

No. 619,073.

Patented Feb. 7, 1899.

M. L. DEERING.

TOWING MACHINE FOR VESSELS.

(Application filed Oct. 16, 1895. Renewed Nov. 30, 1898.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 2.

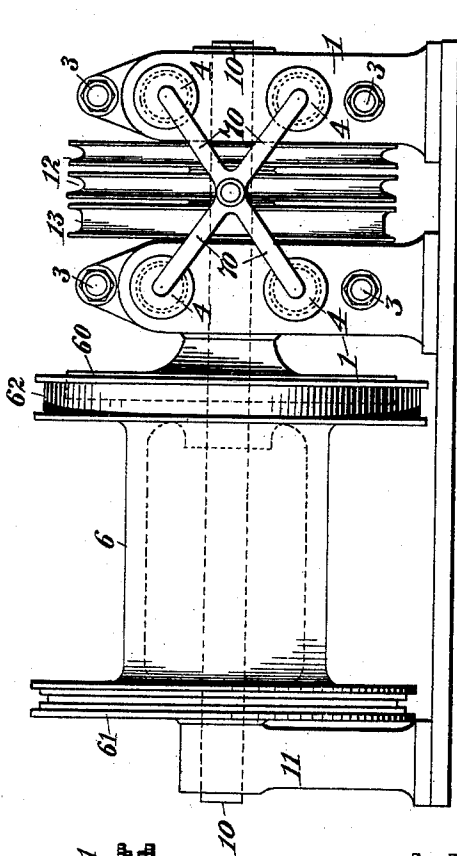
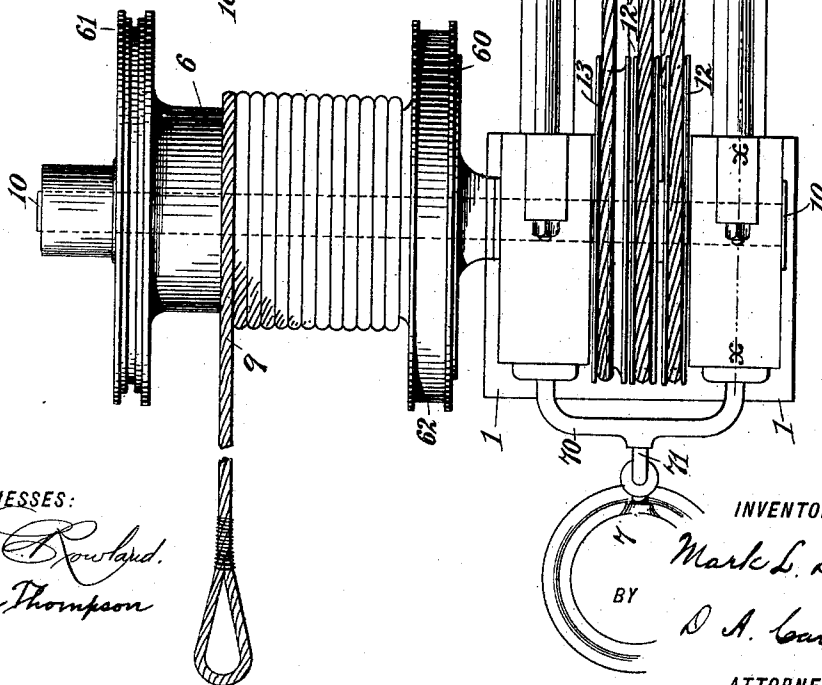


Fig. 1.



