No. 837,568. PATENTED DEC. 4, 1906.

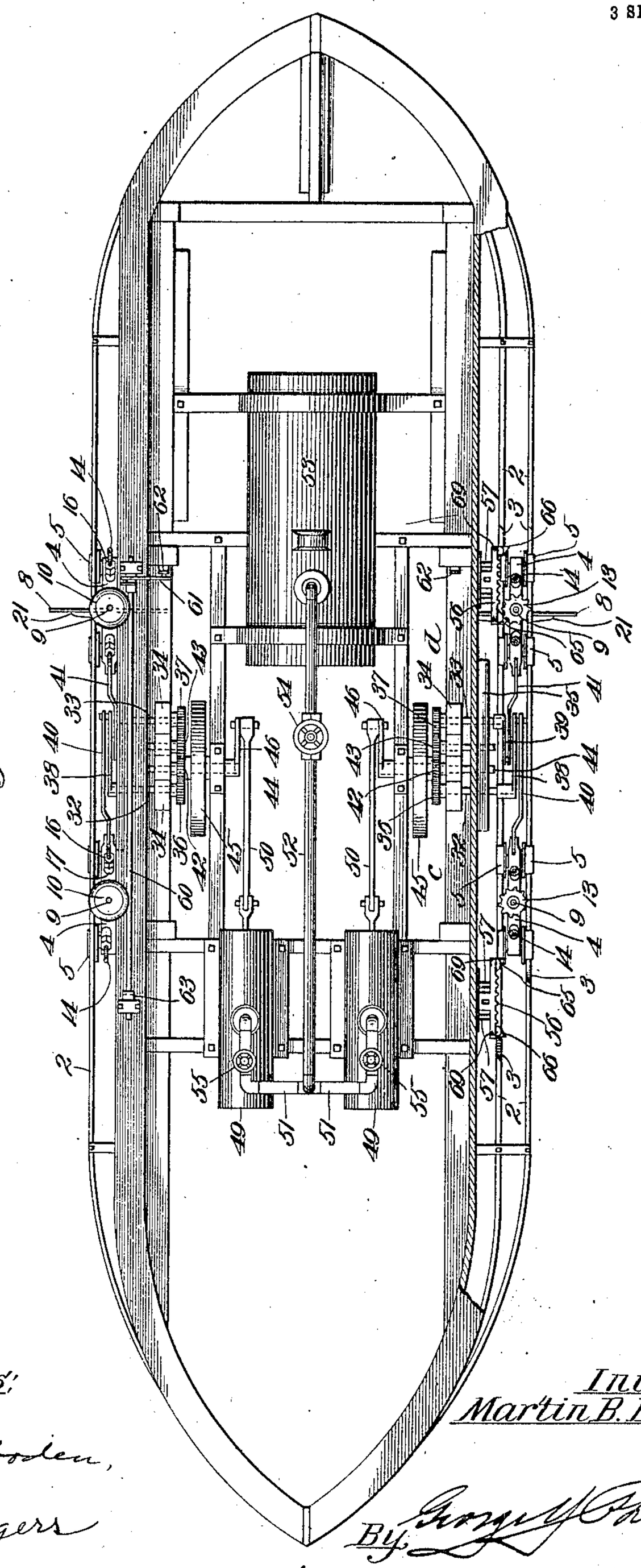
M. B. HUNTER.

VESSEL PROPELLING MECHANISM.

APPLICATION FILED FEB. 19, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

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3 SHEETS—SHEET 2.

