

May 22, 1962

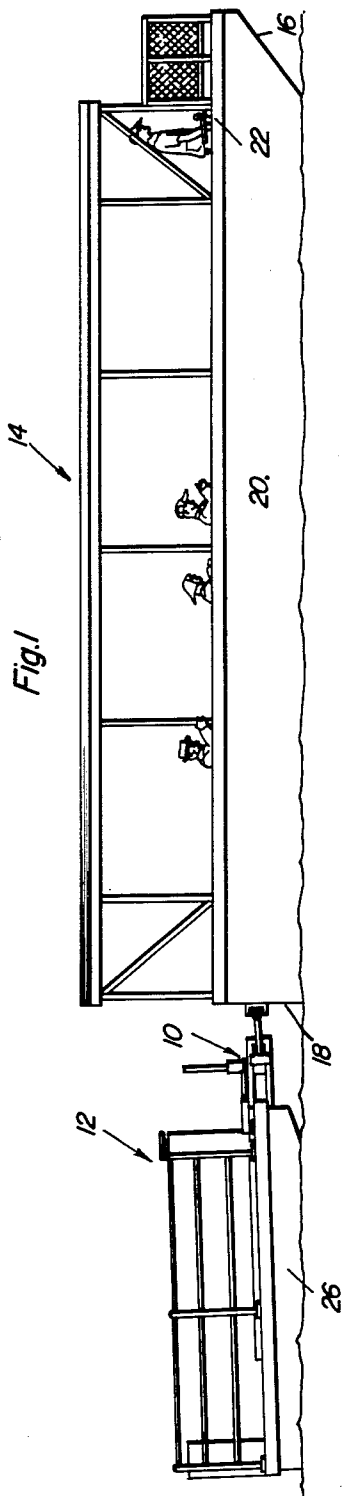
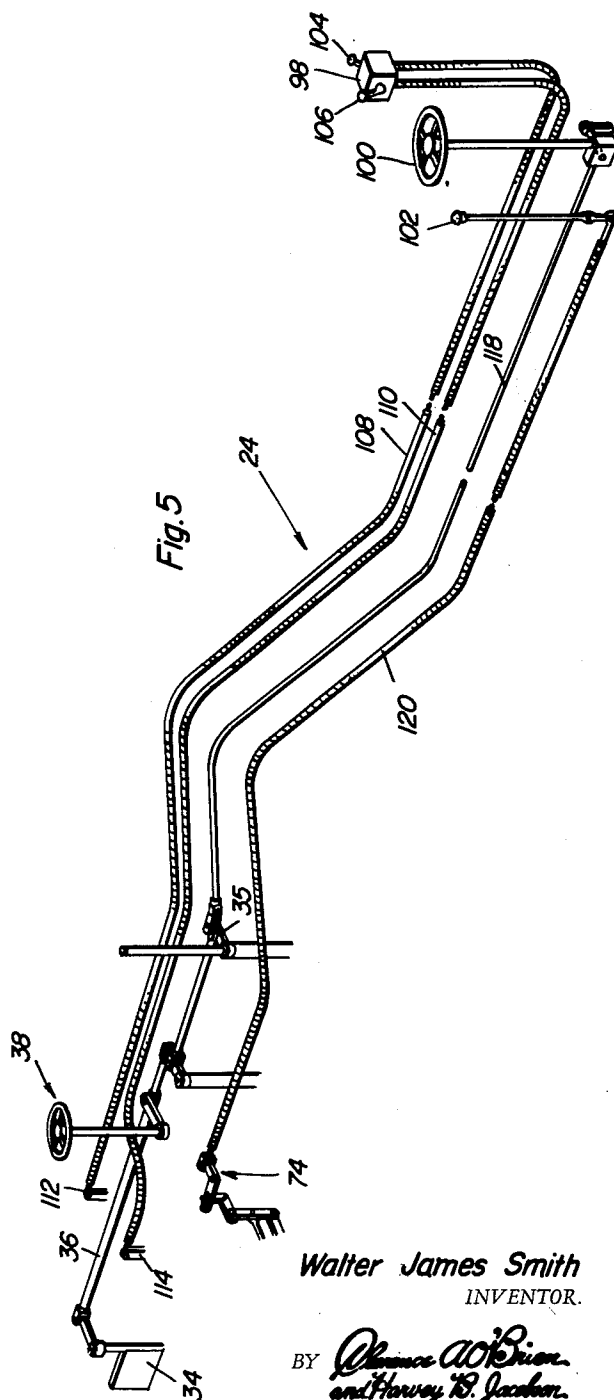
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STEERING CONNECTION BETWEEN A BARGE AND A PUSHER TUG

