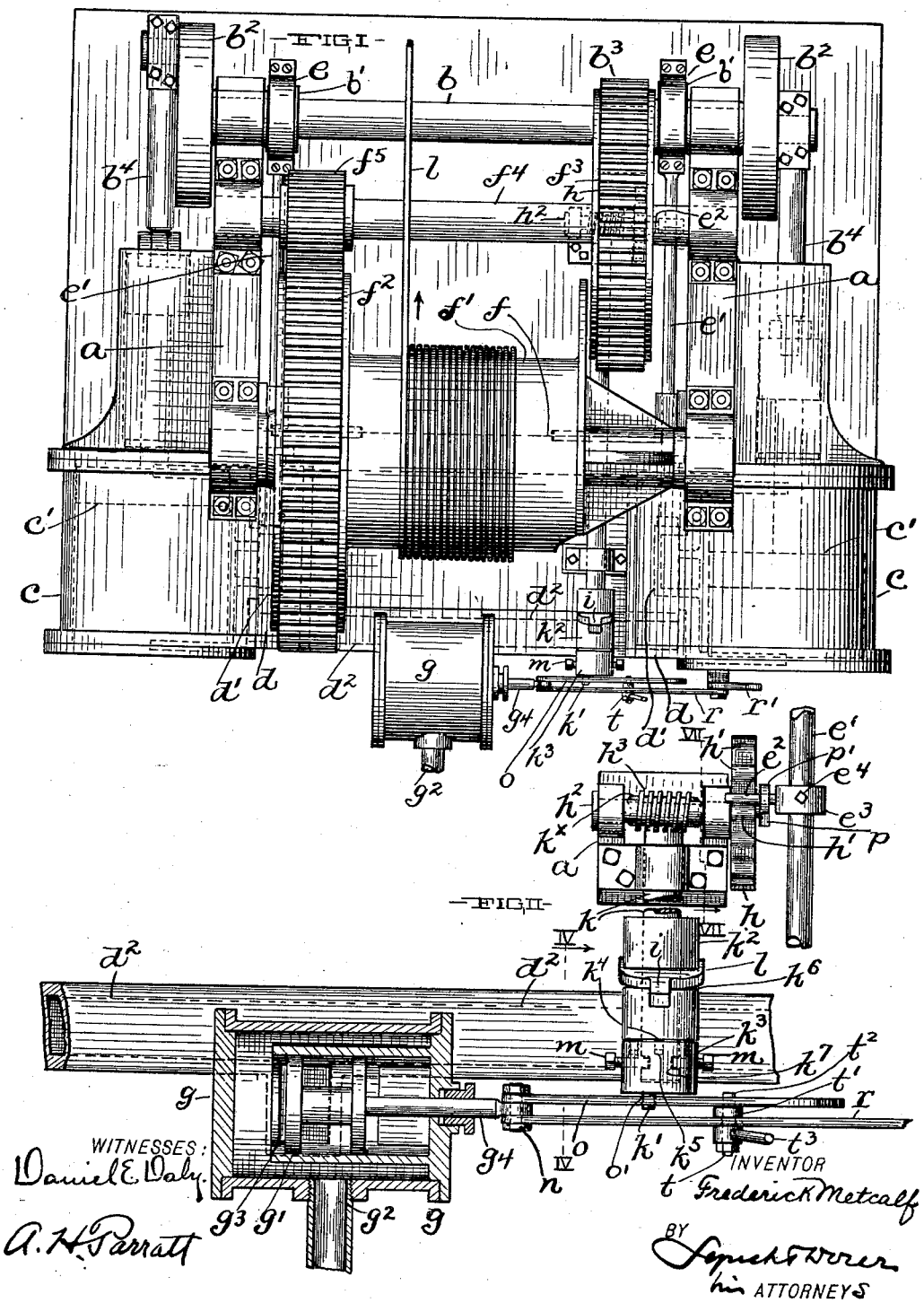
No. 676,196. Patented June 11, 1901.

F. METCALF.

TOWING MACHINE.

(No Model.) (Application filed Mar. 13, 1901.)

2 Sheets—Sheet 1.



No. 676,196. Patented June 11, 1901.

F. METCALF.

TOWING MACHINE.

(No Model.) (Application filed Mar. 13, 1901.)

2 Sheets—Sheet 2.

FIG. III.