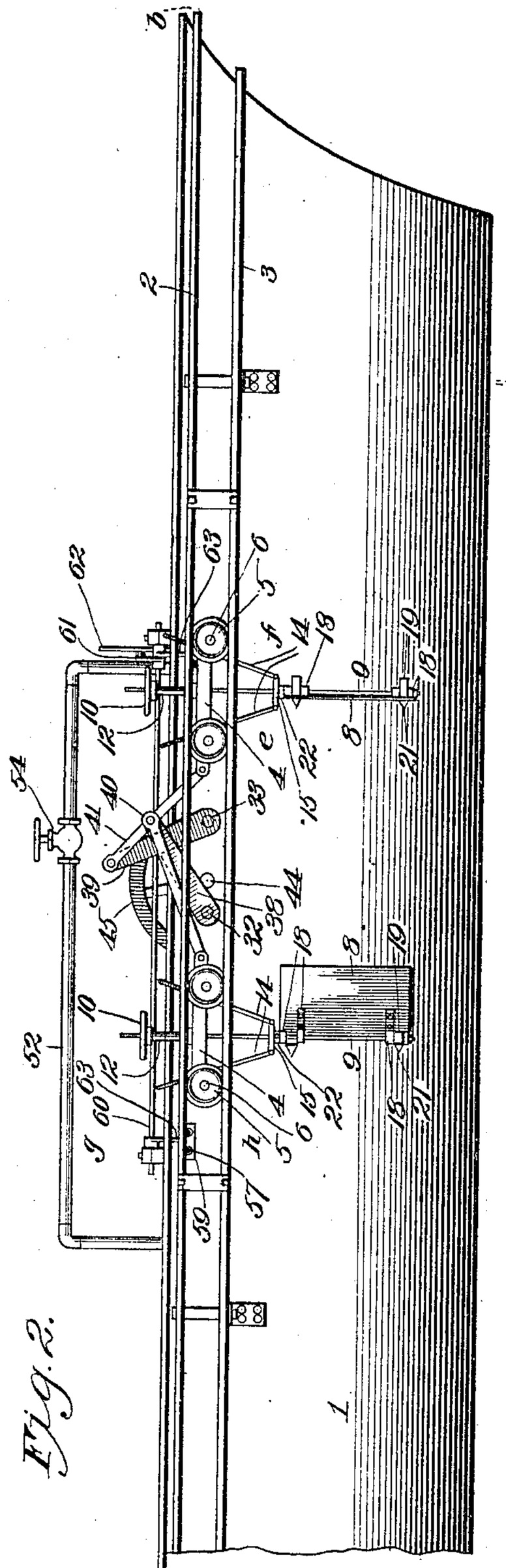

Fig. 2.

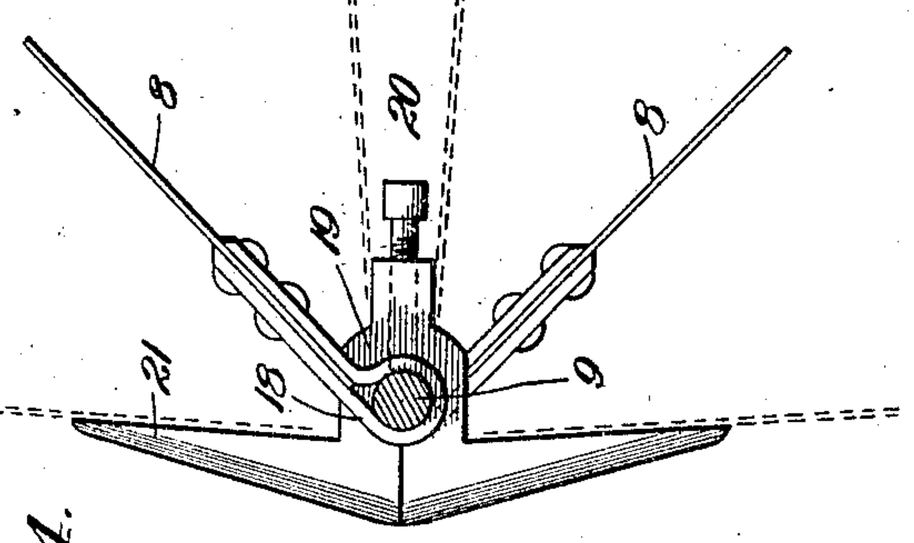

Fig. 4.

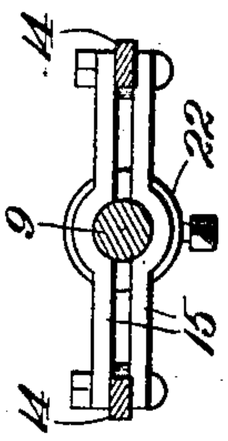

Fig. 5.

