O. J. McGOWAN.

MARINE ENGINE THROTTLING APPARATUS.

APPLICATION FILED JAN. 22, 1914.

1,155,669.

Patented Oct. 5, 1915.

5 SHEETS—SHEET 1.

Fig. 1.

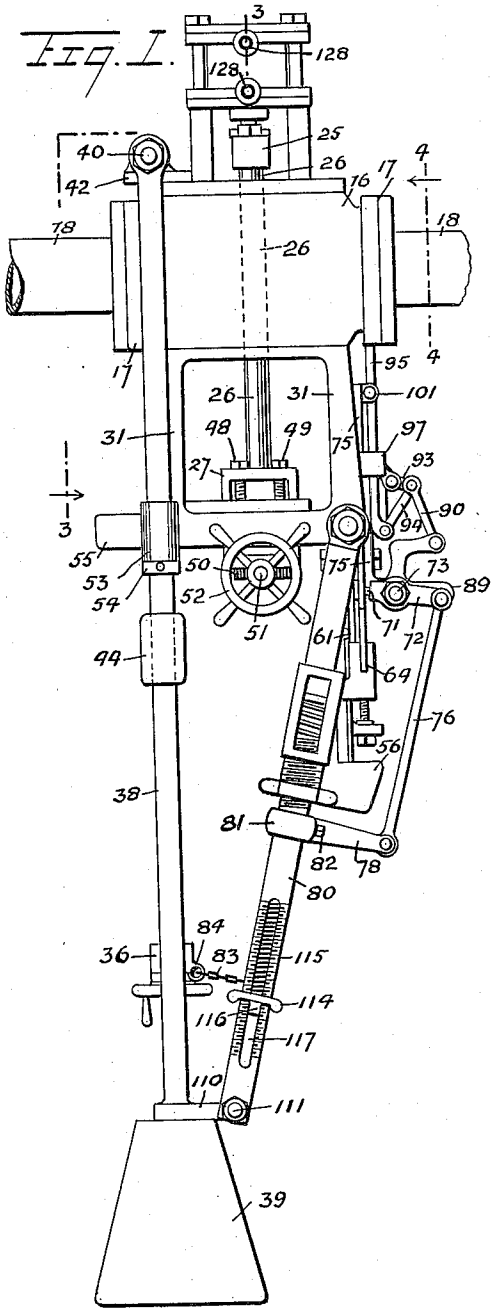
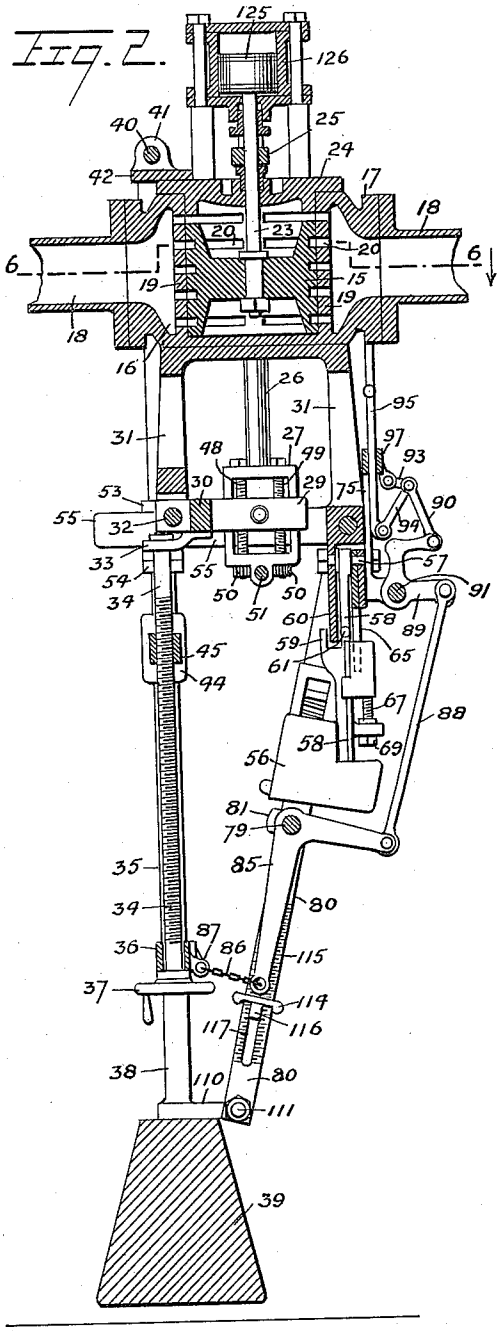


Fig. 2.



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Fig. 3.