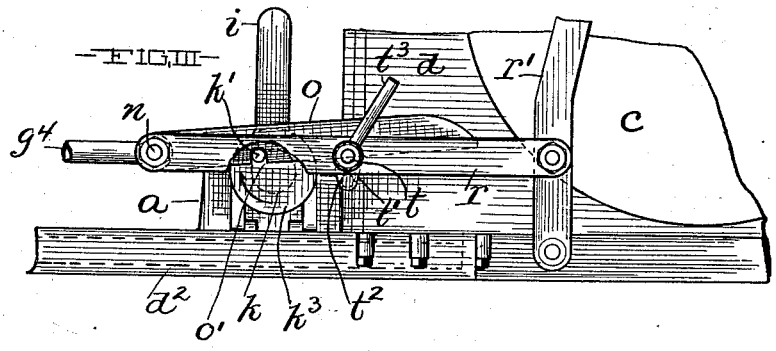


FIG. IV.

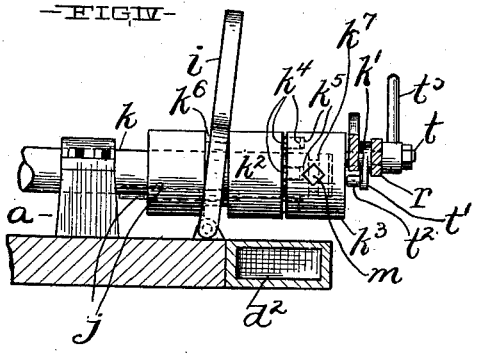


FIG. V.

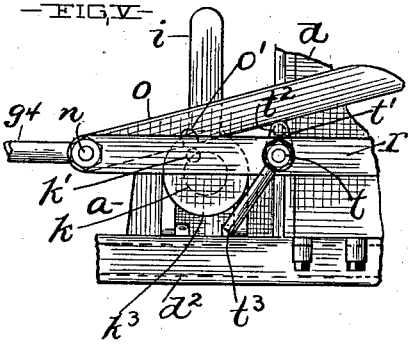


FIG. VII.

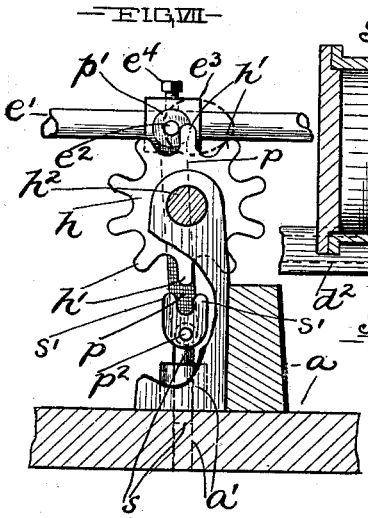


FIG. VI.

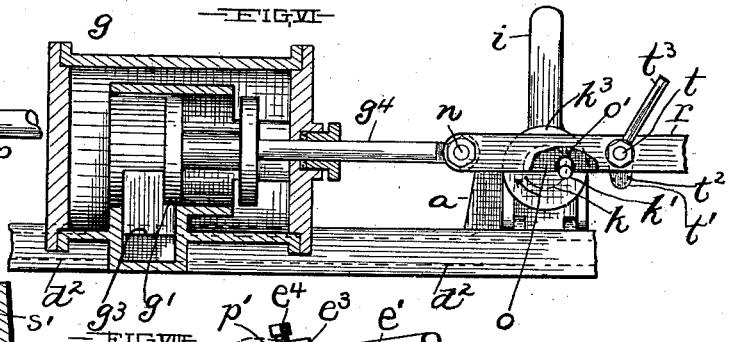
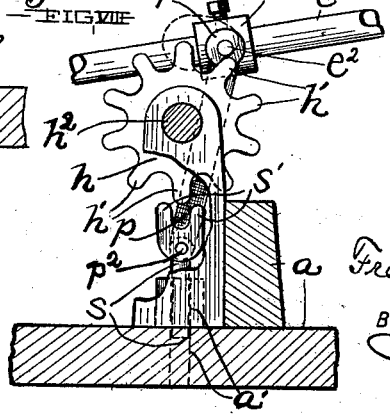


FIG. VIII.



WITNESSES:

Daniel E. Daly.

A. H. Parrall

INVENTOR

Frederick Metcalf

BY Lynch & Boyden

his ATTORNEYS

UNITED STATES PATENT OFFICE.

FREDERICK METCALF, OF CLEVELAND, OHIO, ASSIGNOR TO THE CHASE MACHINE COMPANY, OF SAME PLACE.

TOWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 676,196, dated June 11, 1901.

Application filed March 13, 1901. Serial No. 50,897. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK METCALF, a resident of Cleveland, in the county of Cuyahoga and State of Ohio, 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 pertains to make and use the same.

My invention relates to improvements in towing-machines.

One object of my invention is to prevent the tow-line-engaging drum from paying out or winding up too much line and yet enable the drum to pay out a comparatively large length of line when the strain upon the tow-line exceeds the normal strain.