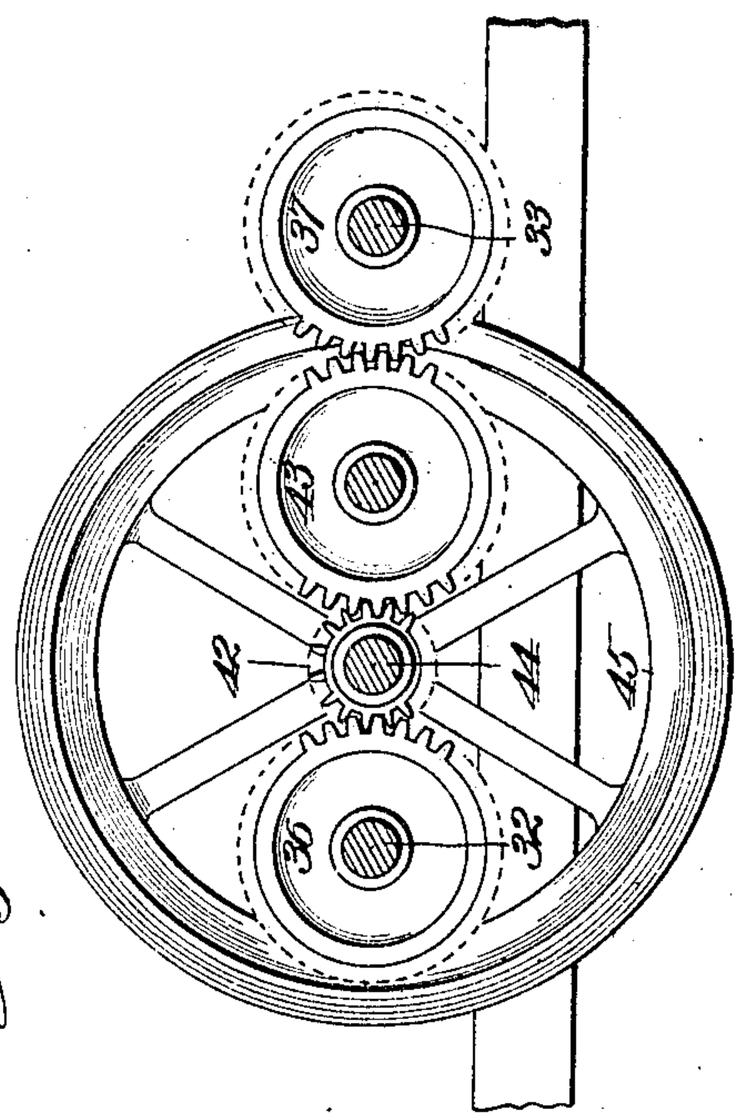

Fig. 3.

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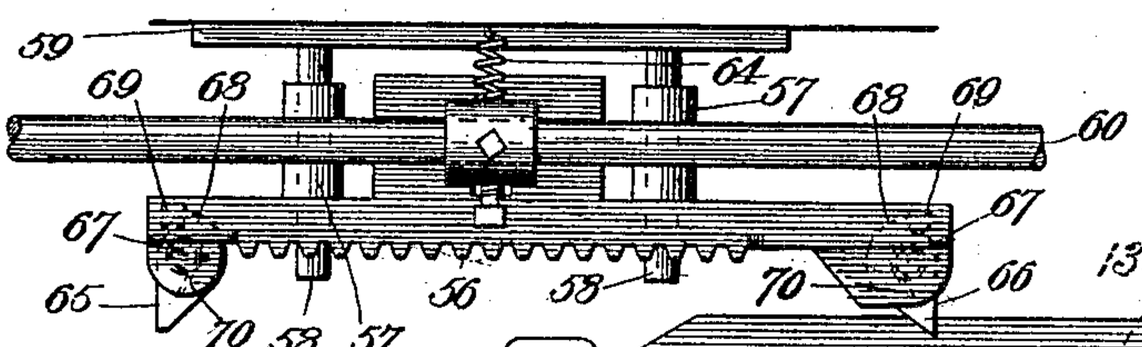
3 SHEETS—SHEET 3.

Fig. 7.



