

No. 725,340.

PATENTED APR. 14, 1903.

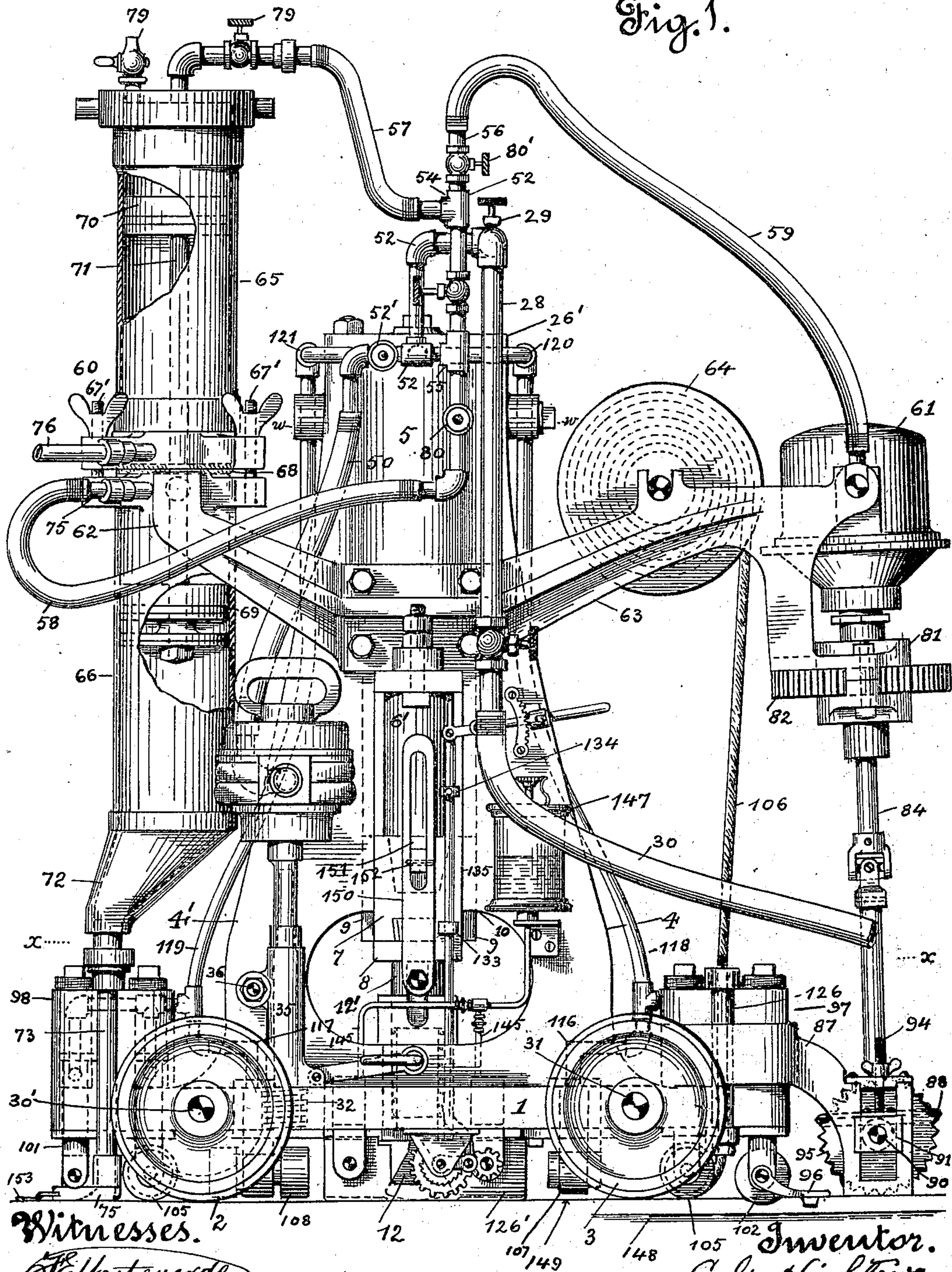
C. G. HIGHTOWER.
APPARATUS FOR CALKING SEAMS OF VESSELS.