Another object of my invention is to provide improved mechanism for automatically controlling the operation of the valve which controls the supply of steam or fluid under pressure to the fluid-pressure engine of the machine, so that when the strain upon the tow-line becomes abnormal the valve will automatically be actuated to increase or decrease the supply of steam or fluid to the engine, according as the strain upon the tow-line has become greater or less than the normal strain.

Another object of the invention is to provide such an improved construction and arrangement of the parts of the mechanism for controlling the operation of the aforesaid valve that when the abnormal strain upon the tow-line is great enough to require the movement of the valve into its full-open position the valve shall be permitted without injury to any part of the mechanism and without interfering with the function which is to be performed by the mechanism to remain full open until a rotation of the tow-line-engaging drum in the direction opposite to the direction in which it is rotated by the abnormal strain upon the line is effected.

With these objects in view and to the end of realizing other advantages hereinafter appearing the invention consists in certain features of construction and combinations of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure I is a top plan of a towing-machine embodying my invention. A portion of the winding-drum is broken away in this figure to more clearly show certain features of construction. Fig. II is a top plan, partly in section, showing the mechanism for automatically controlling the operation of the valve which controls the supply of steam or fluid under pressure to the engine of the machine, and portions are broken away in this figure to reduce the size of the drawing. Fig. III is a side elevation showing a portion of the mechanism for controlling the operation of the said valve. Fig. IV is a vertical section on line IV IV, Fig. II, looking in the direction indicated by the arrow. Fig. V is a view showing a portion of the mechanism for controlling the operation of the valve and other features hereinafter described. Fig. VI is an elevation showing the valve-casing containing the aforesaid valve in central longitudinal section with the valve full open and with the valve-operating mechanism in a corresponding position. Fig. VII is a vertical section on line VII VII, Fig. II, illustrating mechanism for preventing circumferential displacement of a star-wheel constituting a part of the illustrated valve-operating mechanism. Fig. VIII is a view illustrative of the operation of the mechanism shown in Fig. VII. Portions are broken away in Figs. VII and VIII to more clearly show certain features of construction.

Referring to Fig. I of the drawings, *a* designates the stationary framework of the machine, and *b* represents a horizontally-arranged engine-shaft, which is supported from the framework *a* in any approved manner. The shaft *b* is operatively provided with cranks b^2, which have their wrists operatively connected by pitmen or rods b^4 with the pistons *c'* of the cylinders *c* of a steam-engine. The cylinders *c* have of course an arrangement at right angles to the shaft *b* and are each provided in the usual manner with a valve-chest *d* and passage-ways for supplying the steam to the respective cylinder and for causing the cylinder to exhaust at one end while taking steam at its other end, but passage-ways and valves for supplying any fluid under pressure to the cylinder or cylinders of an engine and for caus-

ing a cylinder to exhaust at one end while taking in fluid under pressure at its other end are so well understood that description and illustration thereof in detail are considered unnecessary in this specification. Suffice it to state that the valves d' within the valve-chests and shown in dotted lines, Fig. I, are operatively connected with the rods e' of eccentric-straps e, which embrace eccentrics b', formed upon the shaft b in the usual manner.

A shaft f is arranged at one side of and parallel with and a suitable distance from the engine-shaft b and supported from the framework a. A pinion b^3 is operatively mounted upon the engine-shaft b and meshes with the counter-gear f^3 of a counter-shaft f^4, which is supported from the framework a and arranged between and parallel with the shafts b and f. The shaft f^4 has a counter-pinion f^5, meshing with the spur-gear f^2, operatively mounted upon the shaft f. A drum f' is operatively mounted in any approved manner upon the shaft f, and the tow-line l engages the said drum and is coiled upon or paid out by the drum, according as the drum is rotated in the one or the other direction. The tow-line l leads from the drum f' in the direction indicated by the arrow in Fig. I.