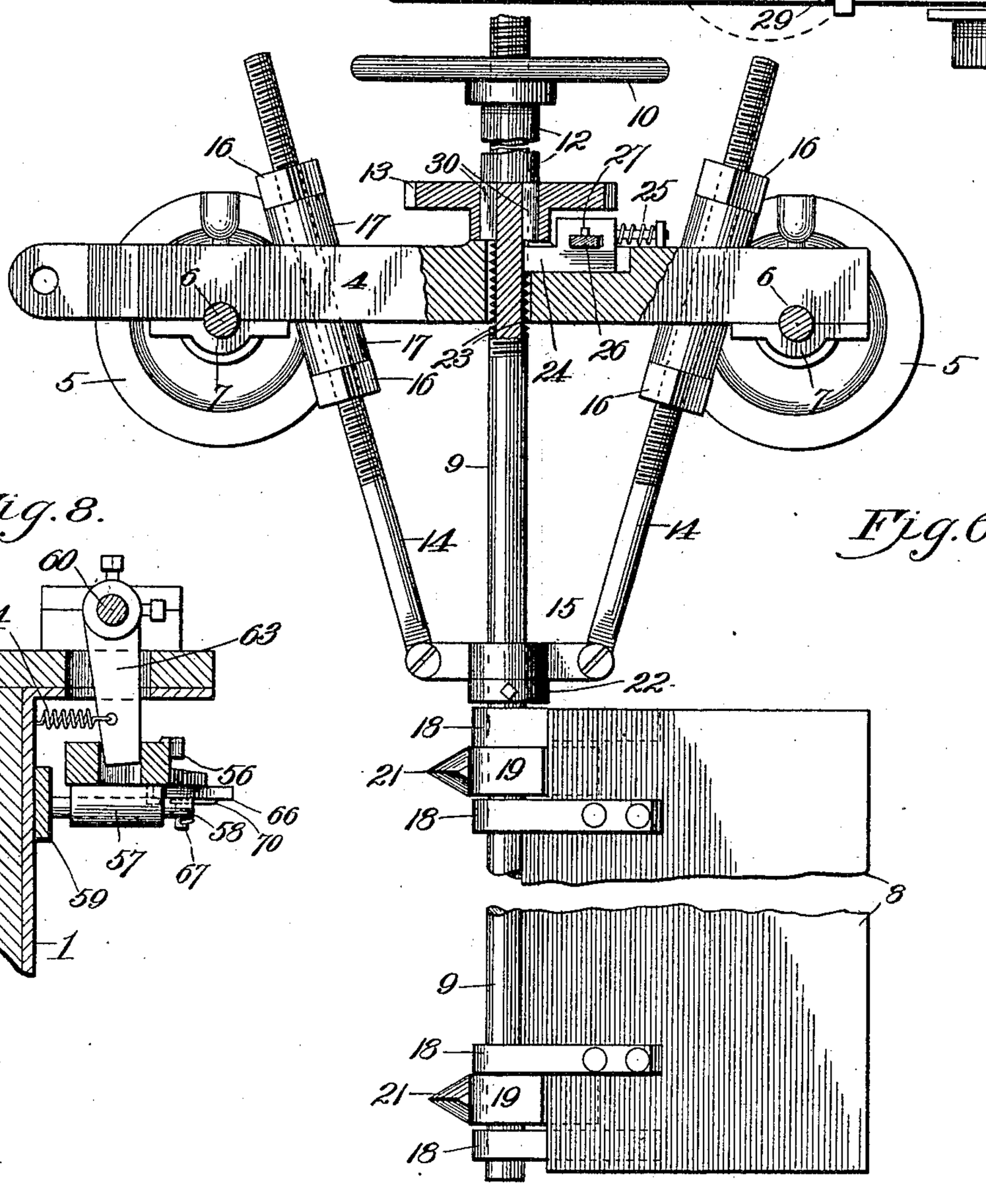


Fig. 6.

Fig. 8.

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UNITED STATES PATENT OFFICE.

MARTIN B. HUNTER, OF KANSAS CITY, MISSOURI.

VESSEL-PROPELLING MECHANISM.

No. 837,568. Specification of Letters Patent. Patented Dec. 4, 1906.

Application filed February 19, 1906. Serial No. 301,796.

To all whom it may concern:

Be it known that I, MARTIN B. HUNTER, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Vessel-Propelling Mechanism, of which the following is a specification.

