

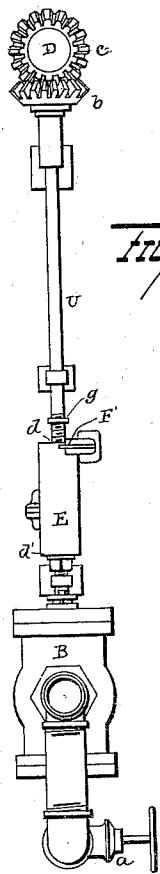
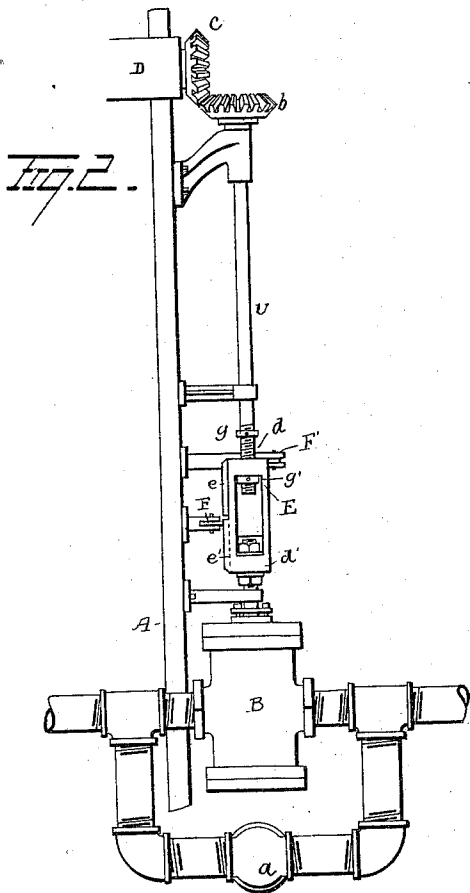
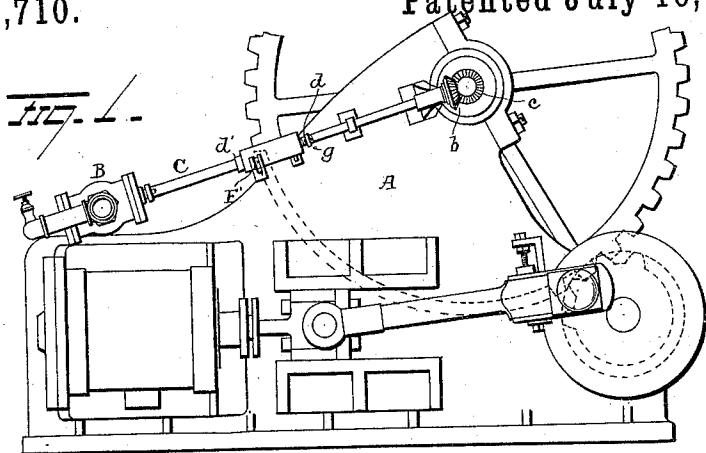
(No Model.)

3 Sheets—Sheet 1.

F. METCALF.
TOWING MACHINE.

No. 542,710.

Patented July 16, 1895.



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(No Model.)

3 Sheets—Sheet 2.

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Fig. 4.

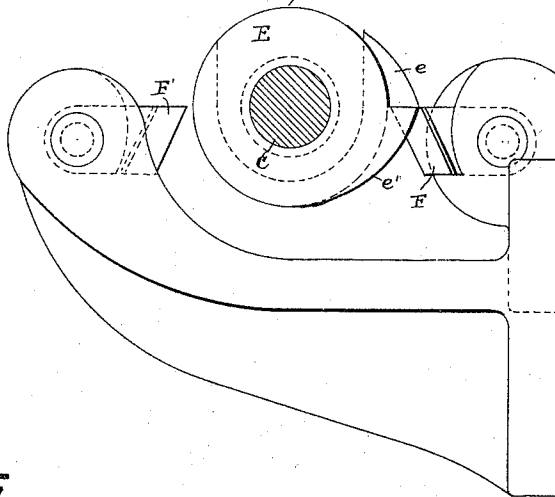


Fig. 5.