Steam-supply passage-ways d^2 conduct the steam to the valve-chests d of the engine-cylinders, and g designates a valve-casing having its chamber connected at g^3 with the said passage-ways, and g' represents a common slide-valve contained within the said casing and controlling the supply of steam passing through the casing to the outlet g^3 of the said casing from the casing's inlet g^2. (See Figs. II and VI.) The arrangement of parts is such that normally the valve g' shall be partially open, as shown in Fig. II, admitting enough steam to the valve-chests of the engine to supply the engine-cylinders with a quantity of steam sufficient to counterbalance the normal strain upon the tow-line. Mechanism or apparatus whereby the valve g' is automatically actuated in the direction required to still farther open the said valve or moved in the opposite direction, according as the strain upon the tow-line from any cause becomes greater or less than the normal strain upon the said line, is provided, and my invention, as already indicated, comprises, primarily, such mechanism or apparatus for controlling the supply of steam to the engine as will enable the tow-line-engaging drum in the normal condition of the machine with the normal strain upon the line to safely pay out a comparatively large predetermined length of line, and the said improved mechanism or apparatus comprises, preferably, the following: A star-wheel h or intermittently-actuated wheel having radial teeth or projections h', arranged at equal intervals circumferentially of the wheel and adapted to be rotated one tooth at a time by means operatively connected with a movable member of the engine, is operatively mounted upon a shaft h^2, which is supported from the framework a and arranged horizontally and parallel with the engine-shaft b, preferably at one side of one of the eccentric-strap rods e' of the engine. Preferably the shaft h^2 extends near the said rod e' and the wheel h is mounted upon the shaft's end which is adjacent to the said rod, and a pin or projection e^2, with which the said rod e' is provided, is arranged to engage and intermittently rotate the wheel h, one tooth at a time, once during each rotation of the engine-shaft, and obviously the wheel h, and consequently the shaft h^2, are rotated in the one direction or the other, according as the engine-shaft is rotated in the one or the other direction. A worm h^3 is formed upon the shaft h^2 and at its under side meshes with a worm-wheel $k^\times$, operatively mounted upon one end of a horizontally-arranged shaft k, also supported from the framework a and arranged at right angles to and below the worm-shaft h^2. The slide-valve g' has its stem g^4 extending outside of the valve-casing g, parallel with the worm-shaft h^2, and consequently at right angles to the shaft k. Means for establishing operative connection between the valve-stem g^4 and a revolving pin or member k', with which the shaft k is provided, is employed, and the arrangement of parts is such that the valve g' is actuated in the direction required to still farther open the valve or more nearly close the same, according as the said revoluble pin or member k' travels in the one direction or the other. The revoluble member k' is formed, preferably, upon one of the parts or members of a clutch with which the shaft k is provided—that is, the shaft k extends between the worm-shaft and the line of the valve-stem g^4 and has its outer end provided with a clutch whose members k^2 and k^3 are provided upon their opposing faces with mutually-engageable pins k^4 and holes k^5. The holes k^5 are shown formed in the outer clutch member k^3 and engaged by the pins k^4, with which the inner clutch member k^2 is provided. The inner clutch member k^2 is slidable endwise of the shaft k, but operatively connected with the shaft by the well-known means of groove and feather j, as shown in Fig. IV, and can therefore be actuated out of operative engagement with the companion and other clutch member k^3, being provided with an annular groove k^6, engaged by the fork of a forked lever i, applied in any approved manner. The outer clutch member k^3 is loosely mounted on the extreme outer end of the shaft k and prevented from displacement endwise of the shaft by means of any suitable number of set-screws m, which extend through the said clutch member into engagement with an annular groove k^7, formed in the periphery of the shaft, and the revoluble pin or member k' of the shaft, already hereinbefore referred to, is formed upon the outer end of the said loosely-mounted clutch member at one side of the axial line of the shaft

and is operatively connected with or disconnected from the shaft, according as the clutch members engage or disengage each other. A normally horizontally arranged bar *o*, extending from the outer end of the stem g^4 of the valve g', is pivoted at one end horizontally and parallel with the shaft k to the outer end of the said stem by means of a pin n. The bar *o* is provided in its under side with a recess o', arranged to be engaged by the revoluble pin or member k' of the shaft k during the operation of the machine. The arrangement of parts is preferably such that the valve g' in the normal position of the parts has been moved about one-fourth of its travel toward its full-open position by the pin or member k', as shown in Figs. II and III. With the worm h^3 provided with a left-hand thread and with the arrangement of the remaining parts of the valve-operating mechanism as hereinbefore described and illustrated, obviously the revoluble pin or member k' travels in the direction indicated by the arrow in Figs. III and VI or in the opposite direction, according as the winding-drum f' is being rotated in the direction required to pay out or wind up tow-line. In other words, the shaft k is intermittently rotated in the direction indicated by the arrow in Figs. III and VI when the tow-line-engaging drum pays out tow-line during an abnormal strain upon the said line and is rotated in the opposite direction when the drum is rotated in the direction required to wind up tow-line when the strain upon the tow-line being normal is from any cause reduced or when an abnormal strain greater than the normal strain upon the said line is from any cause lessened. In the normal position of the parts enough steam is being admitted to the engine to counterbalance the normal strain upon the tow-line and the revoluble pin or member k' is ready to move the bar *o*, and consequently the connected valve g', in the direction required to admit more steam to the engine or in the opposite direction to reduce the supply of steam to the engine, according as the strain upon the tow-line is increased or decreased. It will be observed that the arrangement of parts is such also that an operative engagement between the revoluble pin or member k' of the shaft k and the bar *o* takes place only during the upper half of the revolution of the said member k', and that consequently the travel of the valve g' is effected during the said half of the revolution of the said member k', and that the valve will be left in the one or the other of its extreme positions, according as the aforesaid revoluble pin or member k', traveling in the one direction or the other, has commenced to make the lower half of its revolution during its said travel. The capability of the valve to dwell in its full-open position when rendered necessary by a continuity of an increasing abnormal strain upon the tow-line is important, because thereby the maximum supply of steam to the cylinder is continued until the abnormality in the strain upon the tow-line is removed without any injury to or interference with the valve-operating mechanism or other parts of the machine. It will be observed also that with a drum f' capable of winding up or uncoiling six inches of tow-line during one rotation of the engine-shaft and with the star-wheel h having ten teeth, with the worm h^3 having a pitch of three-fourths of an inch, and with the worm-wheel $k^\times$ having a pitch-circle eighteen inches in diameter the drum will pay out or wind up one hundred and twenty feet of tow-line during one revolution of the revoluble pin or member k' of the shaft k or the drum will pay out or wind up sixty feet of tow-line during the travel of the steam-supply valve g' from the one to the other of its extreme positions.

