the purpose described.

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