APPLICATION FILED JUNE 10, 1901.

NO MODEL.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

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Walter E. Vane

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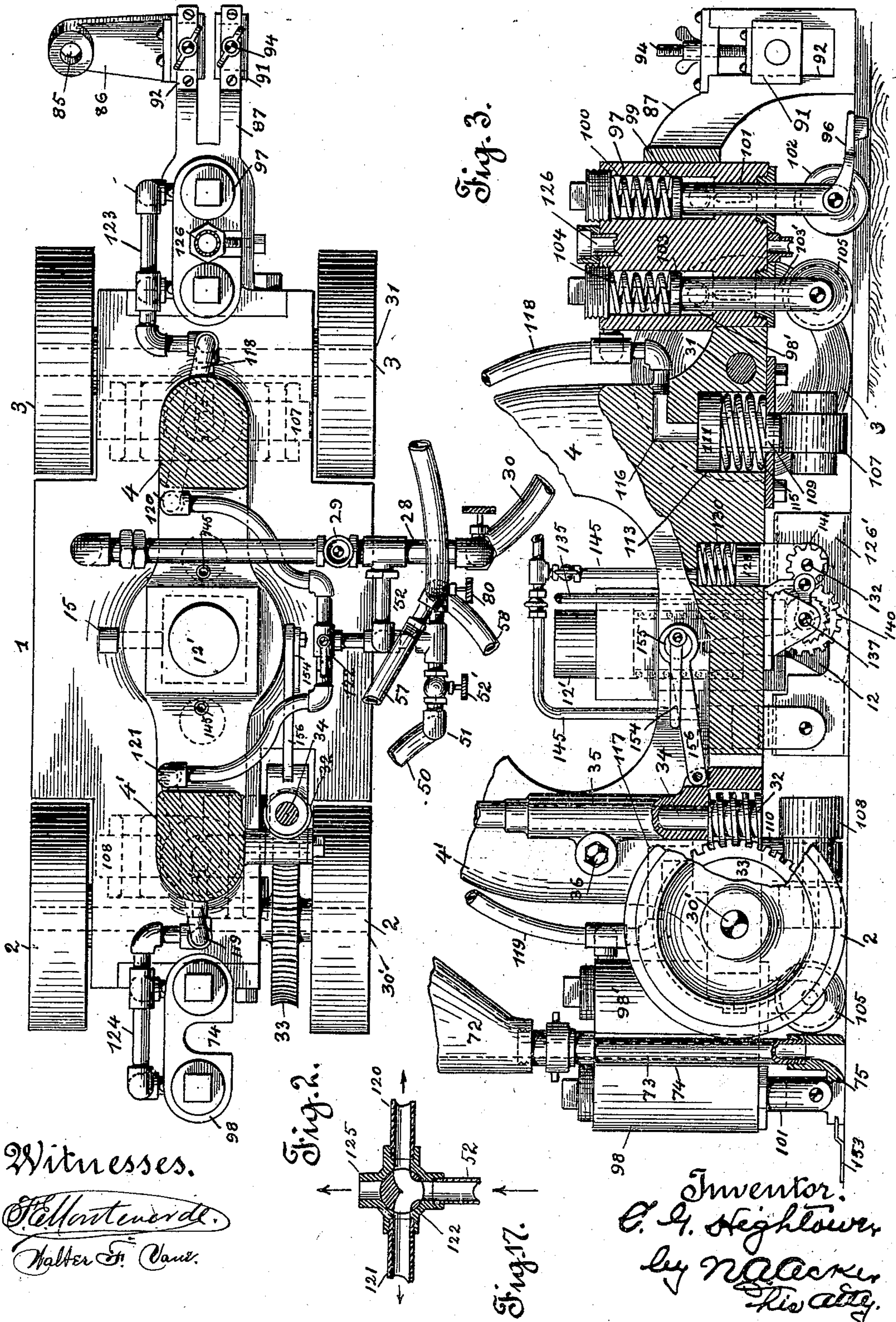
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4 SHEETS—SHEET 2.