The operative connection of the revoluble pin or member k' with the shaft k through the instrumentality of a clutch renders possible an accurate setting or adjustment of the said member k' relative to the position of the valve g' in placing the machine in condition for operation. A disengagement of the slidable clutch member k^2 by a proper manipulation of the lever i, engaging the said clutch member from the companion and relatively stationary clutch member k^3, renders the last-mentioned clutch member and the revoluble pin or member k' with which it is provided free to be adjusted circumferentially of the shaft k, and a reëstablishment of operative engagement between the two clutch members secures the said revoluble member k' in the desired adjustment.

Means for locking the star-wheel h and connected mechanism, so far as actuation or operation of the said wheel and mechanism is concerned, when not being operated by the pin or projection e^2 of the respective eccentric-rod e' is provided and comprises, preferably, a bar p, which is suspended from the said rod, as shown in Figs. II, VII, and VIII, between the star-wheel and the said rod. The pin or projection e^2 is preferably formed upon a collar e^3, mounted upon the said eccentric-rod and secured in the desired adjustment by means of a set-screw e^4. The said pin or projection e^2 is circular in end elevation. The bar p is provided at its upper end with an ear p', that loosely embraces and is turnable upon the pin or projection e^2. The bar p is pivotally connected at its lower end by means of a pin p^2, arranged horizontally and parallel with the axis of the star-wheel to a vertically-arranged and vertically-shiftable slide s, which engages a correspondingly-arranged slideway forming hole a', formed in the bed or stationary framework a of the machine, and the said slide s is provided at its upper end with a member s', arranged to enter the space between the two adjacent teeth or projections h' of the star-wheel h simultaneously (see Fig. VIII) with the disengagement of

the pin or projection e^2 of the aforesaid eccentric-rod from the said wheel, and preferably the slide s has two members s', forming a fork arranged to straddle the tooth or projection of the star-wheel formed between the wheel's spaces entered by the said members s. Obviously the engagement of the space or spaces formed between the teeth or projections of the star-wheel by the relatively stationary member or members s', when the said wheel is disengaged by the pin or projection of the eccentric-rod, prevents the star-wheel and connected mechanism from turning until again operated by the last-mentioned pin or projection, and consequently there is no liability of a circumferential displacement of the revoluble pin or member k' of the shaft k between the intermittent movements of the wheel h during the operation of the machine. The sweep of the star-wheel-actuating member e^2 is shown in dotted lines, Fig. VII. Another bar r, arranged at the outer side and a short distance from and extending longitudinally of the bar o, is normally parallel with the bar o and is pivoted at one end horizontally and parallel with the axial line of the shaft k to the outer end of the valve-stem g^4 preferably by means of the pin n, which attaches the inner bar o to the said stem. The bar r is attached at its other end to a suitably-applied manually-operated lever r'. A short shaft t, arranged horizontally and parallel with the shaft k, and consequently arranged at right angles to the bars o and r, is journaled in the outer bar r a suitable distance from the pivot n and is operatively provided at its inner end, between the two bars o and r, with a depending arm or lever t', which has a lug or member t^2 projecting in under and affording a bearing or support for the inner bar o, as shown in Figs. II and IV. The shaft t at its outer end is operatively provided with a hand-lever t^3. The provision of the manually-operated shaft t and its arm t' t^2 enables the upward tilting of the bar o to the extent required to lift the recessed portion of the said bar out of the path of the revoluble pin or member k', and thereby render inoperative the mechanism employed in automatically controlling the operation of said valve g' when required for any reason—as, for instance, in establishing the normal length of tow-line between the vessel towing and the boat being towed. Fig. V shows the shaft t turned to the extent required to lift the bar o out of the path of the pin or member k'.