Filed Sept. 22, 1959

4 Sheets-Sheet 1



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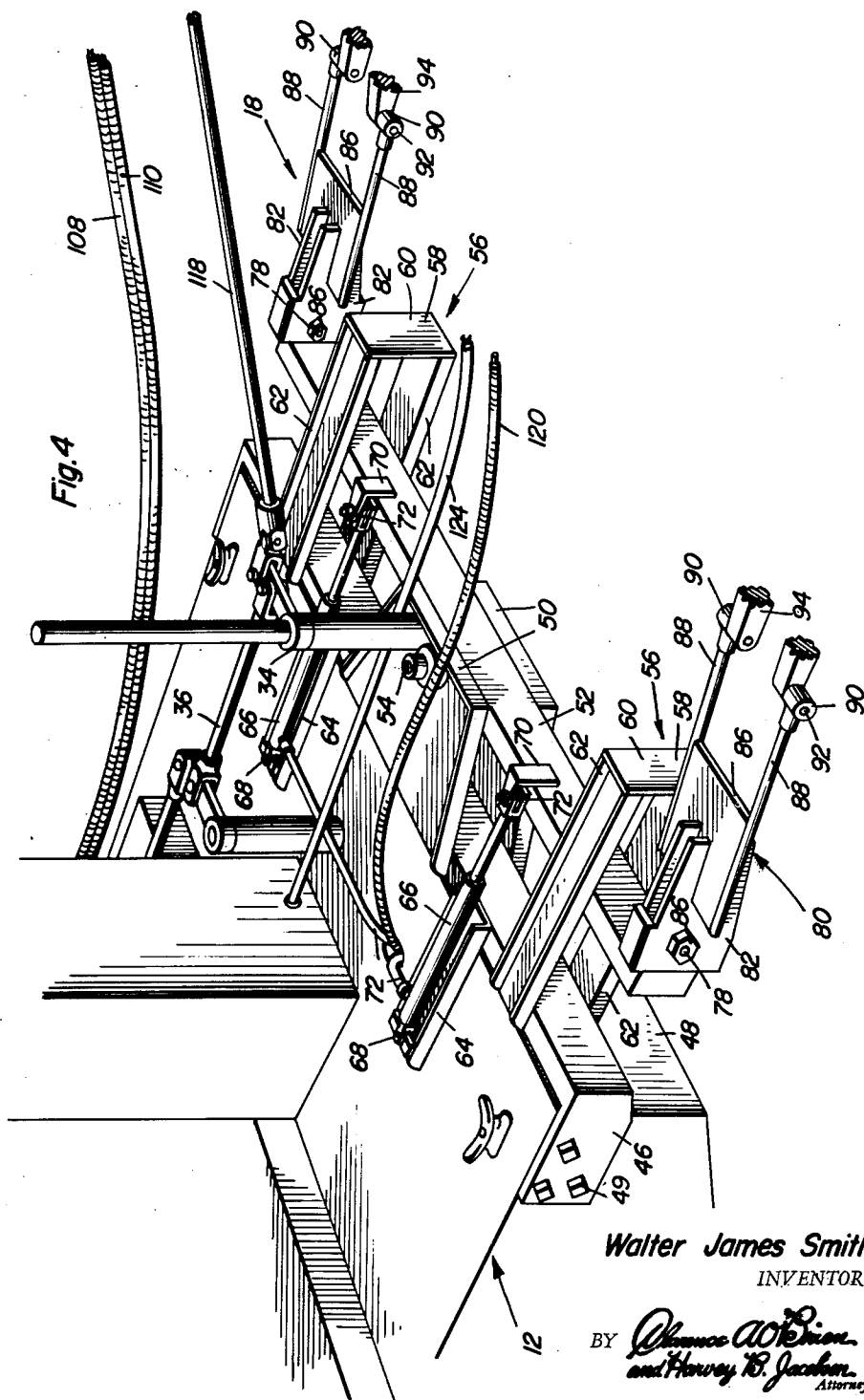
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STEERING CONNECTION BETWEEN A BARGE AND A PUSHER TUG