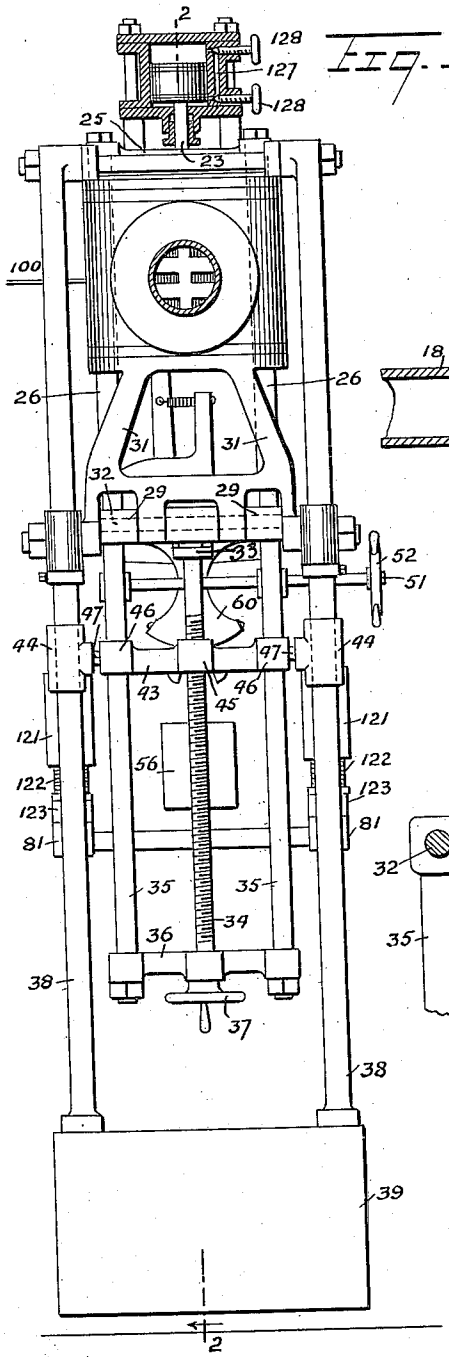


Fig. 6.

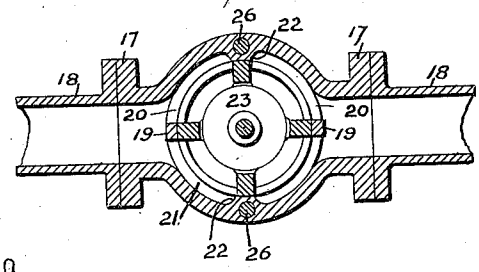


Fig. 7.

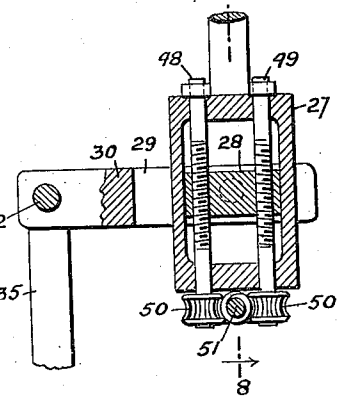


Fig. 8.

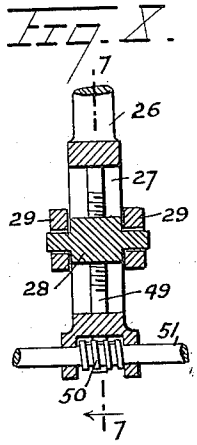
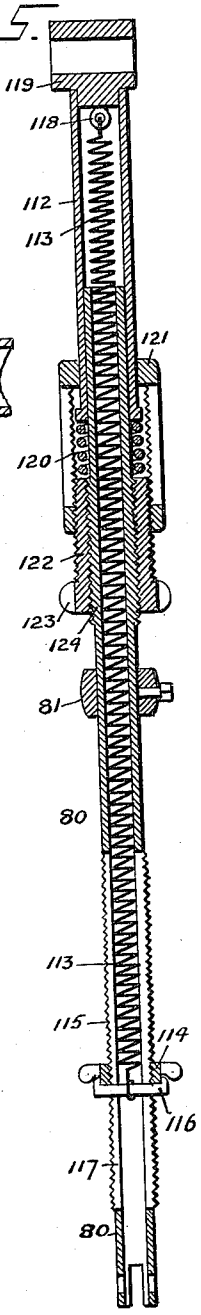


Fig. 5.



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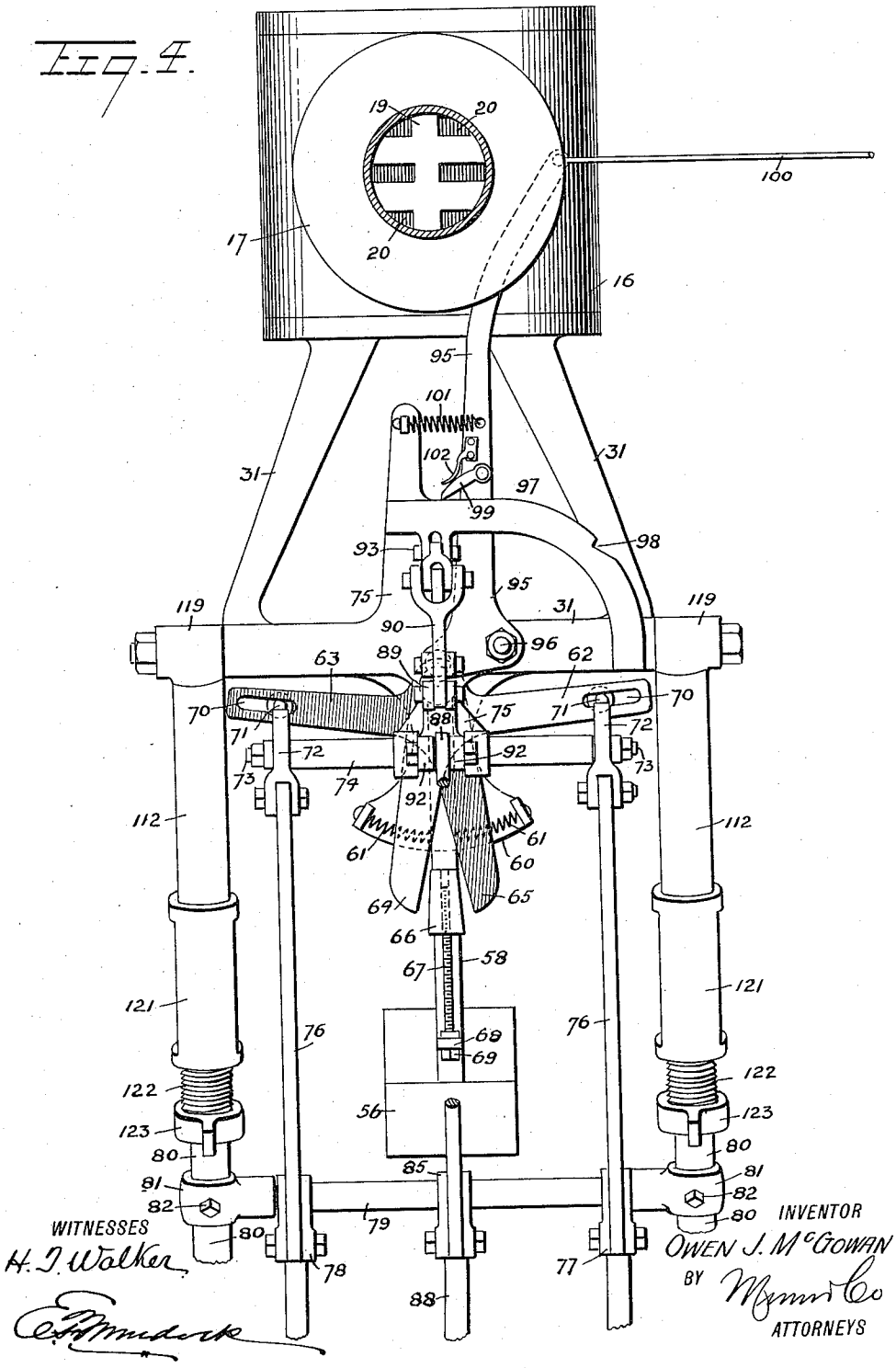
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5 SHEETS—SHEET 3.