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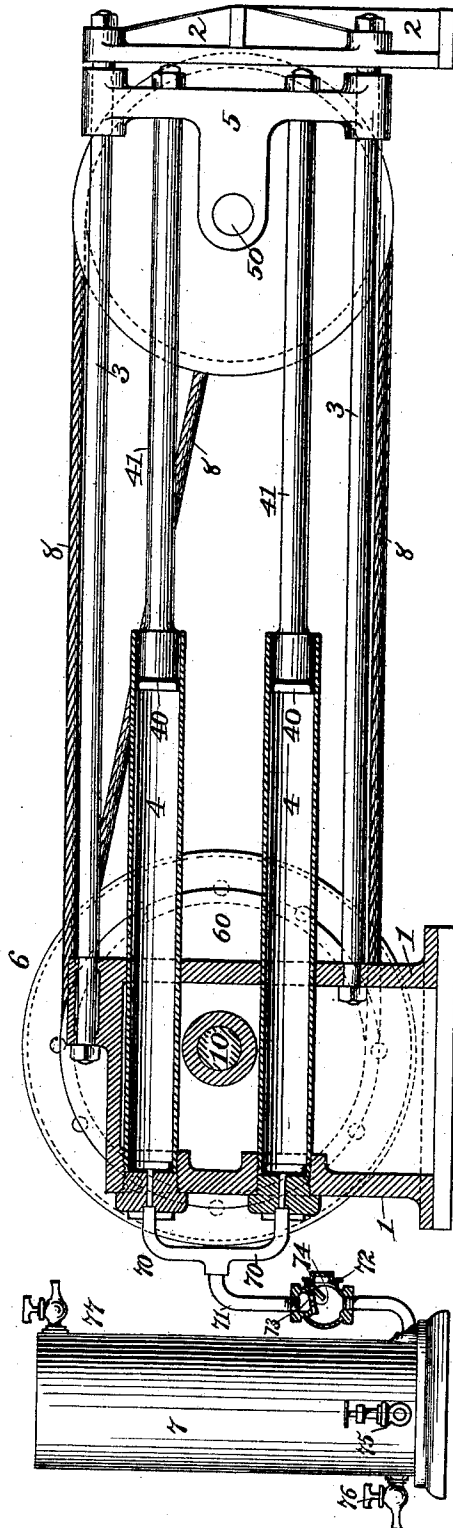
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2 Sheets—Sheet 2.

Fig. 3.



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# UNITED STATES PATENT OFFICE.

MARK L. DEERING, OF NEW YORK, N. Y., ASSIGNOR TO FRANCIS H. STILLMAN, OF SAME PLACE.

## TOWING-MACHINE FOR VESSELS.

SPECIFICATION forming part of Letters Patent No. 619,073, dated February 7, 1899.

Application filed October 16, 1895. Renewed November 30, 1898. Serial No. 697,849. (No model.)

*To all whom it may concern:*

Be it known that I, MARK L. DEERING, of New York, (Brooklyn,) in the county of Kings and State of New York, have invented a certain new and useful Improvement in Towing-Machines, of which the following is a full, clear, and exact description, reference being made to the accompanying drawings, forming part of this specification.

10 This invention relates to improvements in machines to which towing-hawsers are attached and which are adapted to offer a yielding resistance to the hawser when a vessel is being towed by it; and the invention consists of a machine comprising a hydraulic cylinder and piston, or a plurality of such cylinders and pistons, and an air-chamber in communication with the cylinder or cylinders and comprising other mechanism interposed  
15 between the hawser and the piston or pistons and adapted to impart to the piston or pistons less motion than is transmitted to itself by the hawser and to the hawser greater motion than is transmitted to itself by the piston or  
20 pistons, the machine having substantially the structure and combinations of parts described and claimed herein.

On the accompanying sheets of drawings, Figure 1 is a top view, Fig. 2 an end view, and Fig. 3 a side elevation and section in the plane  $x x$ , Fig. 1, of the machine.

Similar reference-numerals designate like parts in the different views.

35 The object of this invention is to prevent the rupture of a hawser used for towing vessels by the plunging or sudden change of direction of one of the vessels to which it is attached, the machine being adapted to pay out the hawser when the strain upon it is greater  
40 than the normal towing strain but less than the breaking strain of the hawser and to draw the hawser in again when it is relieved from the excessive strain.

The machine may be stationed either on the vessel that is to tow the other or on the vessel that is to be towed. Although it may comprise only one hydraulic cylinder and piston, yet in that case the space required for it is greater than can be conveniently spared on  
50 many vessels. So to render its size unobjectionable it is constructed with four cylinders

and pistons instead of one. It then has the form represented in the drawings, and that is the form which is preferred under ordinary circumstances and which is referred to specifically in the following description. 55