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4 Sheets-Sheet 3



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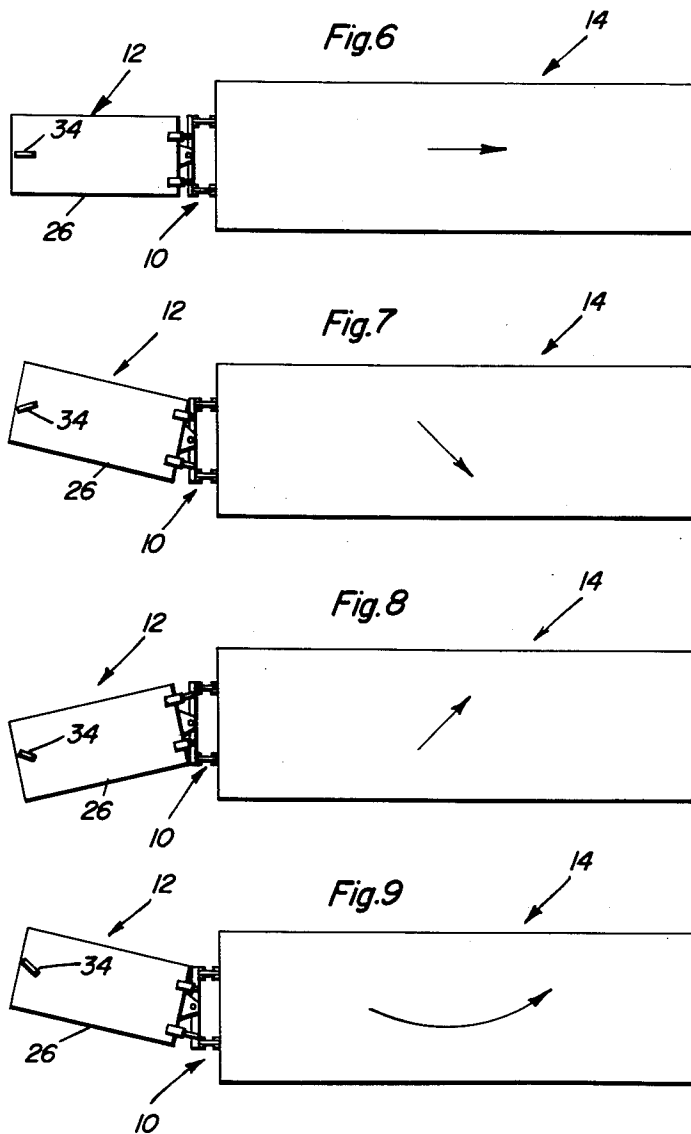
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STEERING CONNECTION BETWEEN A BARGE AND A PUSHER TUG

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4 Sheets-Sheet 4



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3,035,537

**STEERING CONNECTION BETWEEN A BARGE
AND A PUSHER TUG**

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13 Claims. (Cl. 114—236)

This invention relates to a steering connection and more particularly to a steering connection which is adapted to be secured between a pusher tug and a barge for the purpose of pivoting the barge with respect to the pusher tug about a vertical axis.

When a pusher tug is rigidly secured to a barge in alignment therewith for the purpose of propelling the barge, it becomes extremely difficult at times, especially in the presence of high winds, to steer the barge and the tug with the rudder control of the pusher tug alone. If the pusher tug is secured in alignment with the barge, the combined areas of the sides of the pusher tug and barge turning through the water makes it very difficult to maneuver the vessel through other than very gradual turns.