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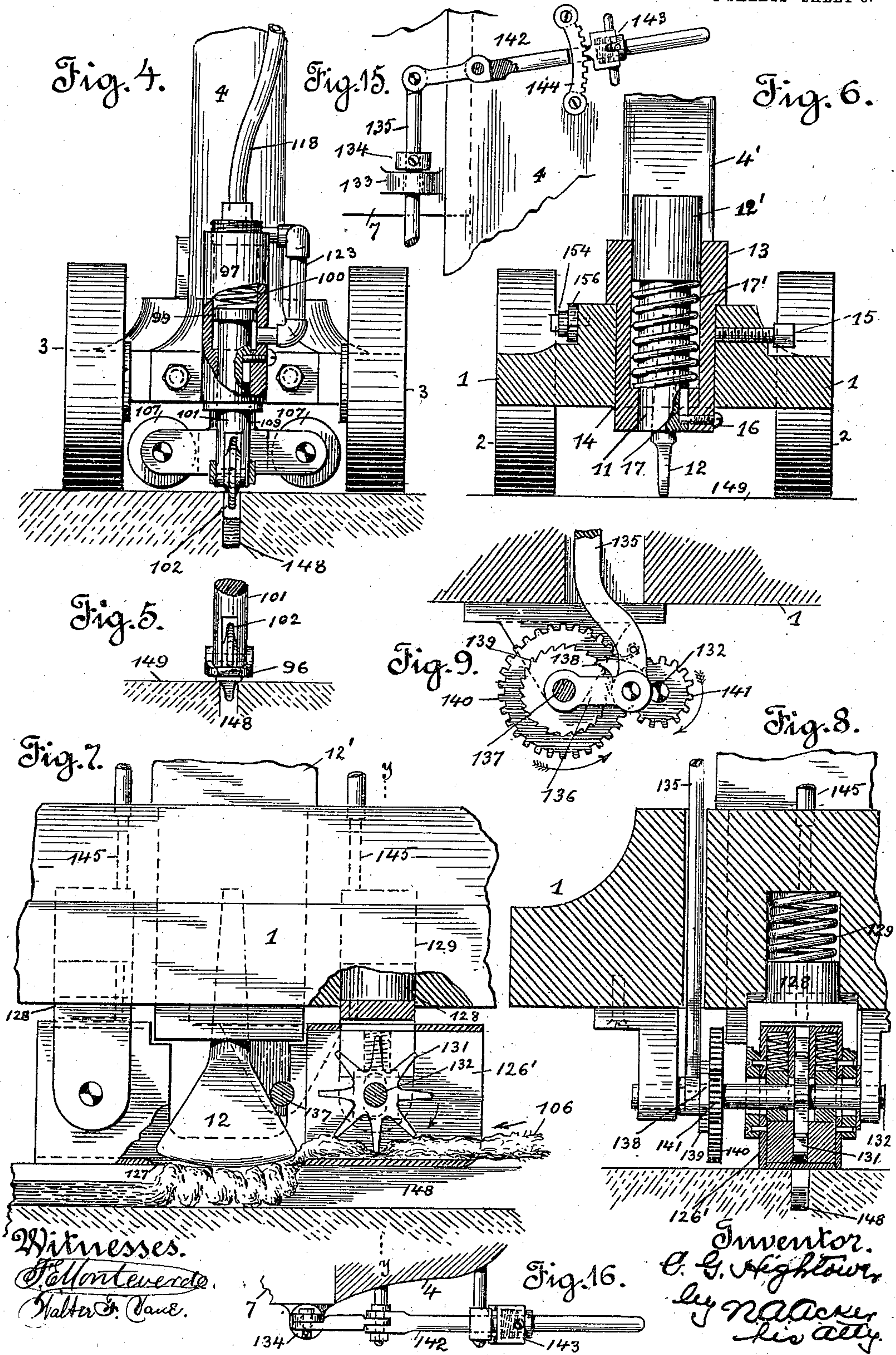
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4 SHEETS—SHEET 3.