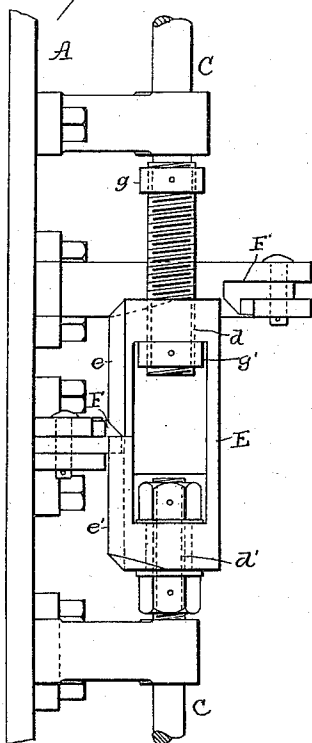
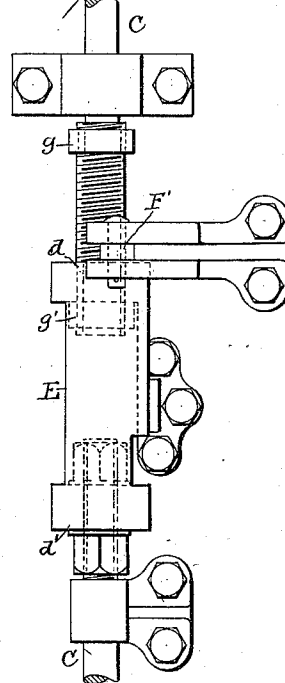


Fig. 6.



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3 Sheets—Sheet 3.

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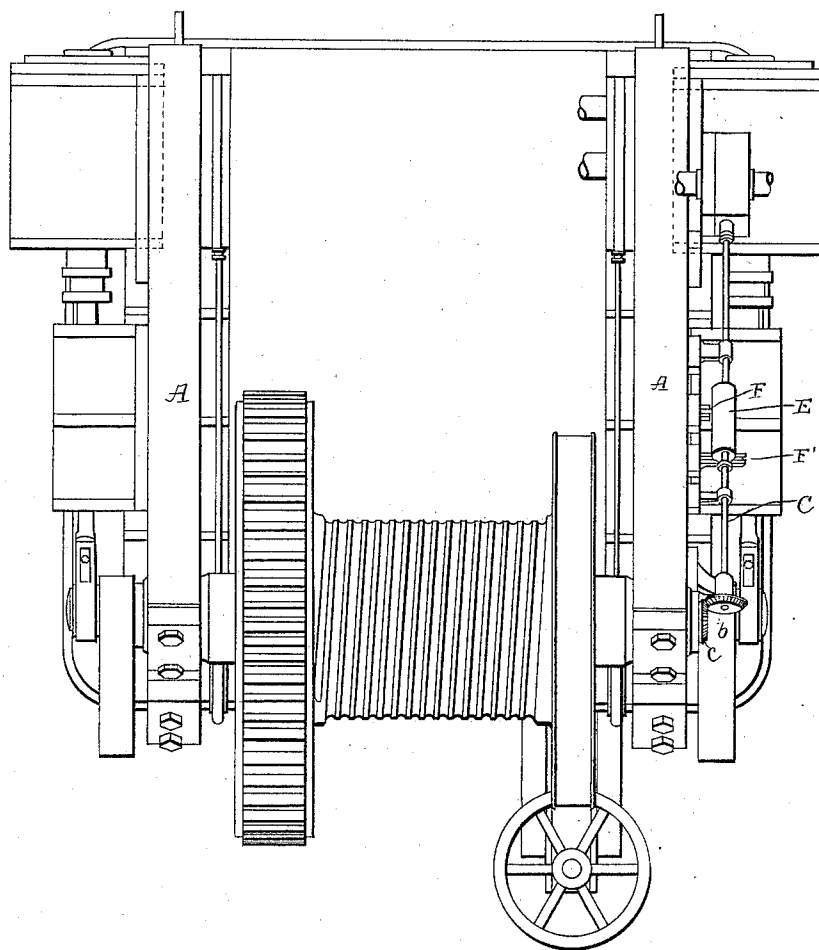


Fig. 7-

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UNITED STATES PATENT OFFICE.