Although the rudders utilized on conventional tug vessels are designed whereby a substantial amount of the thrust from a propeller may be diverted to one side or the other, a large portion of the thrust of the tug is wasted by diverting the thrust of the water from the propeller.

The present invention incorporates the use of a steering mechanism secured between a pusher type tug and a barge for the purpose of pivoting the barge with respect to the tug about a vertical axis whereby the combined vessels may be steered by pivoting the tug with respect to the barge as well as by the rudder control of the pusher tug. Furthermore, as will be hereinafter set forth, it enables the pusher tug to be pivoted with respect to the barge in one direction and the rudder control of the pusher tug to be pivoted in the opposite direction whereby the thrust of the pusher tug propelling the barge will effect the movement of the combined vessels through the water in an angulated direction with respect to the longitudinal center line of the barge.

The main object of this invention is to provide a steering connection between a pusher tug and a barge for steering the combined vessels without the operation of the rudder control of the pusher barge as well as in combination with the latter if it becomes necessary to execute relatively tight turns.

A further object, in accordance with the preceding object, is to provide a steering connection which may be remotely controlled from either the barge or the pusher tug.

Still another object is to provide a means whereby the pusher tug is pivotally secured to the barge about a horizontal axis whereby the two vessels may be pivoted slightly with respect to each other should a rough sea be encountered.

Yet another object of this invention is to provide a means for limiting the pivotal movement of the tug about a vertical axis with respect to the barge.

A final object to be specifically enumerated herein is to provide a steering connection that will conform to conventional forms of manufacture and be readily disengageable from the barge so as to provide a device that will be economically feasible and adapted for use with numerous vessels as well as a device which will enable the pusher tug to be operated by itself.

These, together with other objects and advantages which will become subsequently apparent, reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

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FIGURE 1 is a side elevational view of the steering connection shown mounted between a pusher tug and a barge;

FIGURE 2 is an enlarged top plan view of the steering connection shown mounted between the pusher tug and the barge, parts of the barge being broken away;

FIGURE 3 is an enlarged transverse vertical sectional view taken substantially upon the plane indicated by the section line 3—3 of FIGURE 2;

FIGURE 4 is an enlarged perspective view of the steering connection showing the manner in which it is secured to the pusher tug, parts of the connecting elements and the barge being removed;

FIGURE 5 is an enlarged perspective perspective view of the remote controls for operating the pusher tug and the steering connection from the barge;

FIGURES 6 through 9 are top plan schematic views of the barge and the pusher tug with the steering connection disposed therebetween on a reduced scale showing the positions of the rudder of the pusher barge and the steering connection when the combined vessels are being propelled directly forward, diagonally to the right, diagonally to the left, and through a left-hand turn, respectively, the positions of the steering connection and the rudder of the pusher tug being reversed from FIGURE 9 during a turn to the right.

Referring now more specifically to the drawings, the numeral 10 generally designates a steering connection comprising the present invention which is adapted to be secured between a pusher tug generally designated by the reference numeral 12 and a barge generally designated by the reference numeral 14.

The barge 14 may be constructed of any conventional design having a bow 16 and a stern 18 interconnected by a pair of spaced sides 20 and a bottom (not shown). The barge 14 may be utilized for any desired purpose and outfitted in accordance therewith. Conveniently, the barge 14 may also be provided with a control station 22 for the purpose of remotely controlling the power supply and steering mechanism of the barge 12 remotely by means of a control system generally designated by the reference numeral 24 (see in particular FIGURE 5).

The barge 12 may be provided with any conventional form of hull 26 having disposed therein a conventional form of power supply generally designated by the reference numeral 28 which is operatively connected to a propelling mechanism preferably including a propeller 30. A steering mechanism, generally referred to by the reference numeral 32, is provided and includes a rudder 34 of conventional design which is operatively connected to a steering arm 35 by means of control shaft 36. The tug 12 is also provided with a steering control generally referred to by the reference numeral 38 which is operatively connected to the control shaft 36 for the purpose of steering the pusher tug 12 while aboard the same. The pusher tug 12 is also provided with a hydraulic pump mechanism generally referred to by the reference numeral 40, which is driven by means of power output shaft 42 and a flexible belt 44.