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NO MODEL.

4 SHEETS—SHEET 4.

Fig. 10.

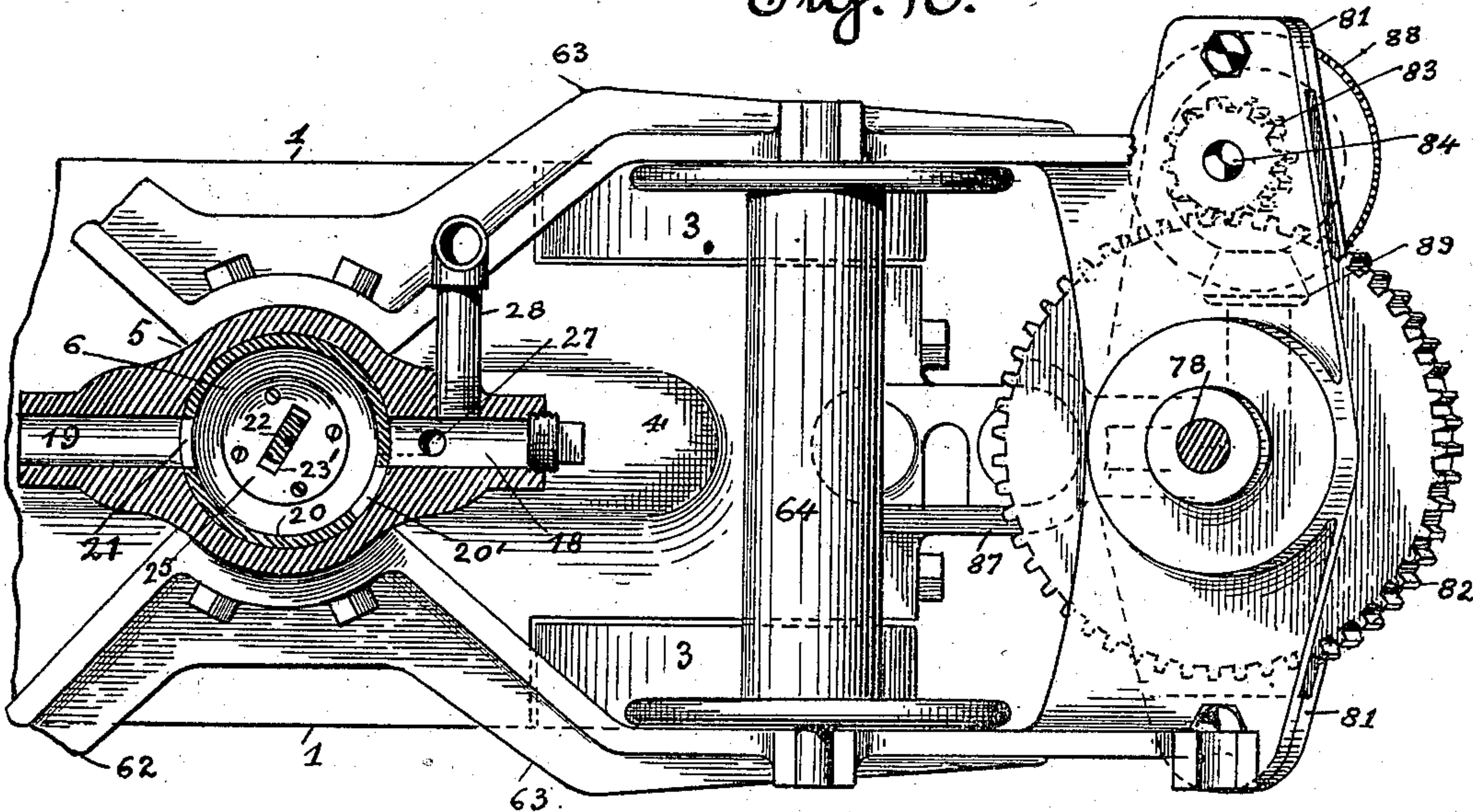


Fig. 12.