Fig. 4.



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5 SHEETS—SHEET 4.

Fig. 9.

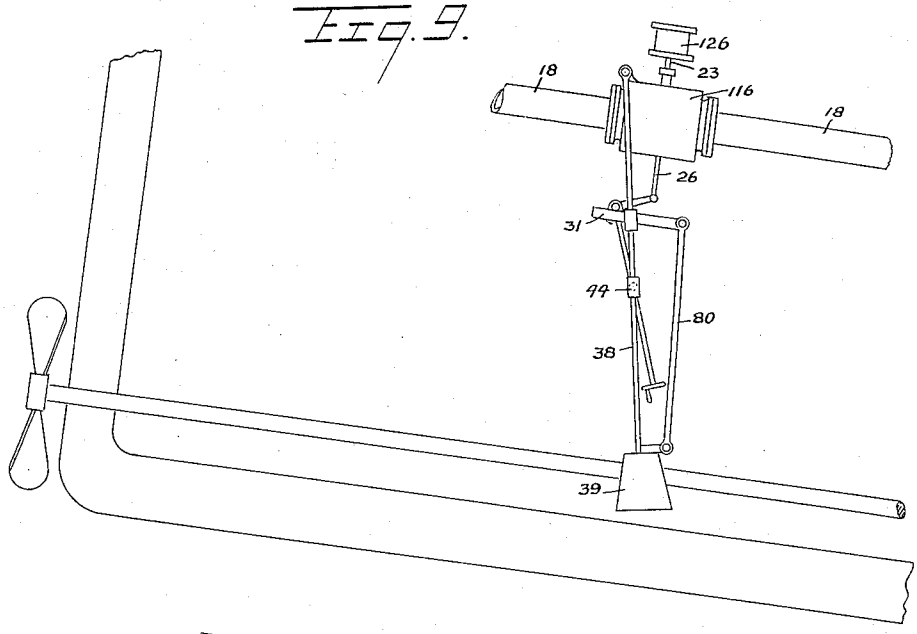
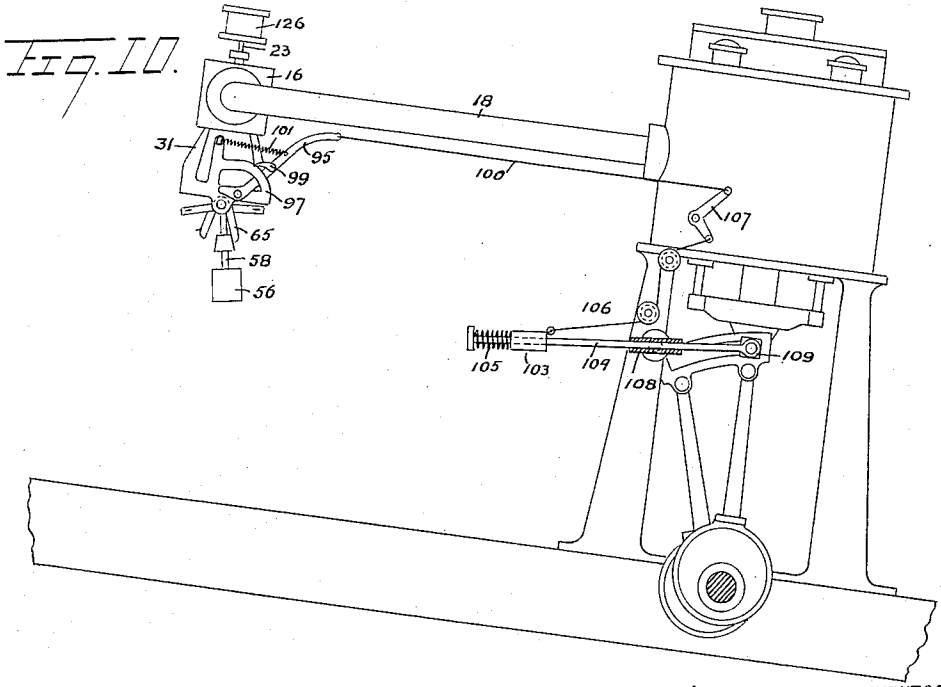


Fig. 10.