I would have it understood that although the details of construction hereinbefore described possess considerable merit my invention is not limited to such details. For instance, the recess o', formed in the under side of the bar o, has the two oppositely-facing walls thereof forming two shoulders, and the revoluble pin or member k' during the operation of the said bar engages and pushes against the one or the other of the said shoulders, according as the said revoluble member is actuated in the one direction or the other, and my invention embraces, broadly, any movable bar operatively connected with the fluid-supply-controlling valve of a towing-machine and provided with two oppositely-facing shoulders arranged a suitable distance apart, in combination with a suitably-applied and suitably-operated revoluble or movable member arranged to engage and push against the one or the other of the said shoulders, according as it is traveling in the one or the other direction. Obviously also any machine of the character indicated should be provided with means for enabling a reversal of the engine, and obviously an ordinary combined fluid-supply controlling and reversing valve might be employed in lieu of the plain slide-valve illustrated; but reversing-gears and reversing-valves are so well understood that illustration or description thereof is not considered necessary in this application, and I would have it understood that my invention is not limited to the employment of any particular type of valve, nor to any special arrangement of the parts of the mechanism for transmitting motion from the engine to the valve.

What I claim is—

1. In a towing-machine, the combination, with the tow-line-engaging drum, a fluid-pressure engine, an operative connection between the engine-shaft and the drum, a passage-way for conducting fluid under pressure to the engine, and a valve arranged to control the supply of fluid to the said passage-way, of a shiftable bar operatively connected with the valve and provided with two shoulders arranged a suitable distance apart, a revoluble pin or member arranged to engage and push against the one or the other of the said shoulders according as it is traveling in the one or the other direction, and mechanism whereby the revoluble member is actuated in the one direction or the other according as the engine-shaft is rotated in the one or the other direction.

2. In a towing-machine, the combination, with a fluid-pressure engine, the winding-drum, an operative connection between the drum and the shaft of the engine, a passage-way for supplying fluid under pressure to the engine, a valve-casing having an inlet for receiving the fluid under pressure, and an outlet connected with the said passage-way, and a suitably-applied valve controlling communication between the inlet and the outlet of the valve-casing, of a shiftable bar operatively connected with the valve and provided with a recess, and suitably-operated mechanism comprising a movable pin or member for engaging the said recess and actuating the bar, the arrangement of parts being such that the valve is actuated in the one direction or the other according as the aforesaid bar is shifted in the one or the other direction, substantially as and for the purpose set forth.

3. In a towing-machine, the combination, with a fluid-pressure engine, the winding-

drum, an operative connection between the drum and the engine-shaft, and a passage-way for supplying fluid under pressure to the engine, of a valve-casing having an inlet for receiving the fluid under pressure and having an outlet connected with the aforesaid passage-way, an endwise-shiftable bar, a valve controlling communication between the inlet and the outlet of the valve-casing and operatively connected with the aforesaid bar, suitably-operated mechanism comprising a revoluble pin or member, and means for transmitting motion from the said revoluble member to the bar, the arrangement of parts being such that the valve is actuated in the one direction or the other according as the aforesaid bar is shifted in the one or the other direction, substantially as and for the purpose set forth.

4. In a towing-machine, the combination, with a fluid-pressure engine, the winding-drum, an operative connection between the drum and the engine-shaft, a passage-way for supplying fluid under pressure to the engine, and a suitably-applied valve for controlling the supply of fluid to the said passage-way and provided with a stem, of an endwise-shiftable bar pivoted at one end to the valve-stem and having two shoulders, and a suitably-operated shaft provided with a pin or member arranged to revolve about the axis of the shaft and arranged, furthermore, to engage and push against the one or the other of the aforesaid shoulders according as it is traveling in the one direction or the other, which last-mentioned shaft is parallel or approximately parallel with the axis of the pivotal connection between the said bar and the valve-stem, substantially as and for the purpose set forth.

5. In a towing-machine, the combination, with a fluid-pressure engine, the winding-drum, an operative connection between the drum and the engine-shaft, a passage-way for supplying fluid under pressure to the engine, a valve-casing having an inlet for receiving the fluid under pressure and having its outlet connected with the said passage-way, and a suitably-applied slide-valve arranged to operate in a horizontal plane and control communication between the inlet and the outlet of the valve-casing and having a stem extending outside of the valve-casing, of a suitably-operated shaft arranged at right angles to the travel of the valve, a vertically-tiltable endwise-shiftable bar forming an extension of and suitably pivoted to the valve-stem, and means for transmitting motion from the last-mentioned shaft to the valve-stem and for actuating the valve in the one direction or the other according as the said shaft is rotated in the one or the other direction, substantially as and for the purpose set forth.