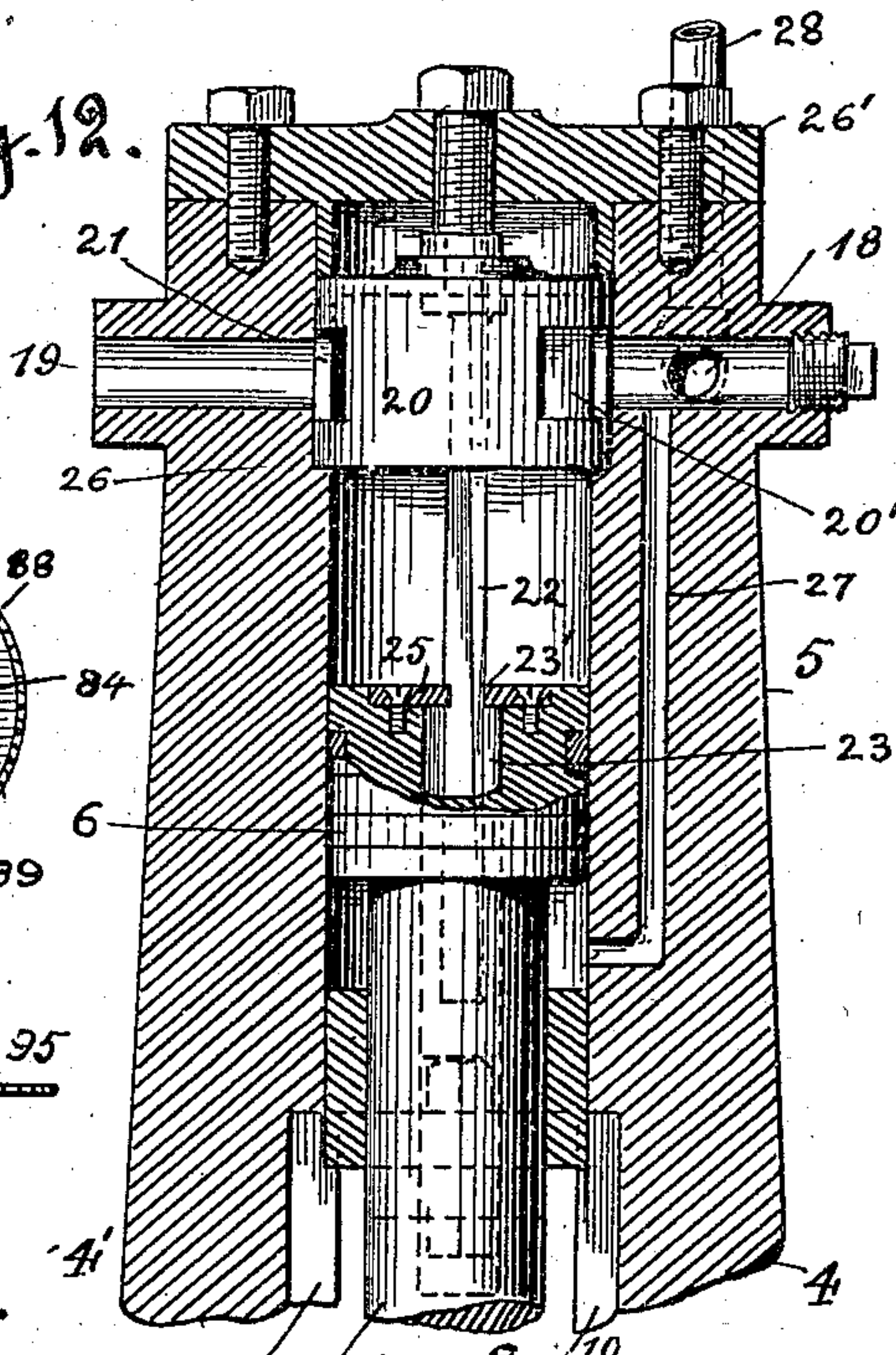


Fig. 13.