With attention now directed more particularly to FIGURES 2 through 4 of the drawings, it will be noted that the steering connection 10 comprises a mounting beam 46 which is secured to the bow 48 of the pusher tug 12 by any convenient manner such as fasteners 49. Secured to the mounting beam 46 and extending towards the barge 14 is a pair of vertically spaced mounting plates 50 between which a transversely extending steering bar 52 is pivotally secured intermediate its ends for pivotal movement about a vertical axis by means of pivot shaft 54. The pivot shaft 54 is passed through suitable apertures (not shown) formed in the mounting plates 50 and the steering bar 52 with its opposite ends secured

through the remote surfaces of the mounting plates 59 by any convenient means. Also secured to the mounting beam 46 is a pair of guide means generally referred to by the reference numeral 56, each comprising a U-shaped horizontally disposed guiding element 58 having a bight portion 60 and two leg portions 62 with the free ends of the latter secured to the mounting beam 46 and with the opposite end portions of the steering bar 52 slidably disposed between the leg portions 62 of each guiding element 56.

It is to be noted, with attention directed more particularly to FIGURES 7 through 9 of the drawings, that the mounting beam 46 and the bight portions 60 of each of the guiding elements 58 serve to limit the pivoting movement of the steering bar 52 between two limit positions.

Secured to the pusher tug 12 by means of mounting brackets 64 are a pair of extensible motors 66, each of which has one end pivotally secured to one of the mounting brackets 64, as at 68. The other end of each of the extensible motors 66 is pivotally secured to a mounting bracket 70, as at 72, and it may be seen that the steering bar 52 may be pivoted about the pivot shaft 54 upon the operation of the extensible motors 66. The extensible motors 66 are of the hydraulic type and have secured thereto hydraulic lines 72 which are operatively connected to the hydraulic pump mechanism 40. A control, generally designated by the reference numeral 74, may be operated by means of flexible cable 120 to direct fluid pressure from the hydraulic pump mechanism 40 to either of the extensible motors 66, thereby effecting rotation of the steering bar 52 about pivot shaft 54.

Secured to the opposite ends of the steering bar 52 by means of a pair of pivot bolts 78 are a pair of rocker arm assemblies generally designated by the reference numeral 80. Each of the rocker arm assemblies 80 includes a pair of spaced plates 82 which are disposed on opposite sides of the right angled end portions 84 (see FIGURE 3) of the steering bar 52. The pivot bolt 78 is passed through suitable apertures (not shown) formed in the spaced plates 82 and the end portions 84, with the opposite ends secured through the remote surfaces of the spaced plates 82 by means of suitable fasteners 86. Secured to each pair of spaced plates 82 is a horizontally disposed mounting plate 86 which has secured to opposite side edges thereof by any convenient means a pair of connecting arms 88 which extend therefrom towards the barge 14 and have provided on their end portions rubber mounted sockets 90 in which are secured pivot bolts 92 which are also secured through outwardly projecting mounting lugs 94 which extend outwardly from mounting plates 96 which are secured to the stern of the barge 14 by any convenient manner. Pivot bolts 78 and 92 extend transversely of the tug 12 and are disposed horizontally, thereby enabling pivotal movement of the barge 14 with respect to the tug 12 about a horizontal axis, which pivotal movement is desired when operating the pusher tug and barge combination in rough water.

With particular attention now directed to FIGURES 2, 4 and 5, it will be noted that there is provided in the barge 14 at point 22 controls for operating the power supply 28, the rudder 34, and the hydraulic controls 74 which are designated by the reference numerals 98, 100 and 102, respectively, all of which form a part of the remote control mechanism 24. Control 98 includes a throttle control 104 and a shift control 106 that are connected to flexible cables 108 and 110 connected to the throttle control 112 and shifting mechanism 114 of the transmission 116, respectively. Control 100 is operatively connected to steering arm 35 by means of connecting shaft 118 and control 102 is operatively connected to the hydraulic control mechanism 74 by means of flexible cable 120.