6. The combination, with a valve for controlling the supply of fluid under pressure to the engine of a towing-machine, of a shiftable bar operatively connected with the valve and provided with two shoulders arranged a suitable distance apart, a revoluble member arranged to engage and push against the one or the other of the said shoulders according as it is traveling in the one or the other direction, and means for operating the said revoluble member, substantially as and for the purpose set forth.

7. The combination, with a valve for controlling the supply of fluid under pressure to the engine of a towing-machine, of a shiftable bar operatively connected with the valve and provided with two shoulders arranged a suitable distance apart, a suitably-operated worm-shaft, another shaft having a worm-wheel in mesh with the worm of the worm-shaft, and a revoluble pin or member operatively connected with the last-mentioned shaft and arranged to engage and push against the one or the other of the said shoulders according as it is traveling in the one or the other direction, substantially as and for the purpose set forth.

8. The combination, with a valve for controlling the supply of fluid under pressure to the engine of a towing-machine, of a shiftable bar operatively connected with the valve and provided with two shoulders arranged a suitable distance apart, a suitably-operated shaft, a revoluble pin or member arranged to engage and push against the one or the other of the said shoulders according as it is traveling in the one or the other direction, and a clutch for controlling operative connection between the said revoluble pin or member and the shaft.

9. The combination, with a valve for controlling the supply of fluid under pressure to the engine of a towing-machine, of a shiftable bar operatively connected with the valve and provided with two shoulders arranged a suitable distance apart, a revoluble pin or member arranged to engage and push against the one or the other of the said shoulders according as it is traveling in the one or the other direction, means for operating the said revoluble member, and the arrangement of parts being such that the said revoluble pin or member shall operate the valve-actuating bar only during a portion of its revolution, and shall be in position to disengage the said bar when the said valve has been shifted into its full-open position, substantially as and for the purpose set forth.

10. The combination, with a valve for controlling the supply of fluid under pressure to the engine of a towing-machine, of a shiftable bar operatively connected with the valve and provided, upon its under side, with two shoulders arranged a suitable distance apart, a revoluble pin or member arranged to engage and push against the one or the other of the said shoulders according as it is traveling in the one or the other direction, means for operating the said revoluble pin or member, and the arrangement of parts being such that the said revoluble pin or member shall operate the valve-actuating bar only during the upper portion of its revolution, and shall

be in position to disengage the said bar when the said valve has been shifted into its full-open position, and means whereby the bar is supported when the bar is disengaged by the aforesaid revoluble member, substantially as and for the purpose set forth.

11. In a towing-machine, a tow-line-engaging drum, a star-wheel, a fluid-pressure engine provided with a member arranged to intermittently actuate the star-wheel during the operation of the engine and to turn the said wheel in the one direction or the other according as the engine-shaft is rotated in the one or the other direction, an operative connection between the drum and the shaft, a passage-way for conducting fluid under pressure to the engine, a valve for controlling the supply of fluid to the said passage-way, and mechanism for transmitting motion to the said valve from the aforesaid star-wheel, substantially as and for the purpose set forth.

12. In a towing-machine, the winding-drum, a worm-shaft having a star-wheel for turning the same, a fluid-pressure engine, an operative connection between the engine-shaft and the drum, means whereby the star-wheel is intermittently actuated during the operation of the engine and turned in the one direction or the other according as the engine-shaft is rotated in the one or the other direction, a passage-way for conducting fluid under pressure to the engine, a valve arranged to control the supply of fluid to the said passage-way, another shaft having a worm-wheel meshing with the worm of the worm-shaft, and mechanism for transmitting motion from the worm-wheel-bearing shaft to the valve, substantially as and for the purpose set forth.

13. In a towing-machine, the tow-line-engaging winding-drum, a fluid-pressure engine comprising a crank-shaft operatively connected with the drum and having an ordinary eccentric strap and rod establishing operative connection between the valve of a valve-chest of a cylinder of the engine and the engine-shaft, which rod is provided with a pin or projecting member, a star-wheel arranged to be intermittently rotated by the said projecting member of the eccentric-rod during each rotation of the engine-shaft, a passage-way for conducting fluid under pressure to the engine, a valve arranged to control the supply of fluid to the said passage-way, and mechanism through the medium of which power for operating the valve is transmitted from the star-wheel, substantially as and for the purpose set forth.

14. In a towing-machine, the combination, with a tow-line-engaging winding-drum, a star-wheel, a fluid-pressure engine having a member arranged to intermittently actuate the star-wheel during the operation of the engine and to turn the said wheel in the one direction or the other according as the engine-shaft is rotated in the one or the other direction, an operative connection between the engine-shaft and the drum, a passage-way for conducting fluid under pressure to the engine, a valve arranged to control the supply of fluid to the said passage-way, and mechanism for transmitting motion to the said valve from the aforesaid star-wheel, of means for preventing circumferential displacement of the star-wheel during the intervals of time between the intermittent actuations of the wheel.