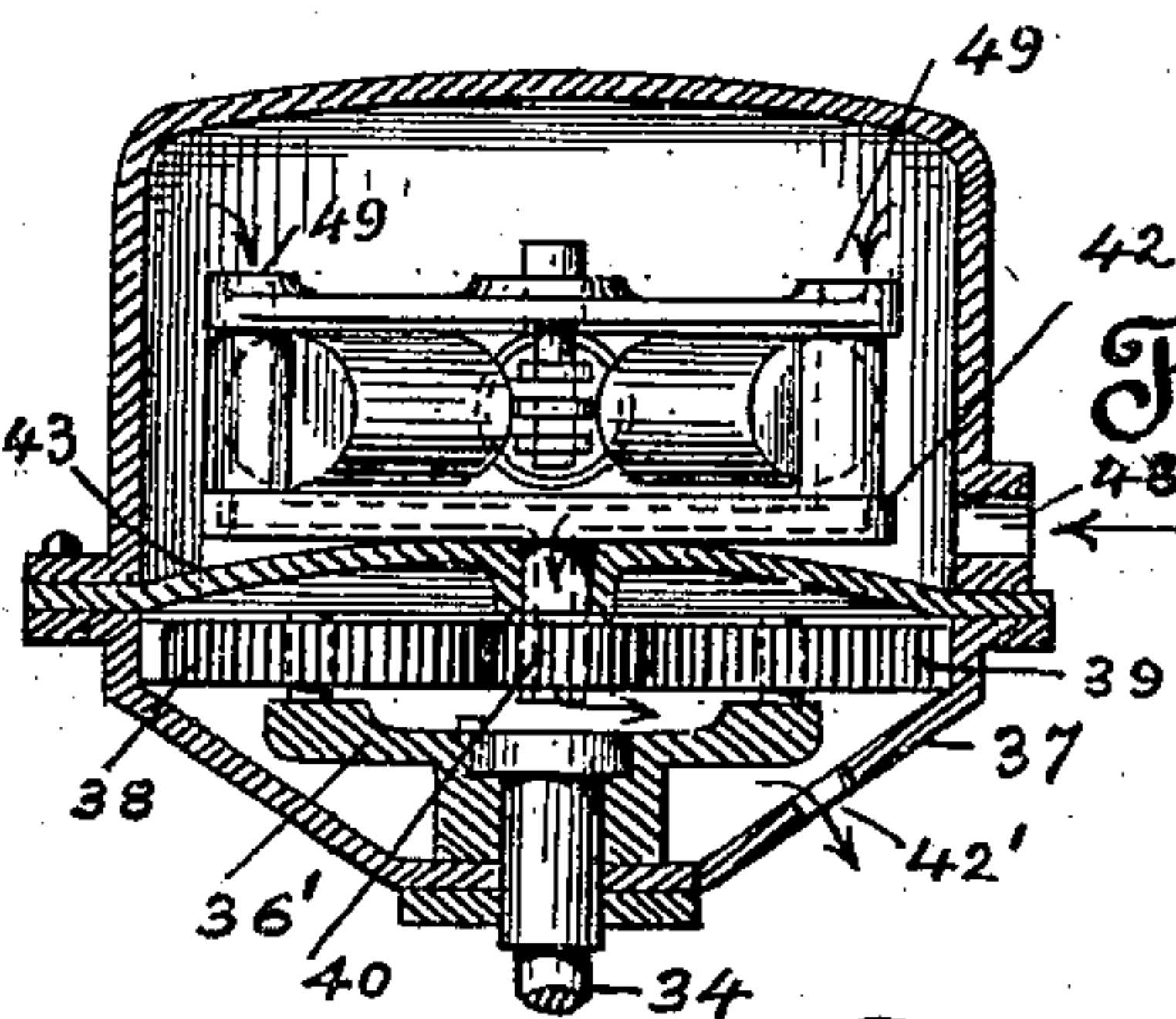


Fig. 14.