My invention relates to vessel-propelling mechanism, and the general object of my invention is to obtain higher efficiency than is possible with present mechanisms of this class.

A secondary object is to provide a combined propeller and braking device—that is to say, a propeller which may be so adjusted as to materially retard the onward movement of the vessel.

A further object of the present improvement is to provide means for automatically and quickly reversing the propeller devices without reversing the direction of running of the driving-engine.

By way of comparison with side-wheel or stern-wheel propellers other objects and advantages arising from the use of my improvements will be pointed out hereinafter.

With the above-named objects in view the invention consists in certain novel and peculiar features of construction and combinations of parts, as hereinafter described and claimed, and in order that it may be fully understood reference is to be had to the accompanying drawings, in which—

Figure 1 is a plan view, partly in section on the line *a b* of Fig. 2, of a boat equipped with my improved propelling mechanism, showing the rear two sets of paddles in propelling position. Fig. 2 is a left-hand side elevation of the same, the parts being in the position shown in Fig. 1 and the forward portion of the vessel being broken away. Fig. 3 is a sectional elevation, enlarged, of the gearing for each side of the vessel, the section being on line *c d* of Fig. 1. Fig. 4 is a detail plan view, its shaft in section, of one of the pairs of paddles in a half-extended position and in open and closed positions in dotted lines. Fig. 5 is a detail sectional plan of the brace connections to the vertical shaft, the section being on line *e f* of Fig. 2. Fig. 6 is a detail side elevation, partly in section and partly broken away, of one of the propellers and its carriage. Fig. 7 is a sectional plan view of the carriage shown in Fig. 6, and the reversing-rack which coöperates with devices mounted on the carriage for reversing the propeller. In this view the gunwale of the vessel is omitted in order to expose the rack to view. Fig. 8 is an enlarged sectional detail taken on the line *g h* of Fig. 2, showing the means for shifting the reversing-rack. In both Figs. 7 and 8 the rack is shown in operative position.

1 indicates the hull of a vessel, of which the stern is at the right in Figs. 1 and 2.

2 and 3 indicate upper and lower trackways strongly secured to the sides of the hull, extending from end to end thereof and adapted to support four longitudinally-reciprocating propeller-carriages 4. Each of said carriages is provided with flanged antifriction-wheels 5, which are preferably fixed upon rotary journals 6, mounted in boxings 7. The lower trackways 3 support the carriages, while the upper trackways prevent the wheels from leaving them.

Supported by each carriage 4 are two paddles 8, which are mounted, preferably, as shown in Figs. 4 and 6. A vertical shaft 9 passes loosely through an opening in the carriage 4, which is shown as a solid block. The upper portion of said shaft is threaded, and mounted thereon is an internally-threaded hand-wheel 10, the hub of which rests upon a sleeve 12, which rests upon a pinion 13, which in turn rests upon the carriage. Thus the weight of the shaft 9 and the parts supported by it is transmitted to the hand-wheel 10, and it is evident that by turning this wheel in one direction or the other the shaft 9 will either be raised or lowered, the object of which will be stated hereinafter.

The shaft 9 is braced at a point below its carriage by two threaded braces 14, the lower ends of which are connected to a clamp 15, which embraces said shaft loosely enough to permit rotation and vertical adjustment thereof. The braces 14 pass upwardly through slots in the carriage and are provided with nuts 16 above and below the same, tubular bosses 17 being interposed between the nuts and the carriage, as shown. When shaft 9 is raised or lowered, the braces 14 may be correspondingly raised or lowered by readjusting the nuts 16.

The paddles 8 are loosely attached to the shaft by means of straps 18, riveted or bolted to the paddles. These straps are supported by blocks 19, rigidly fixed upon the shaft by set-screws 20. Said blocks are provided with integral laterally-projecting arms 21,

which act as stops to arrest the rotary movement of the paddles when they assume a transverse or open position in operation.

A collar 22, provided with a set-screw, may be placed upon the shaft below the clamp 15 for supporting the braces when the latter are raised and before the upper nuts are run down.