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5 SHEETS—SHEET 5.

Fig. II.

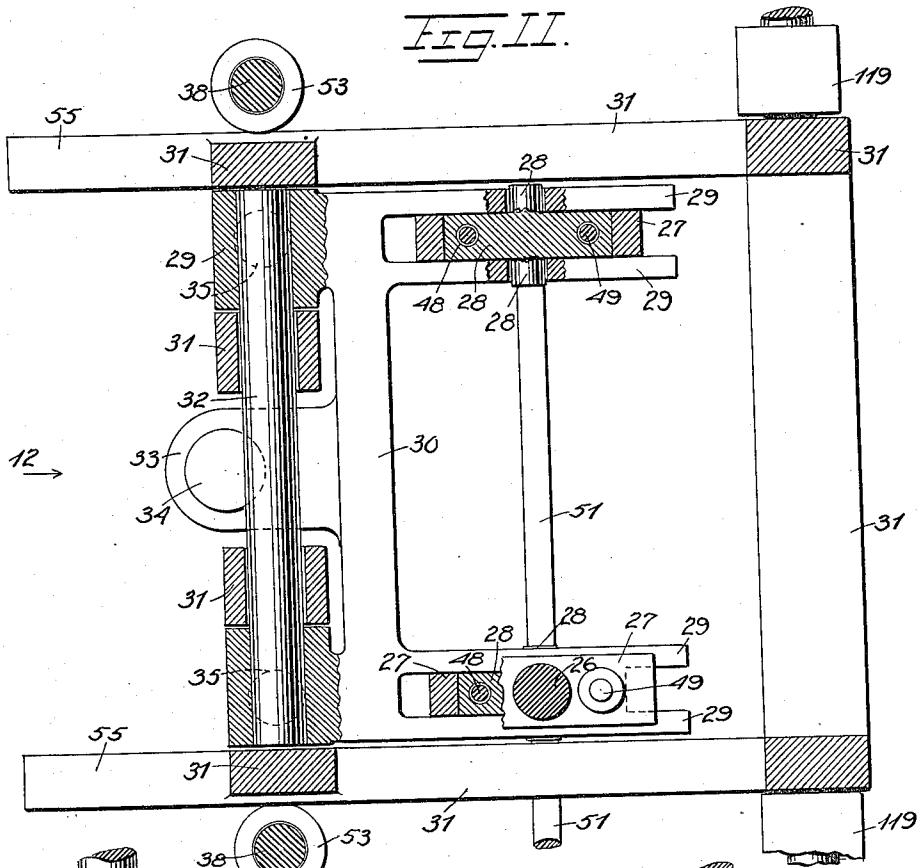
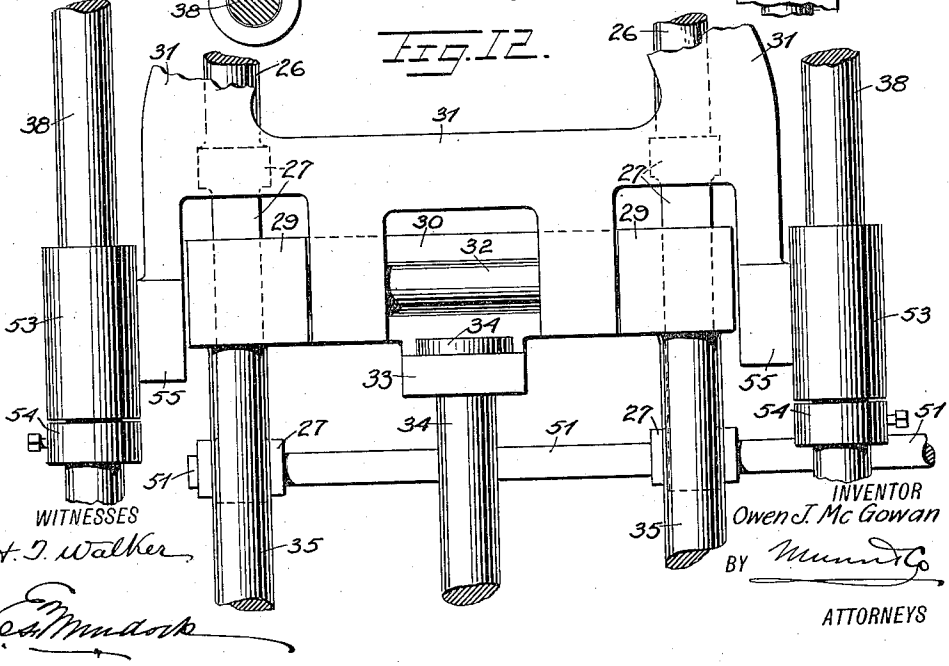


Fig. I2.



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MARINE-ENGINE-THROTTLING APPARATUS.

1,155,669. Specification of Letters Patent. Patented Oct. 5, 1915.

Application filed January 22, 1914. Serial No. 813,705.

To all whom it may concern:

Be it known that I, OWEN J. McGOWAN, a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Marine-Engine-Throttling Apparatus, of which the following is a full, clear, and exact description.

Among the principal objects which the present invention has in view are: To provide a throttling mechanism, adjustable to meet various conditions of service; to anticipate, under certain conditions, the action of a vessel having a throttling mechanism of the character described; to provide a throttling mechanism to operate in correspondence with both the roll and pitch of a vessel; to provide means for subduing the action of a throttling mechanism; to provide means for independent timing of the various controls of the throttle valve; to provide a mechanism for operating the throttle in the event of racing taking place; and to provide means for absorbing the shocks incident to the operation of the above-mentioned mechanisms.