FREDERICK METCALF, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE
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TOWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 542,710, dated July 16, 1895.

Application filed May 2, 1895. Serial No. 547,909. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK METCALF, of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Towing-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in towing-machines. The principle of these machines is this: That the pull of the towed vessel is borne wholly or in part by the pressure in the engine cylinder or cylinders, and sudden shocks are avoided by the machine automatically unwinding rope, which it takes up again when the strain is relieved. As the drum pays out rope the pressure in the cylinder or cylinders increases, and as the drum takes up rope the pressure is diminished.

My invention relates to improvements in the manner of controlling the pressure in the engine cylinder or cylinders, effecting convenience, safety, and ease of manipulation, and making the machine entirely automatic.

In the accompanying drawings, Figure 1 is a side elevation of an apparatus or machine having my regulating valve and gear mounted upon and connected to it. Figs. 2 and 3 are plan and side elevations, respectively, of my regulating-valve, screw-shaft, and connections. Figs. 4, 5, and 6 are end view, plan, and side elevations, respectively, of the connecting nut and sleeve; and Fig. 7 is a plan view.

A represents the frame of the towing-machine, which is fastened to the deck of the towing-vessel, and may be of spur-gear type, as shown in the figure, or the invention may equally well be applied to any other type of towing-machine in which it may be desirable to increase or decrease automatically the pressure in the engine cylinder or cylinders. To effect this result I provide an automatic regulating-valve in the admission passage to the engine cylinder or cylinders, said valve being in any suitable or convenient location between the generator and the engine, but preferably closely adjacent to the cable-drum and engine, as shown in the drawings. This

regulating or reducing valve may be of any suitable or well-known form, and by being opened or closed, so as to admit of an increased or diminished supply to the engine cylinder or cylinders, the pressure in said cylinder or cylinders may be regulated as desired. By opening the valve wider pressure in the engine cylinder or cylinders is increased, and by partly closing the valve the pressure is reduced, as is familiar to those skilled in the art to which my invention relates. B indicates this valve, and it is preferably operated by a screw spindle or shaft C, provided with a bevel-gear *b*, meshing with a similar gear *c* on the drum-shaft D. The spindle or shaft C is in two parts, connected by a nut and sleeve E, arranged at *d* to fit a screw-thread on the shaft C, and at *d'* to rotate about the said shaft C without turning the shaft. It will be readily seen that the portion of the shaft C between the bevel-gear *b* and the nut and sleeve E simply rotates, the rotating and reciprocating of the nut and sleeve E depending upon their position with reference to the pawls F and F'. The portion of the said shaft C between the regulating-valve B and the nut and sleeve E reciprocates only.

The nut or sleeve E is provided with two projections *e* and *e'*, which strike against or throw up (depending on the direction of rotation of the nut and sleeve E) two pawls F and F'. These pawls prevent the nut E from revolving as long as they remain in contact with the projections *e* or *e'*, and compel said nut E to reciprocate and open or close the valve B. At nearly the end of motion of the valve B in either direction the projections *e* or *e'* move beyond the limits of contact with the pawls F and F' and the nut E is free to revolve. The two collars *g* and *g'* fixed on the shaft C soon bind on the nut E and compel said nut to revolve, thus limiting the reciprocating motion in either direction.