Two diametrically opposite keyway-grooves 23 are cut in the upper portion of the shaft 9. A latch or dog 24 is slidably mounted in a deep groove cut in the carriage-block and is pressed inwardly against the shaft by a spring 25, and its inner end engages one or the other of the keyway-grooves 23. A portion of said latch projects above the top of the carriage, and this portion is provided with a slot, through which extends a latch-operating lever 26. Means are provided for preventing longitudinal motion of said lever. As shown, studs 27 have this effect. Projecting upwardly in contact with the inner edge of lever 26 are two fulcrum-studs 28 and 29. When the inner end (in Fig. 7 the upper end) of said lever is forced laterally in either direction, it is obvious that the latch or dog 24 will in either case be retracted from the keyway-groove in the shaft, either stud 28 or stud 29 acting as a fulcrum according to the direction in which lever 26 is moved.

The pinion 13, hereinbefore referred to, is secured on shaft 9 by a pair of keys 30, and when turned one-half a revolution reverses the facing direction of the paddles carried by said shaft. Before describing the means by which said pinion is turned to effect such reversal of the paddles the mechanism for operating the two carriages at each side of the vessel will be described.

Two transverse crank-shafts 32 and 33 are journaled in bearings 34 and in a head-block 35, secured to the outer side of the hull. Fixed upon the inner ends of said shafts, respectively, are cog-wheels 36 and 37, and fixed upon the outer ends of these shafts, respectively, are cranks 38 and 39. The forward crank 38 is pivotally connected to the forward carriage 4 by a pitman 40, and the aft crank 39 is pivotally connected to the aft carriage 4 by a pitman 41. As shown in Fig. 1, these pitmen 40 and 41 are bent intermediate their ends, the effect of which is to permit the trackways to lie closer to the side of the vessel, and in the case of the inner crank-arm the bending is necessary in order that the pitman may have proper connection to its carriage. The aforesaid cog-wheel 36 is driven by a cog-wheel 42, preferably of smaller diameter if the engines employed are small and of high speed. This cog-wheel or pinion 42 drives also a reversing cog-wheel 43, which meshes with the cog-wheel 37 on the other crank-shaft 33. The driving-wheel 42 is fixed upon a main crank-shaft 44, which is provided with a fly-wheel 45 and an engine-crank 46. Thus when this shaft is rotated the two crank-shafts 32 and 33 will be turned in opposite directions, owing to the action of the reversing-wheel 43.

49 indicates an engine-cylinder, the piston-rod of which is connected to a connecting-rod 50, which is connected to the crank 46. The engines shown are a special type of steam-engine having trunk-pistons and no valve-chests; but motors of any kind may be employed.

The mechanism above described is exactly duplicated upon the opposite side of the vessel, and the same reference characters indicate corresponding parts. There are two engines placed side by side. Their cylinders are connected by pipes 51 to a steam-supply pipe 52, which runs to a steam-generator 53. In the main pipe 52 is provided a hand or throttle valve 54, and in the respective branch pipes 51 are hand-valves 55. The operation of said valves will start and stop the engines. Normally both of the engines are operated simultaneously, though one of them may be started or stopped before the other.

By reference to Fig. 2 it will be seen that the cranks 38 and 39 are so set that when in operation one of them draws the forward propeller-carriage rearwardly while the other crank draws the rear propeller-carriage forward. Then when the cranks have passed the "dead-center" points the one pushes the forward carriage forwardly, while the other pushes the rear carriage rearwardly. In Fig. 2 the forward carriage has just started upon its forward stroke, and its paddles 8 of course fold together and trail backwardly. The rear carriage has proceeded a little farther on its active stroke, and the reaction of the water upon the paddles spreads them apart, as shown, so that their full surface is directed perpendicularly to the direction of thrust. The operation of the paddles at the other side of the vessel is the same, and the forward paddle at the opposite side should operate simultaneously and in the same direction, likewise the rear paddles.