It is to be understood that the shaft 118 may be readily disconnected from the steering arm 35 and that

the flexible cables 108, 110 and 120 may be provided with suitable connectors (not shown) adjacent the steering connection 10 which may be also readily disconnected.

Further, it is to be understood that there may be provided a junction box 122 on the stern 18 of the barge 14, see FIGURE 2, in which the ignition wires (not shown) for the power supply 28 housed in the cable 124 may be readily disconnected from the barge 14. Still further, it is to be understood that the ignition wires (not shown) extend from the junction box 122 forward in the barge 14 to the point 22 wherein the ignition controls (not shown) may be also operated from a point adjacent the controls 100 through 104.

With particular attention now directed to FIGURES 6 through 9, the operation of the combined pusher tug 12 and barge 14 is as follows:

In FIGURE 6, it will be noted that the steering connection 10 is in an intermediate position with the tug 12 in longitudinal alignment with the barge 14 and that the rudder 34 of the tug 12 is also in an intermediate position, allowing the thrust of the tug 12 to be directed rearwardly in a line parallel to the longitudinal center lines of the tug 12 and the barge 14, resulting in straightforward movement of the combined vessels as is designated by the arrow. It is to be understood that with the steering connection 10 in this position that the rudder 34 may be turned to one side or the other to steer the combined vessels as is customary.

With particular attention now directed to FIGURE 9 of the drawings, it will be noted that the steering connection 10 has been actuated to pivot the rear end of the tug 12 to the left as seen from the left side of FIGURE 9, and also that the rudder 34 of the tug 12 has also been inclined to the left. Not only does the inclination of the tug 12 with respect to the barge 14 result in an angulated thrust to turn the combined vessels to the left, but the inclination of the rudder 34 further increases the lateral thrust of the tug 12 to turn the combined vessels in a tighter turn to the left. It is to be understood that upon the reverse inclination of the tug 12 with respect to the barge 14 and the reverse inclination of the rudder 34 with respect to the tug 12 that the turn of the combined vessels would be to the right as seen from the left side of FIGURE 9.

With attention now directed more particularly to FIGURE 7 of the drawings, it will be noted that the steering connection 10 has been actuated to incline the rear of the tug 12 to the left while the rudder 34 of the tug 12 has been inclined to the right with respect thereto. Thus, the lateral thrust of the tug being inclined to the left has been offset equally by the inclination of the rudder 34 to the right whereby the passage of the hull 26 of the tug 12 through the water will effect a lateral force against the left side of the hull 26, resulting in the angulated movement in a straight line of the combined vessels, as indicated by the arrow.

With attention directed now more particularly to FIGURE 8 of the drawings, it will be noted that the inclination of the tug 12 and the rudder 34 has been exactly reversed from that which is shown in FIGURE 7, and therefore the direction of the combined vessels is angulated to the left in a straight line as indicated by the arrow in FIGURE 8.

Although the positions of the steering connections 10 combined with the positions of the rudders 34 in FIGURES 7 and 8 would not normally be used, in some instances, especially when pulling up to and away from a dock, maneuvering of this type by the combined vessels is highly desirable.

Thus, it may be seen that herein is described a steering connection which may be secured between a pusher tug and a barge that will greatly assist in increasing the maneuverability of the combined vessels in the conventional manner as well as enable the maneuverability of the combined vessels in a manner heretofore impossible.

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The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. In combination with a load and a pushing vehicle adapted to travel over a supporting medium, a steering connection comprising an elongated steering bar pivotally secured intermediate its ends for rotation about a vertical axis to said pushing vehicle and extending transversely thereof and between said pushing vehicle and said load, connecting means securing the opposite ends of said steering bar to said load and for rotation relative to said load about axes generally paralleling the longitudinal axis of said steering bar whereby the load will pivot with said bar, and power means secured between said steering bar and said pushing vehicle for pivoting said bar relative to said pushing vehicle, said pushing vehicle disposed rearwardly of said load and provided with steering means at the rear end thereof adapted for engagement with said medium to effect lateral thrust on the rear end of said pushing vehicle, guides adapted to be secured to said pushing vehicle and slidably engaging the opposite end portions of said steering bar for guiding the pivotal movement of the latter in a horizontal plane.