At the ends of the machine are standards 1 and 2, which are secured to the deck of the vessel or to a platform and which are connected together by four horizontal rods 3. In the front standard are fixed four horizontal cylinders 4, in each of which is a piston 40. The piston-rods 41 are fastened to a cross-head 5, which travels on the four horizontal rods 3 as guides. A shaft 50, on which two loose sheaves 51 are mounted, is carried by the cross-head, being secured in lugs projecting inward from the cross-head. Through the front standard 1 of the machine extends a shaft 10, which is journaled in the standard and in a pillow-block 11 several feet from the standard and on the same base with it. This shaft is at the same level as the shaft 50, carried by the cross-head 5, and is midway between the two upper and two lower cylinders. On this shaft are two loose sheaves 12 and one, 13, that is keyed to the shaft, the latter being wider on the face than either of the others. Between the front standard and the pillow-block a drum 6 is mounted loosely on the shaft 10 and provided with a clutch 60, whereby it may be fastened to the shaft. The four cylinders are connected at their front ends with a water and air vessel or reservoir 7 by means of a hollow yoke 70 and a pipe 71, provided with a check-valve 72. The reservoir may be located in any convenient place near the other part of the machine. A wire cable 8 is attached to the shaft 50, fixed in the cross-head, and carried around the sheaves, as indicated, and fastened to the broad sheave 13 in the front standard. The towing-hawser 9 is coiled on the drum. The cable 8 is passed around the sheaves and the hawser around the drum in such a manner that the paying out of the hawser winds the cable on the broad sheave 13 when the drum is fastened to the shaft 10 by the clutch 60. 80  
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90  
95

At the outer end of the drum is a chain-wheel 61, by means of which the drum can be revolved by power to be obtained from the engine which operates the capstan of the ves- 100

sel, and at the other end of the drum is a surface 62, against which a brake may be made to act.

In the gate 73 of the check-valve 72 is a small orifice 74, and the valve is so arranged that when fluid flows from the reservoir to the cylinders the gate closes and there is no passage for the fluid through the valve excepting through the orifice 74, and when the fluid flows in the opposite direction the gate opens and the fluid is not retarded by it.

Close to the bottom of the reservoir 7 are a gate 75 and a cock 76, and at or near the top of the reservoir is another cock 77.

The machine is made ready for use by pumping water and air into the reservoir 7 through the gate 75. The quantity of water should be great enough to fill the cylinders 4 and the yoke 70 and pipe 71 and to stand in the reservoir above the gate 75, and air is pumped into the reservoir until the pressure of the air becomes great enough to overbalance the normal towing strain on the hawser. The water then fills the cylinders, into which it has been forced by the air, and the pistons 40 are held in the positions in which they are shown in the drawings, close to the rear ends of the cylinders 4. The hawser is paid out as far as desired by the capstan-engine, the drum being free to turn, while the shaft 10, on which it is mounted, remains at rest. After that the drum is fastened to the shaft by the clutch 60.

When the vessels move forward, the rear vessels being pulled by the hawser, the force exerted by the hawser is transmitted through the drum, clutch, sheaves, cable, cross-head, and pistons to the water in the cylinders, and thence to the air in the reservoir, the air forming a cushion against which the force is finally directed. If the normal force is increased by a sudden excessive strain on the hawser, the hawser unwinds from the drum, the cable 8 is wound on the sheave 13, the cross-head and pistons are drawn forward, and the air in the reservoir is compressed.

If the pistons should be forced forward to the front ends of the cylinders, carrying with them the rear sheaves through a distance of five feet, for example, then twenty-five feet of the cable 8 would be wound on the sheave 13 and as many coils of the hawser would have been unwound from the drum or paid out as there were revolutions of the sheave 13 in winding up the twenty-five feet of cable; but as the air is compressed more and more by the forward movement of the pistons it offers to the action of the hawser a constantly-increasing resistance that soon becomes great enough to balance even the excessive force then exerted by the hawser, and as soon as the hawser is relieved of the extra strain upon it the air expands and drives the pistons back to the rear ends of the cylinders, while the drum is rotated and the hawser drawn in as far as it was drawn out when the strain upon

it was suddenly increased beyond the normal strain.

The check-valve 72 prevents the air from driving the pistons back rapidly enough to break the machine in case the hawser becomes suddenly slack just after it has pulled the pistons forward, that being apt to happen frequently when the water is rough.

The drum is not a necessary part of the machine proper. The hawser may be attached directly to the cable 8 and the machine will then pay out and draw in the hawser substantially in the way described.

If the machine is constructed with a single cylinder and piston, then the system of sheaves is placed on the prolonged axis or at the end of the cylinder, in order that the entire strain on the piston shall be in the direction of its length, since otherwise the machine would not operate in a satisfactory manner, even if it could be made strong enough to withstand the enormous strain of the hawser. The length of the machine then is at least that of the cylinder plus that of the system of sheaves when the traveling sheaves are at their greatest distance from the others; but the length of the machine in the form represented in the drawings, it will be seen, does not exceed but a trifle that of the system of sheaves alone when it is extended, in consequence of the arrangement of the cylinders on opposite sides of the space occupied by the sheaves and cable 8 and the location of the axis of the traveling sheaves in front of the main part of the cross-head in lugs projecting therefrom.