In the drawings; Figure 1 is a side elevation of a throttling apparatus constructed and arranged in accordance with the present invention; Fig. 2 is a vertical section taken on the line 2—2 in Fig. 3; Fig. 3 is a vertical section, partly in section, the section being taken on the line 3—3 in Fig. 1; Fig. 4 is a detail view on an enlarged scale, showing in elevation the upper section of the throttling mechanism and the steam supply pipe in section, the section being taken on the line 4—4 in Fig. 1; Fig. 5 is a detail view on an enlarged scale, showing the mechanism for subduing the action of the apparatus, the view being shown as a longitudinal section of said mechanism; Fig. 6 is a detail view in horizontal section, taken on the line 6—6 in Fig. 2; Fig. 7 is a detail view, on an enlarged scale, showing in section the adjusting screws for the anticipating valve mechanism, the section being taken on the line 7—7 in Fig. 8; Fig. 8 is a section taken on the line 8—8 in Fig. 7; Fig. 9 is a diagrammatic view showing the relation, in operation, between a vessel, the propeller shaft therefor, the steam supply pipe therefor, and a throttling apparatus constructed and arranged in accordance with the present invention; Fig. 10 is a diagrammatic view showing a portion of the throttling apparatus herein described and the governing attachment therefor in service relation to a marine engine, and the link block thereof. Fig. 11 is a horizontal section on an enlarged scale, the section being taken as on the line 11—11 in Fig. 2. Fig. 12 is a rear elevation of the construction shown in Fig. 11, the view being taken as indicated by the arrow 12 in Fig. 11.

As shown in the accompanying drawings, a piston valve 15 is reciprocatively mounted in a casing 16. The casing 16 is provided with bolting flanges 17, by which it is secured, in service, on a steam supply main 18. Interiorly, the casing 16 is provided with a cylindrical partition 19, having annular slits 20 formed therein, imparting to said partition a cage-like appearance. The exterior wall of the partition 19 is separated from the interior wall of the casing 16 to form a steam space 21 at both sides of vertical partitions 22. The partitions 22 are solid throughout their height, and divide the steam space 21 at both sides of the median line of the valve.

The exterior wall of the piston valve 15 closely fits the interior wall of the partition 19. The wall of the valve 15 is slit to correspond with the slits 20 provided in the partition 19. When the slits in the valve 15 and the slits in the partition 19 correspond, as seen in Fig. 2 of the drawings, the passageway for the steam through the casing 16 is clear. When the valve 15 is lifted to place the slits in the valve 15 in register with the solid portions of the partition 19, said passageway is closed. The medium positions of said valve provide for the passage of graduated supplies of steam to said casing.

The valve 15 is suspended on a stem 23. The stem 23 passes upward through a cap cover 24 for the casing 16. The stem 23 is rigidly engaged by a cross-head 25, the ends of which are mounted on plunger rods 26. The rods 26 are housed in elongated bores formed in the partitions 22 of the casing 16, as shown best in Fig. 6 of the drawings. The lower ends of the rods 26 are each provided with a yoke frame 27, the interior whereof is trued to form a rectangular opening, to be guided by pivot blocks 28. The pivot blocks 28 are mounted be-

tween the split forward ends of lever arms 29. The lever arms 29 are united by a cross bar 30 to form a supporting frame for the valve 15.

The supporting frame formed by the arms 29 and bar 30 is pivotally mounted in a rigid frame 31, which is rigidly united to the casing 16. The pivot for said frame is formed by a shaft 32, which extends transverse the frame 31, as shown by dotted lines in Fig. 3 of the drawings. The arms 29 and bar 30 are rigidly united to or integrally formed with the side bars 35. Said supporting frame is provided with a bracket plate 33 rigidly secured to the bar 30, said plate being perforated to pivotally hold the end of a feed screw 34—see Fig. 2 of the drawings.

The side bars 35 are rigidly connected at their lower ends by a bridge bar 36, as shown in Fig. 3 of the drawings. The bar 36 is perforated to form a bearing for the feed screw 34. The upper end of the feed screw 34 is pivotally mounted in the plate 33, said screw having a head to rest above said plate to support said screw. At the lower end of the screw is provided a hand-wheel 37, whereby said screw may be rotated.

The swinging frame is connected with a plumb frame having swinging arms 38, at the lower end of which is pivotally mounted a plumbing mass or weight 39. The plumbing mass and the arms 38 thereof are pivotally mounted by means of a shaft 40, upon the cover 24. The shaft 40 is provided with bearings in ears 41, which are integrally formed on a plate 42, which plate is rigidly mounted on the cover 24.

The swinging frame for the supporting frame of the valve 15 is operatively connected with the plumb frame and the arms 38 thereof, by a rocker bar 43—see Fig. 3 of the drawings—and sliding socket blocks 44. The bar 43 is centrally provided with a tapped hub 45. The threads of the hub 45 register with the threads of the screw 34, with the result that, as the screw 34 is rotated, the bar 43 is relatively raised and lowered on the bars 35, the enlarged ends 46 of the bar 43 being smooth-bored to slide on the side bars 35. The rocker bar 43 is provided at the ends with pintles 47, which enter sockets formed in the blocks 44 on the arms 38. The blocks 44, like the ends 46, are smooth-bored to slide on the arms 38.

It will be seen that, as the rocker bar 43 is raised and lowered by manipulating the screw 34, the proportional variation of the rocker bar with reference to the side bars 35, and the swinging arms 38 in relation to the pivots of the plumb frame and swinging frame, differs. The closer the rocker bar 43 is brought to the shaft 32, which is the pivot for the supporting frame of the valve 15, the more sensitive is the action of said supporting frame to the angular variation of the axis of the casing 16 and the plumb frame having the swinging arms 38. It will be understood that the plumb frame, under all conditions of pitch of a vessel, remains vertical, while the angle between the plane of the horizon and the main 18 and the casing 16 varies. The relative effect, however, is the same as if the plumb frame swung on its pivot shaft 40.