The operation is as follows: The pressure of the engine-cylinders will normally counterbalance the strain or load on the hawser and the drum will thus remain stationary; but when, owing to the pitching of the vessels, a sudden strain comes on the cable the latter will pay out somewhat, and in so doing the pressure in the engine-cylinders will have a

cushioning effect to prevent injurious jerks on the hawser. As the hawser pays out the drum will be turned, and thus the bevel-gear *c* on the drum-shaft will turn the screw-shaft or spindle *C* through the gear *b* to open or enlarge the port of the pressure-regulating valve *B*, and thereby increases the pressure of the engine cylinder or cylinders to counterbalance the load on the hawser. When the strain is lessened these operations are reversed, and the pressure is reduced to the equality of the load on the hawser as the latter is hauled in by the reverse turning of the drum by the engine.

To allow for paying out or taking in the hawser at any time, a by-pass is provided around the regulating-valve, so that pressure may be supplied to the engine cylinder or cylinders without passing through the regulating-valve, this by-pass being provided with a valve *a*, which is normally closed.

The operation of paying out the hawser is as follows: The main admission and by-pass valves are opened, the reversing mechanism being in position to unwind rope from the drum. The machine unwinds rope until the full length required is paid out, when the by-pass valve is shut and the engine reversed. As hereinbefore shown, the gearing and screw shaft will have fully opened the regulating-valve *B*, and the excess of pressure in the engine-cylinder will cause the machine to wind on rope, also partly closing the regulating-valve until the cylinder-pressure balances the strain on the rope.

To take up rope the by-pass valve is opened, the reversing mechanism being normally in the position to wind rope on the drum, and the excess of pressure causes the machine to take up rope, the regulating-valve being gradually closed, as before shown, until the full length of rope is wound on. The by-pass valve is now closed and the reduced pressure in the engine-cylinder causes the rope to unwind until the regulating-valve has been opened sufficiently to bring the cylinder-pressure to an equality with the strain on the rope. The machine is thus seen to be perfectly automatic.

It will of course be understood that I do not limit my invention to the details herein shown and described.

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

1. In a towing machine, the combination with a pressure regulating valve, located in the admission passage to the engine cylinder or cylinders, a screw spindle or shaft, a nut or sleeve containing projections which hit on suitably placed pawls, and gearing whereby the pressure in the engine cylinder or cylin-

ders is increased as increased strain on the hawser causes the latter to be paid out, and is diminished as the strain on the hawser is lessened and the latter is hauled in, substantially as set forth.

2. In a towing machine the combination of a pressure regulating valve located in the admission passage to the engine cylinder or cylinders with a by-pass, a valve thereon, whereby admission may be had to the engine cylinder or cylinders without passing through the pressure regulating valve, substantially as set forth.

3. In a towing machine, the combination of a pressure regulating valve located in the admission passage to the engine cylinder or cylinders, a valve on a by-pass whereby admission may be had to the engine cylinders without passing through the pressure regulating valve, a screw spindle or shaft, a nut and sleeve containing projections which hit on suitably placed pawls, and gearing whereby the pressure of the engine cylinder or cylinders is increased as increased strain on the hawser causes the latter to be paid out, and is diminished as the strain on the hawser is lessened and the latter is hauled in, substantially as set forth.

4. In a towing machine, the combination of a pressure regulating valve located in the admission passage to the engine cylinder or cylinders, a valve on a by-pass, whereby admission may be had to the engine cylinder or cylinders without passing through the pressure regulating valve, and a reversing mechanism to change the direction of motion of the engine, substantially as set forth.

5. In a towing machine, the combination of a pressure regulating valve located in the admission passage to the engine cylinder or cylinders, with a valve on a by-pass whereby admission may be had to the engine cylinder or cylinders without passing through the pressure regulating valve, a screw spindle or shaft, a nut and sleeve containing projections which hit on suitably placed pawls and gearing, whereby the pressure of the engine cylinder or cylinders is increased as increased strain on the hawser causes the latter to be paid out, and is diminished as the strain on the hawser is lessened and the latter is hauled in, and a reversing mechanism to change the direction of motion of the engine, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

FREDERICK METCALF.

Witnesses:

GILMAN E. JOPP,
FRANK S. MANTON.