Oil may be used in the cylinders instead of water, and it is expected that oil will be used in them when the weather is cold enough to render water likely to freeze.

If the pressure in the reservoir needs to be reduced, the cock 77 is turned and a portion of the compressed air allowed to escape, and when it is desired to expel the water or oil from the cylinders and empty the reservoir the cocks 76 and 77 are both opened and the air issues from the upper and the water from the lower cock.

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

1. A towing-machine comprising a cylinder and piston, or plurality of cylinders and pistons, and a reservoir in communication with the cylinder or cylinders, in combination with means for rendering the machine operative, said means consisting of gas confined in the reservoir under pressure and a liquid interposed between the gas and the piston or pistons, substantially as described.

2. A towing-machine comprising a cylinder and piston, or plurality of cylinders and pistons, an air-reservoir, a passage connecting the reservoir with the cylinder or cylinders, and a valve in said passage, in combination with means for rendering the machine oper-

ative, said means consisting of gas confined in the reservoir under pressure and a liquid interposed between the gas and the piston or pistons, substantially as described.

3. A towing-machine comprising the combination of a hydraulic cylinder and piston, or plurality of cylinders and pistons, an air-reservoir in communication with the cylinder or cylinders, and a system of sheaves, part of the sheaves being mounted on a shaft having stationary bearings, and the others on a shaft movable in the direction of the length of the system, and a cable passing over the sheaves, substantially as described.

4. A towing-machine comprising the combination of a hydraulic cylinder and piston, or plurality of cylinders and pistons, an air-reservoir in communication with the cylinder or cylinders, a system of loose sheaves, part of the sheaves being mounted on a shaft 10 having stationary bearings and the others on a shaft movable in the direction of the length of the system, a sheave 13 tightly secured on the shaft 10, and a cable passing over the loose sheaves and fastened to the sheave 13, substantially as described.

5. A towing-machine comprising the combination of a plurality of hydraulic cylinders and pistons, an air-reservoir in communication with the cylinders, and a system of sheaves and a cable passing over the sheaves, located between the cylinders and piston-rods and connected to the piston-rods, substantially as described.

6. A towing-machine comprising the combination of a plurality of hydraulic cylinders and pistons, an air-reservoir in communication with the cylinders, a system of sheaves, part of the sheaves being located between the cylinders and mounted on a shaft having stationary bearings and the others being mounted on a shaft 50 movable in the direction of the length of the system, a cross-head in which the shaft 50 is journaled and which is secured to the piston-rods, and a cable passing over the sheaves, substantially as described.

7. A towing-machine comprising the combination of four hydraulic cylinders 4, pistons

in the cylinders, an air-reservoir in communication with the cylinders, a shaft 10 mounted in the standard in which the cylinders are secured and in a pillow-block 11 and extending between the two cylinders on the side of the standard toward the pillow-block, a system of loose sheaves, part of these sheaves being mounted on the shaft 10 between two cylinders on one side and two on the other, and the other loose sheaves being mounted on a shaft 50, a cross-head in which the shaft 50 is journaled and which is attached to the piston-rods, a sheave 13 tightly secured on the shaft 10, a cable passing over the loose sheaves and fastened to the sheave 13, and a drum 6 on the shaft 10 between the pillow-block and the cylinders, substantially as described.

8. A towing-machine comprising the combination of the four horizontal cylinders 4 fixed in the standard 1, pistons in the cylinders, an air-reservoir in communication with the cylinders, the shaft 10 extending through the standard 1 above two of the cylinders and below the other two, a cross-head attached to the piston-rods and provided with a shaft 50, guides on which the cross-head travels, sheaves mounted on the shafts 10 and 50, and a cable passing over the sheaves, substantially as described.

9. A towing-machine comprising the combination of the four horizontal cylinders 4 fixed in the standard 1, pistons in the cylinders, an air-reservoir in communication with the cylinders, a shaft mounted in stationary bearings in the standard 1, sheaves mounted on that shaft between two of the cylinders on one side and the other two cylinders on the other side, a cross-head having lugs projecting forward from its main part and adapted to pass between the cylinders, a shaft 50 journaled in the lugs of the cross-head, sheaves on the shaft 50, a cable passing over the sheaves, and guides on which the cross-head travels, substantially as described.

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In presence of—  
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