While the sensitiveness of the valve 15 may be varied by manipulating the screw 34, the time of action is constant. To vary the time of action, I provide right and left screws 48 and 49, pivotally mounted in the yoke frame 27, and thread-engaged with suitably tapped holes formed in the blocks 28. Upon the lower ends of the screws 48 and 49 are fixedly mounted worm wheels 50, the teeth whereof are formed to register with worm sections on a shaft 51. The shaft 51 has rigidly mounted at one end thereof a hand wheel 52, as shown in Figs. 1 and 3 of the drawings.

The blocks 28 being definitely held in the arms 29, the plunger rods 26 and valve 15 suspended thereby may be said to be supported upon the screws 48 and 49. When manipulating said screws by rotating the shaft 51 in the manner described, the normal relation of the valve 15 to the partition 19, and of the slits in said valve to the slits 20 in said partition, is varied. Thus, it may be desired to so manipulate the screws 48 and 49 that when the axis of the casing 16—which usually in service is parallel with the keel of the vessel—is horizontal, the valve 15 is in position to close the passageway through said casing. Thus, the throttling apparatus may be used to anticipate the motion of the vessel, as, for instance, if in a heavy sea the vessel settles at the stern, which corresponds to the lift of the bow, the wheel 52 can be revolved to manipulate the screws 48 and 49, to lift the valve 15 relative to the arms 29 of the supporting frame. The result of this would be that as the vessel righted, the stern rising under the influence of the waves, the stem would be cut off completely at the normal level of the vessel, and the shaft would lack impulse or drive as the propeller was lifted from the water in the forward and downward pitch of the vessel. It will be understood that if desired, this action can be augmented, so that the passageway through the main 18 and the casing 16 could be determined prior to the vessel assuming the normal level after settling at the stern. It will also be noticed that this operation is controlled manually, and further, that the control may be predetermined, set, or varied at will.

The plumb frame having the swinging arms 38 is disposed to swing in a plane parallel with the longitudinal axis of the ves-

sel, or what may be termed to be "in the line of pitch" of the vessel. To prevent any side thrust of the plumb frame, I provide rollers 53, which are rotatably mounted on the arms 38, being thereon supported in operative position by a collar 54. The rollers 53 bear on the side rails 55 connecting the vertical members fore and aft of the frame 31. The side rails 55 are preferably parallel with the keel of the vessel and with the axis of the casing 16, thereby insuring a steady movement of the casing relative to the plumb frame.

As above mentioned, one of the objects which the present invention has in view is to throttle the steam supply in correspondence with the roll of the vessel. The operation of the plumb frame above described does not effect this. A minor plumbing mass or weight 56 is employed to operate the valve 15 to provide for the roll. At the outset, it will be understood that the objectionable roll of a vessel is that produced by what is called a quarter sea, or one which both rolls and pitches the vessel. Also, the roll may occur on either side of the longitudinal axis of the vessel, lifting thereby either one or the other of the screws of a twin-screw propelled vessel. With this in view, the operative mechanism is duplicated, one operating on one side, and the other on the other side.

The weight 56 is suspended from a bolt 57 by an arm 58. The arm 58 is furnished with a bracket having a finger 59 to extend around behind a shield plate 60. The plate 60 thus forms a guide and steadying device for the arm 58 and weight 56, to prevent the forward or rearward throw of the latter. The arm 58 is normally held in its central position by springs 61, as seen in Fig. 4 of the drawings.

Pivotally mounted on the bolt 57 are bell crank levers 62. As shown in Fig. 4 of the drawings, these levers are differently shaded to distinguish between the same as one crosses behind the other. The lower legs 64 and 65 of said levers cross to opposite sides of a wedge block 66, which is slidably mounted on the arm 58, and which is moved on said arm by a feed-screw 67. The feed screw 67 is held definitely in position by a lug 68 on the arm 58, below which the wrench head 69 of said screw extends, permitting the same to be manipulated when engaged by the proper tool. By adjusting the wedge block 66 lengthwise of the arm 58, the time or inauguration of the action of the throttling apparatus by the rolling action of the vessel may be advanced or retarded.

Each of the levers 62 and 63 is provided with a slot 70. Extending through the slot 70 are reduced ends 71 of rocking levers 72. The levers 72 are pivotally mounted on pintles 73 in the ends of a spreader arm 74. The spreader arm 74 is supported on a bracket plate 75, behind which the levers 62 and 63 extend.

The rocking levers 72 are pivotally united by connecting rods 76, with bell crank levers 77 and 78, respectively, the former being thus connected with the lever 62, and the latter with the lever 63. The levers 77 and 78 are independently and rotatively mounted on a framing bar 79, which extends between, and is rigidly secured upon, cushion braces 80, the bar 79 being provided with collar nuts 81 to fit said braces, and with set screws 82 to fix the position of said bar on said braces. The lower arms of the levers 77 and 78 are each connected by short sections of chains 83, as shown best in Fig. 1 of the drawings, to the bridge-bar 36 connecting the side bars 35 of the frame supporting the valve 15.

From the foregoing, it will be seen that as the vessel rolls beyond a predetermined angle at either side, the plumbing weight 56 remaining constant, one or other leg 64 or 65 of the levers 62 and 63, respectively, engages the wedge block 66, and through the medium of the connecting rod 76, rocks one or other of the levers 77 and 78. The effect on the supporting frame for the valve 15 is the same whichever lever is operated, and that is, to draw the lower end of the supporting frame forward or toward the bell crank levers 77 and 78, lifting the arms 29, rods 26 connected therewith, and valve 15, to close the passageway for the steam through the valve casing 16. In this manner, provision is made to prevent the racing incident to one of the propellers being lifted from the water when the vessel is rolling heavily, though at the moment there is no pitch of the vessel.