As heretofore stated, the direction of propulsion may be reversed without reversing the engines. This is accomplished as follows: Each vertical shaft, as aforesaid, carries a pinion 13. Directly in the path of each of these pinions, which are reciprocated, as shown, is placed a toothed rack 56, which is immovable longitudinally but has a limited freedom of movement in and out—*i. e.*, toward or from the pinion. The normal position of the rack is such that the pinion, as it is carried past it, will escape engagement therewith by a fraction of an inch. As shown in Fig. 7, the rack 56 is provided with sleeves 57, which are slidably mounted on outwardly-projecting guides 58, strongly secured to a plate 59, which is secured to the side of the vessel be-

low the gunwale. Upon the gunwale, preferably, is mounted a longitudinal rock-shaft 60. This is connected by a rod 61 with an operating-lever 62, which is within easy reach of the engineer. An arm or finger 63, fixed upon said rock-shaft, engages the rack 56, preferably as shown in Fig. 8, in such a manner that when the rock-shaft is turned in the proper direction the rack will be thrust outwardly, so as to engage the pinion 13 when the latter arrives at one of two points in its path. The rack is yieldingly held in its normal inoperative position by any suitable means. As shown, a spring 64 performs this function. The number of teeth in the rack is such as will rotate the pinion exactly one-half a revolution. It is understood that each rock-shaft 60 operates both the racks 56 on the same side of the boat.

The purpose of the above-described latch 24 is to prevent rotation of the vertical shaft 9 during the normal operation of the propellers, and the purpose of the device for retracting the latch is to permit said shaft to be turned half-way around by the engagement of the pinion 13 with rack 56, when it is desired to reverse the facing direction of the paddles. Hence to operate the latch-lever 26 automatically I provide two abutments 65 and 66, preferably mounted on the rack itself, so as to move therewith and not be struck by the latch-lever 46, except when necessary. These abutments act as such with respect to the latch-lever when the latter impinges upon them from the outside, but when struck upon their inner faces they will yield and will not displace the latch-lever. To this end the abutments are mounted pivotally on studs 67 and are formed with shoulders 68, which are normally in contact with stop-lugs 69, being pressed thereon by light torsion-springs 70, which permit the abutments to yield or turn when struck by the latch-lever upon the inner sides. If the abutments were made immovable, the latch 24 would always be disengaged after the shaft 9 had been reversed, and the propeller-paddles would be liable to turn askew. The abutments are set at such points that they will release the shaft 9 just before the pinion 31 strikes the end tooth of the rack. Thus by a simple movement of lever 62 the engineer may reverse the action of the propellers at one side of the vessel and by operating the duplicate lever 62 at the opposite side of the vessel (controlling duplicate mechanism) the opposite paddles may be reversed.

When all four sets of paddles are reversed in as quick succession as possible and then the engines stopped, it is obvious that the outspread paddles will then form a very efficient brake and will rapidly arrest the motion of the boat through the water, or the engines may continue to run, and the paddles in that case will simply "back water."

The vessel may be turned in its course without turning the tiller. (Not shown.) This is effected by simply stopping one of the engines until the vessel has changed its course sufficiently.

My object in providing means for adjusting the propeller vertically is to provide for the paddles being submerged to about the same depth regardless of the varying load carried by the vessel. For example, if the load be increased the hull sinks lower. In that case the paddles may be raised by turning the hand-wheels 10 in the proper direction.

With the old "wheel" propellers there was a large waste of power, as is well known, owing partly to what may be termed "backlash" of the water and partly to the fact that the wheel has to travel always at an angle to the ideal angle of the application of power, and, further, perhaps, to the fact that a considerable quantity of water is elevated by such propellers in operation. None of these faults can be predicated of my straight reciprocating propellers. No water is raised by them and none depressed.

There is a continuous propulsion, as one set of paddles is always commencing a stroke when the other set has come to the end of a stroke. The intermediate cog-wheels 43 might be dispensed with, as the cranks 38 and 39 could be set so as to operate the carriages in the same manner as described, though the cranks would in that case have to be shortened.

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

1. In vessel-propelling mechanism, the combination of a reciprocatory carriage, a shaft carried thereby, one or more propelling-paddles carried by the shaft, a latch mechanism for holding the shaft rigid with relation to the carriage, means for rotating the shaft a half-revolution to face the paddle or paddles in a new direction, and means for automatically disengaging the latch mechanism to release said shaft preliminary to its rotary adjustment.