15. In a towing-machine, the combination, with the tow-line-engaging drum, a star-wheel, a fluid-pressure engine having a member arranged to intermittently actuate the star-wheel during the operation of the engine, and to turn the said wheel in the one direction or the other according as the engine-shaft is rotated in the one or the other direction, an operative connection between the engine-shaft and the drum, a passage-way for conducting fluid under pressure to the engine, a valve arranged to control the supply of fluid to the said passage-way, and mechanism for transmitting motion to the valve from the aforesaid star-wheel, of a movable member arranged to enter the space between adjacent teeth or radial projections of the star-wheel during the intervals of time between the intermittent actuations of the said wheel and thereby lock the said wheel against rotation during the said intervals of time, and such an operative connection between the said locking member and the engine as will result in rendering the said locking member operative as soon as the star-wheel-actuating member of the engine has disengaged the said wheel.

16. In a towing-machine, the combination, with the tow-line-engaging drum, a star-wheel, means for intermittently operating the star-wheel, a fluid-pressure engine, an operative connection between the engine-shaft and the drum, a passage-way for conducting fluid under pressure to the engine, a valve arranged to control the supply of fluid to the said passage-way, and mechanism for transmitting motion to the said valve from the star-wheel, of a slide having a member arranged to enter the space between adjacent teeth or radial projections of the star-wheel during the intervals of time between the intermittent actuations of the said wheel, a slideway for the slide, and means for operating the said slide, the arrangement of parts being such that the said slide shall be rendered operative as soon as the star-wheel-actuating member has disengaged the said wheel.

17. In a towing-machine, the combination, with a tow-line-engaging drum, a star-wheel, a fluid-pressure engine having a pin or projecting member arranged to intermittently actuate the star-wheel during the operation of the engine and to engage the said wheel at the top and turn the wheel in the one direction or the other according as the engine-shaft is rotated in the one or the other direction, a passage-way for conducting fluid un-

der pressure to the engine, a valve arranged to control the supply of fluid to the said passage-way, and mechanism for transmitting motion to the valve from the star-wheel, of a slide arranged at an elevation below the star-wheel and movable up and down and having two upwardly-projecting members forming a fork arranged to straddle a tooth or radial projection of the star-wheel during the upward movement of the slide, a slideway for the slide, and a bar having an ear loosely mounted upon the aforesaid star-wheel-actuating pin or member of the engine, which bar is pivoted at its lower end to the aforesaid slide, all arranged and operating substantially as shown, for the purpose specified.

18. In a towing-machine, the combination, with a tow-line-engaging drum, a fluid-pressure engine, an operative connection between the engine-shaft and the drum, a passage-way for conducting fluid under pressure to the engine, and a valve arranged to control the supply of fluid to the said passage-way, of a revoluble pin or member, means for intermittently operating the said revoluble member, and mechanism for transmitting motion from the said revoluble member to the valve.

19. In a towing-machine, the combination, with the tow-line-engaging drum, a fluid-pressure engine, an operative connection between the engine-shaft and the drum, a passage-way for conducting fluid under pressure to the engine, and a valve arranged to control the supply of fluid to the said passage-way, of a bar having two shoulders arranged a suitable distance apart, a pivotal connection between the bar and the valve, a revoluble pin or member arranged to engage the one or the other of the said shoulders according as it is traveling in the one direction or the other, and mechanism whereby the said revoluble member is actuated in the one direction or the other according as the engine-shaft is rotated in the one or the other direction, of means for shifting the aforesaid bar out of the path of the aforesaid revoluble member, substantially as and for the purpose set forth.

20. In a towing-machine, the combination, with the tow-line-engaging drum, a fluid-pressure engine, an operative connection between the engine-shaft and the drum, a passage-way for conducting fluid under pressure to the engine, a valve arranged to control the supply of fluid to the said passage-way, an upwardly-tiltable endwise-shiftable bar operatively connected with the valve and having its lower surface provided with two shoulders arranged at a suitable distance apart, a revoluble pin or member arranged to engage or push against the one or the other of the said shoulders according as it is traveling in the one direction or the other, and mechanism whereby the said revoluble member is actuated in the one direction or the other according as the engine-shaft is rotated in the one or the other direction, of another bar arranged alongside of the first-mentioned bar and operatively connected with the valve, a lever operatively connected with the second-mentioned bar, and an oscillating shaft carried by the last-mentioned bar and having a depending arm provided with a pin or projecting member extending under the first-mentioned bar, all arranged and operating substantially as shown, for the purpose specified.

Signed by me at Cleveland, Ohio, this 7th day of March, 1901.

FREDERICK METCALF.

Witnesses:
C. H. DORER,
A. H. PARRATT.