Mounted upon the framing bar 79 is a third bell crank lever 85, similar in shape and design to the levers 77 and 78, and likewise connected by a short chain section 86, to an eyelet 87 formed on the bridge bar 36. The lever 85, as seen best in Fig. 2 of the drawings, is united by means of a connecting rod 88, to a bell crank lever 89, the upper end whereof is connected to a toggle link 90, and is pivoted on a short shaft 91, the bearings whereof are formed in bracket heads 92 extending outward from the bracket plate 75.

The toggle link 90 is pivotally connected with a relatively short link 93 and a swinging link 94, the last-mentioned link being pivotally connected with a lever 95. The lever 95 is fulcrumed on a stud bolt 96 extending from the frame 31, and is guided in its movement by the quadrant frame 97 wherein is formed a detent 98 to receive a pawl 99 when the lever 95 is drawn backwark by the pull on a line 100.

The lever 95 is normally held by a spring

101 in the position shown in Fig. 4 of the drawings, where the lower end of the lever 95 is depressed to maintain the levers 89 and 85 in the out-of-service position shown best in Fig. 2 of the drawings. A short spring 102 serves to throw the pawl 99 into engagement with the detent 98 when the lever 95 is drawn back to permit such engagement. Thereafter, the lever 95 and parts connected therewith are held permanently in this position. When the lever 95 is thus drawn back, the toggle links 90, the lever 89, connecting rod 88 and lever 85, are affected to draw the lower end of the frame supporting the valve 15 outward to lift said valve to completely close the slits 20 in the partition 19 of the casing 16, thus effectually closing the passage of steam through the main 18.

The lever 95 is operated in the manner above described only when, due to violent racing from any cause, such as the breaking of a shaft or loss of a propeller, the weight 103 shown in Fig. 10 of the drawings, is thrown outward on a shaker bar 104, compressing a spring 105 in advance of said weight.

Attached to the weight 103 is a cord 106, operatively connecting said weight to the short end of a bell crank lever 107, the upper end of which lever is operatively connected by the line 100 to the lever 95. The bar 104 is slidably mounted in a bearing 108, and is connected to a link block 109, with which an engine to which the present apparatus is attached, is provided.

The spring 105 is adjusted to hold the weight 103 in its normal position on the bar 104. When the bar is violently swung, as by the racing of a broken propeller shaft, the weight 103 moves outward toward the free end of said bar, and draws upon the cord 106 to rock the levers 107 and 95. In this manner, the apparatus is employed as a safety governor to operate in the event of such an accident as is above outlined.

It will be understood that, before the valve 15 may be moved to pass steam through the casing 16, the pawl 99 must be released from engagement with the detent 98, manually, and the spring 101 be permitted to move the lever 95 and parts connected therewith to the normal or out-of-service position, where the same remains during the normal operation of the throttling apparatus above described.

The plumbing weight 39 suspended at the ends of the swinging arms 38 is provided with extension arms 110, at the ends whereof are pivotally secured by bolts 111, the cushion braces 80. The primary purpose of the cushion braces 80 is to relieve the apparatus from the shocks of the weight 39, when moved by the motion of the vessel, backward or forward. To maintain within bounds the swing or oscillation of the weight 39, each brace 80 is telescopically mounted in a tube 112, and connected therewith by a coil spring 113, as shown in Fig. 5 of the drawings. The normal or working tension of each spring 113 is regulated by manipulating a wing nut 114, the threads whereof engage threads on a screw section 115 formed on each brace 80. The nuts 114 are each engaged by a short bar 116 that extends through slots 117 formed in the sides of the screw section 115, and to which the one end of the spring 113 is anchored. The opposite end of the spring 113 is anchored in an eyelet 118 formed in a hub 119 with which each of the tubes 112 is provided.

A compression spring 120 serves to counterbalance the spring 113, and to overcome the contractive impulse thereof, to prevent, under normal conditions, the relative advance of the center of gravity of the weight 39.

The spring 120 is housed in an internally-threaded nut 121, and holds the brace 80 within said nut to bear against the end of the tube 112 when forced thereto by a double-threaded nut 122. The double-threaded nut 122 is provided with a head 123, by which said nut may be manipulated. Said nut is internally and externally threaded to register with threads on a threaded section 124 formed on the brace 80, and with the internal threads of the nut 121.

It will be seen that when installing an apparatus such as hereinbefore described, the nuts 114 and 121 and 122 may be manipulated to balance the weight 39 in its desired position. It will also be observed that the braces 80 do not interfere with the swing of the arms 38 and the weight 39 carried thereby.

It will be observed that, if desired, the combined braces 80 and tubes 112 may be lengthened or shortened, thereby altering the normal or initial position of the weight 39 to quicken or slow the closure of the valve 15. In other words, if the initial pull of the spring 113 be increased, and the compression of the spring 120 be relieved, the valve plumbing frame would be swung forward to partially close the valve 15, while, if the reverse arrangement of the springs 113 and 120 is effected, the plumbing frame would be relatively retarded or held backward to retard the closure of the valve 15.

To further soften or cushion the operation of the valve 15, the stem 23 is provided with a piston 125, which operates in a closed cylinder 126. The upper and lower sections of the cylinder 126 are connected by a by-pass passage 127, the entrance and exit of which are controlled by screw valves 128, as shown best in Fig. 3 of the drawings. By manipulating the valves 128, it is obvious that the rate of flow of liquid in the cylin-

der 126 may be retarded or accelerated at will. The operation of the dashpot thus formed is obvious, serving in the hereinbefore-described construction to prevent the too rapid operation of the valve 15 when arriving at the end of its stroke in either direction.