2. In vessel-propelling mechanism, the combination of a reciprocatory carriage, a shaft carried thereby, one or more propelling-paddles carried by the shaft, a latch mechanism for holding the shaft rigid with relation to the carriage, means for tripping the latch from engagement with the shaft when the carriage is moving in one direction, means for tripping the latch from engagement with the shaft when the carriage is moving in the opposite direction, and means for normally holding said latch-tripping mechanism in inoperative position with respect to said latch mechanism.

3. In vessel-propelling mechanism, the combination of a rotary shaft provided with one or more propeller-paddles, a reciproca-

tory carriage carrying said shaft, yieldingly-actuated means for holding said shaft normally rigid with the carriage, and means for automatically causing said shaft-rotating means to release the shaft.

4. In vessel-propelling mechanism, the combination of a rotary shaft provided with one or more propeller-paddles, a reciprocatory carriage carrying said shaft, yieldingly-actuated means for holding said shaft normally rigid with the carriage, means for automatically causing said shaft-holding means to release the shaft, and means for rotating said shaft one hundred and eighty degrees while free to turn.

5. In a vessel-propelling mechanism, the combination of a reciprocatory carriage, a shaft carried thereby and equipped with one or more propelling-paddles adapted to face forwardly or rearwardly with respect to the course of the vessel, and provided at opposite sides with grooves, a latch carried by the carriage and normally engaging one of said grooves, means for withdrawing said latch from the groove, means to rotate said shaft one hundred and eighty degrees, and means for forcing said latch into the other groove of the shaft when said groove registers with said latch, to lock the shaft from further rotation.

6. In a vessel-propelling mechanism, a reciprocating carriage, a shaft carried thereby and equipped with one or more propelling-paddles to face forwardly or rearwardly with respect to the course of the vessel, a latch for locking said shaft against rotative movement, a pinion rigid with the shaft, a rack carried by the vessel, means for disposing said rack in the path of said pinion, and devices carried at each end of the rack and immovable as to inward but movable as to outward movement, and one of them adapted to trip the latch in the forward and the other in the rearward movement of the carriage.

7. In a vessel-propelling mechanism, a reciprocatory carriage, a shaft carried thereby and provided with one or more propelling-paddles, means for holding said shaft with the paddle or paddles facing rearwardly, a pinion rigid with said shaft, a rack for engagement with said pinion, a lever to move said rack toward the plane of movement of the pinion, means carried by the rack for unlocking said shaft preliminary to the engagement of its pinion by said rack, means for locking the shaft in its new position after being turned one hundred and eighty degrees through the engagement of said pinion and rack, and means for withdrawing the rack from the path of the pinion after the latter has been turned.

8. In a vessel-propelling mechanism, a reciprocable carriage, a vertical rotatable paddle-carrying shaft carried thereby, a pinion keyed upon the shaft, a latch normally preventing rotation of the shaft, a yieldingly-retracted rack mounted on the side of the vessel, means for overcoming the yielding resistance of said rack and moving it toward the carriage, and a pivoted abutment mounted on the end of the rack in position to act upon the latch by the movement of the carriage and thereby unlock said shaft just prior to the engagement of the rack by the pinion, and means to lock the shaft in its new position.

9. In a vessel-propelling mechanism, a paddle-supporting carriage, means for reciprocating the carriage longitudinally of the vessel, a vertical shaft upon which the paddles are mounted, parts rigidly carried by said shaft, and means carried by said shaft, in combination with means adapted to coöperate therewith and normally inoperative, but controllable by an operator, for automatically causing a reversal of the facing direction of the paddles by rotating said shaft through an arc of one hundred and eighty degrees.

10. In vessel-propelling mechanism, the combination of a reciprocating paddle-supporting carriage, a vertical paddle-supporting shaft carried by the carriage, a pinion keyed upon said shaft, a latch normally engaging a keyway in said shaft, a latch-releasing lever mounted on the carriage, a rack engageable with said pinion during a reciprocation of the carriage, and adapted to impart a half-rotation to said pinion, said rack being normally in such a position that it will not be engaged by the pinion, means for moving the rack to operative position at the will of an operator, and devices mounted upon the rack for engaging said latch-releasing lever and thereby unlatching the shaft just prior to engagement of the pinion with the rack.

In testimony whereof I affix my signature in the presence of two witnesses.

MARTIN B. HUNTER.

Witnesses:
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