2. The combination of claim 1 wherein said power means includes extensible motors adapted to be secured between the opposite end portions of said steering bar and said pushing vehicle.

3. The combination of claim 2 wherein said extensible motors comprise hydraulic cylinders, each having one end pivotally secured to said steering bar and the other end adapted to be pivotally secured to said pushing vehicle.

4. The combination of claim 1 wherein said guides include limit stops for limiting the pivotal movement of said steering bar between two limit positions.

5. The combination of claim 1 wherein said connecting means comprises rocker arms adapted to be secured between opposite end portions of said steering bar and said load.

6. The combination of claim 5 including means on each of said rocker arms pivotally securing one end to an end portion of said steering arm for movement about a horizontal axis extending longitudinally thereof and means on the other end of each of said rocker arms adapted to pivotally secure said other end to said load.

7. In combination with a load and a pushing vehicle adapted to travel over a supporting medium, a steering connection comprising an elongated steering bar pivotally secured intermediate its ends for rotation about a vertical axis to said pushing vehicle and extending transversely thereof and between said pushing vehicle and said load, connecting means securing the opposite ends of said steering bar to said load and for rotation relative to said load about axes generally paralleling the longitudinal axis of said steering bar whereby the load will pivot with said bar, and power means secured between said steering bar and said pushing vehicle for pivoting said bar relative to said pushing vehicle, said pushing vehicle disposed rear-

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wardly of said load and provided with steering means at the rear end thereof adapted for engagement with said medium to effect lateral thrust on the rear end of said pushing vehicle, said power means including extensible motor adapted to be secured between the opposite end portions of said steering bar and said pushing vehicle, said extensible motors comprising hydraulic cylinders each having one end pivotally secured to said steering bar and the other end adapted to be pivotally secured to said pushing vehicle and wherein guides are adapted to be secured to said pushing vehicle and slidably engage the opposite end portions of said steering bar for guiding the pivotal movement of the latter in a horizontal plane, said guides including limit stops for limiting the pivotal movement of said steering bar between two limit positions.

8. In the combination of a first pusher hull and a second hull, a steering connection secured between said first and second hulls, said first pusher hull being longitudinally aligned with said second hull and being provided with a power supply operatively connected to a propelling mechanism and a steering mechanism for steering said second hull, said second hull having power and steering controls, means operatively connecting said power and steering controls to said power supply and steering mechanism respectively, said steering connection comprising an elongated steering bar pivotally secured intermediate its ends for rotation about a vertical axis to said first hull extending transversely thereof and between said first and second hulls, connecting means securing the opposite ends of said steering bar to said second hull whereby the latter will pivot with said bar, and power means secured between said steering bar and said first hull for pivoting said bar relative to said first hull.

9. The combination of claim 8 wherein said power means includes extensible motors secured between the opposite end portions of said steering bar and said first hull.

10. The combination of claim 8 including guides secured to said first hull and slidably engaging opposite end portions of said bar for guiding the pivotal movement of the latter in a horizontal plane.

11. The combination of claim 10 wherein said guides include limit stops for limiting the pivotal movement of said steering bar between two limit positions.

12. The combination of claim 8 wherein said last-mentioned connecting means comprises rocker arms secured between opposite end portions of said steering bar and said second hull.

13. The combination of claim 12 including means on each of said rocker arms pivotally securing one end to an end portion of said steering arm for movement about a horizontal axis extending longitudinally thereof and means on the other end of each of said rocker arms pivotally securing said other end to said second hull.

References Cited in the file of this patent

UNITED STATES PATENTS

2,360,902	Simmons	Oct. 24, 1944
2,640,708	Fraga	June 2, 1953
2,812,725	Candlin	Nov. 12, 1957
2,816,517	Candlin	Dec. 17, 1957
2,922,237	Harrison et al.	Jan. 26, 1960