While I have herein described the use of a single throttling device in conjunction with two levers 62 and 63 and the single plummet 56 to operate on both, to avoid racing of the propellers, it will be understood that I may use a number of throttling devices, if desired, to conform with the latest approved method of ship-building, wherein separate engines are employed for operating separate propellers. Also, while I have herein described the throttle as adapted for use in conjunction with steam propelling systems, I may use the device for the purpose of throttling other fluid, such as compressed air or expanding gases. The operation in these employments would be substantially the same as that above set forth.

Claims:

1. A throttling apparatus as characterized, comprising a valve adapted to lift vertically; a suspension frame operatively connected with said valve to lift the same; a plumbing member pivotally mounted above said frame; means connecting said frame and said plumbing member to vary the extent of operation of said frame; and means connecting said frame and said valve, embodying a supporting screw adapted to extend or contract the connection between said suspension frame and said valve, to vary the closing moment of said valve relative said frame.

2. A throttling apparatus as characterized, comprising a valve adapted to lift vertically; a suspension frame operatively connected with said valve to lift the same; a plumb member pivotally mounted above said frame; means connecting said frame and said plumb member to vary the extent of operation of said frame; means connecting said frame and said valve, embodying a supporting screw adapted to extend or contract the connection between said suspension frame and said valve, to vary the closing moment of said valve relative said frame; and a manually-operative screw member for at will manipulating said supporting screw.

3. A throttling apparatus as characterized, comprising a vertically-operating valve; a rocking suspension frame therefor, operatively connected with to lift said valve; a plumb member pivotally mounted above said suspension frame; means operatively connecting said suspension frame and plumb member, said means embodying devices for varying the extent of the lift of said suspension frame relative said plumb member; and means for lifting said frame and said plumb member to vary the extent of action of said frame relative said plumb member.

4. A throttling apparatus as characterized, comprising a vertically-operating valve; a rocking suspension frame therefor, operatively connected with to lift said valve; a plumb member pivotally mounted above said suspension frame; means operatively connecting said suspension frame and plumb member, said means embodying devices for varying the extent of the lift of said suspension frame relative said plumb member; means for lifting said frame and said plumb member to vary the extent of action of said frame relative said plumb member; and manually operative means mounted on said frame for varying the operative connection between the same and said plumb member.

5. A throttling mechanism as characterized, comprising a plumb member; a controlling valve mounted on a steam-supply main; a transmission mechanism operatively connecting said plumb member and said valve, said transmission mechanism embodying means for varying the length of said transmission mechanism to alter the closing moment of said valve relative to said plumb member; a brace for said plumb member, pivotally connected therewith; and a casing for said valve, having pivotal mountings for said plumb member and said brace, said mountings being separated to form the base of a triangular arrangement of said plumb member and said brace.

6. A throttling mechanism as characterized, comprising a plumb member; a controlling valve mounted on a steam-supply main; a transmission mechanism operatively connecting said plumb member and said valve, said transmission mechanism embodying means for varying the length of said transmission mechanism to alter the closing moment of said valve relative to said plumb member; a brace for said plumb member, pivotally connected therewith; a casing for said valve, having pivotal mountings for said plumb member and said brace, said mountings being separated to form the base of a triangular arrangement of said plumb member and said brace; and a cushion mounted on said brace to limit the movement of said brace and plumb member.

7. A throttling mechanism as characterized, comprising a valve; a casing for said valve having a pendent frame provided with side arms disposed in parallel relation with the axis of said casing; a plumb frame having swinging arms pivotally mounted on said casing, above said side arms; a weight connected with said frame, at the lower end thereof; rolling members mounted on said arms to track on said rails, to control the path of movement of said arms; a brace frame having a plurality of telescopic members, said members being pivotally connected

with said pendent frame and said plumb frame; and resilient members mounted on said brace frame to cushion the relative movement of the parts of said telescopic members.

8. A throttling mechanism as characterized, comprising a valve having a pendent frame; a supporting frame for said valve, pivotally mounted in said pendent frame; means for positively determining the movement of said valve; a plumb frame embodying swinging arms pivotally mounted on said casing, above said pendent frame, and provided with a weighted member at the free end thereof; a pivotal member connecting said supporting frame and said plumb frame; a plurality of telescopically-arranged brace members pivotally connected at opposite ends thereof with the plumb frame and pendent frame, the connection of the pendent frame being removed from the plumb line of said plumb frame; a plurality of springs mounted on said telescopic brace members to vary the relative movement thereof; and screw-threaded bearing members for said springs to vary the normal tension of said springs.

9. A mechanism as characterized comprising, a valve adapted to lift vertically; a suspension frame operatively connected with said valve to lift the same; a plumbing member pivotally mounted above said frame; means connecting said frame and said member to vary the extent of operation of said member; an auxiliary plumbing member adapted for movement in a plane perpendicular to the plane of movement of the first-mentioned plumbing member; and means operatively connecting said frame and said auxiliary plumbing member for varying the operative connection of said first-mentioned plumbing member and said valve.

10. A mechanism as characterized comprising, a valve adapted to lift vertically; a suspension frame operatively connected with said valve to lift the same; a plumbing member pivotally mounted above said frame; means connecting said frame and said member to vary the extent of operation of said member; an auxiliary plumbing member adapted for movement in a plane perpendicular to the plane of movement of the first-mentioned plumbing member; and means operatively connecting said plumbing members to vary the active moment of said valve.

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

OWEN J. McGOWAN.

Witnesses:
E. F. Murdock,
Philip D. Rollhaus.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."