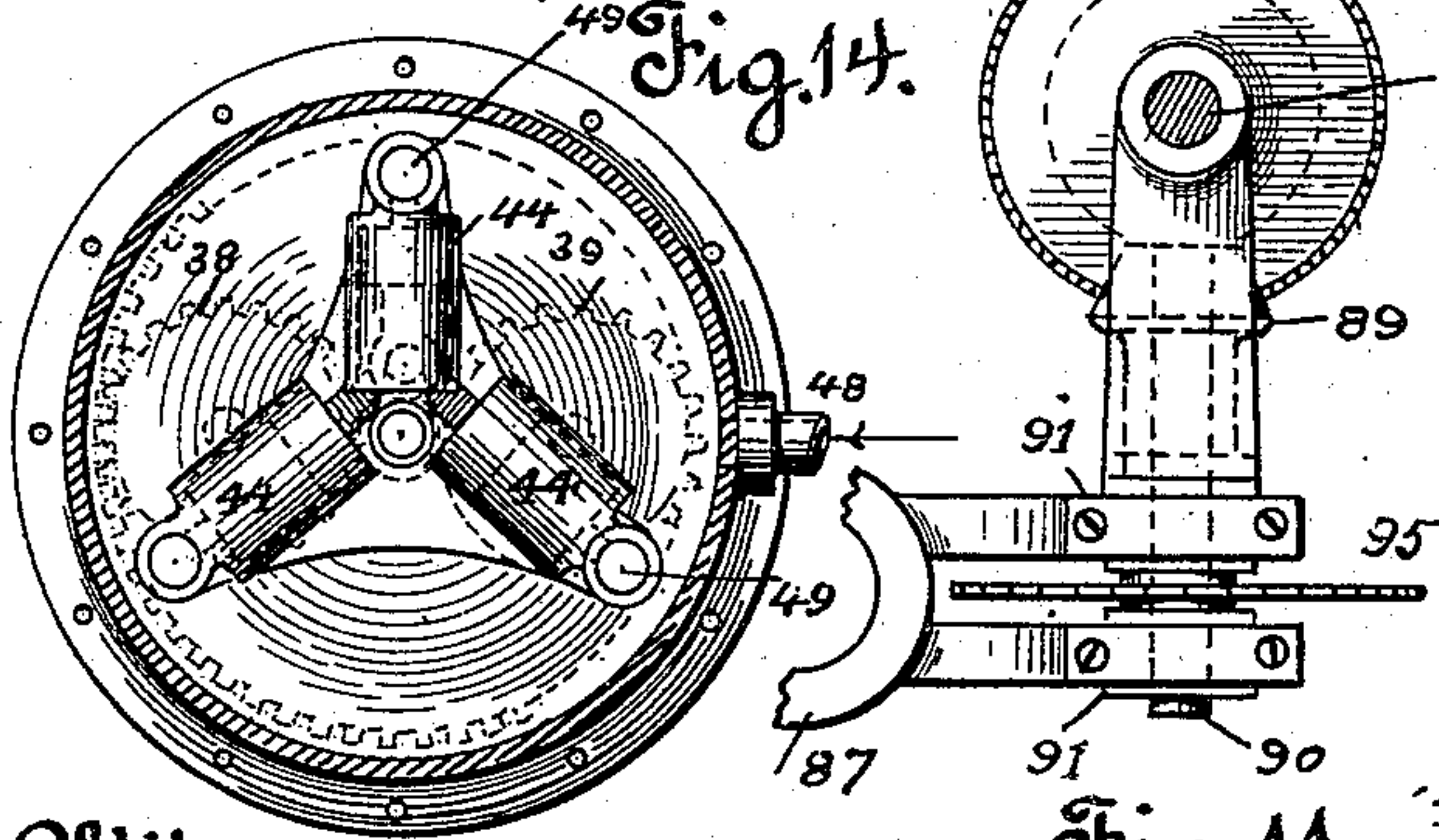
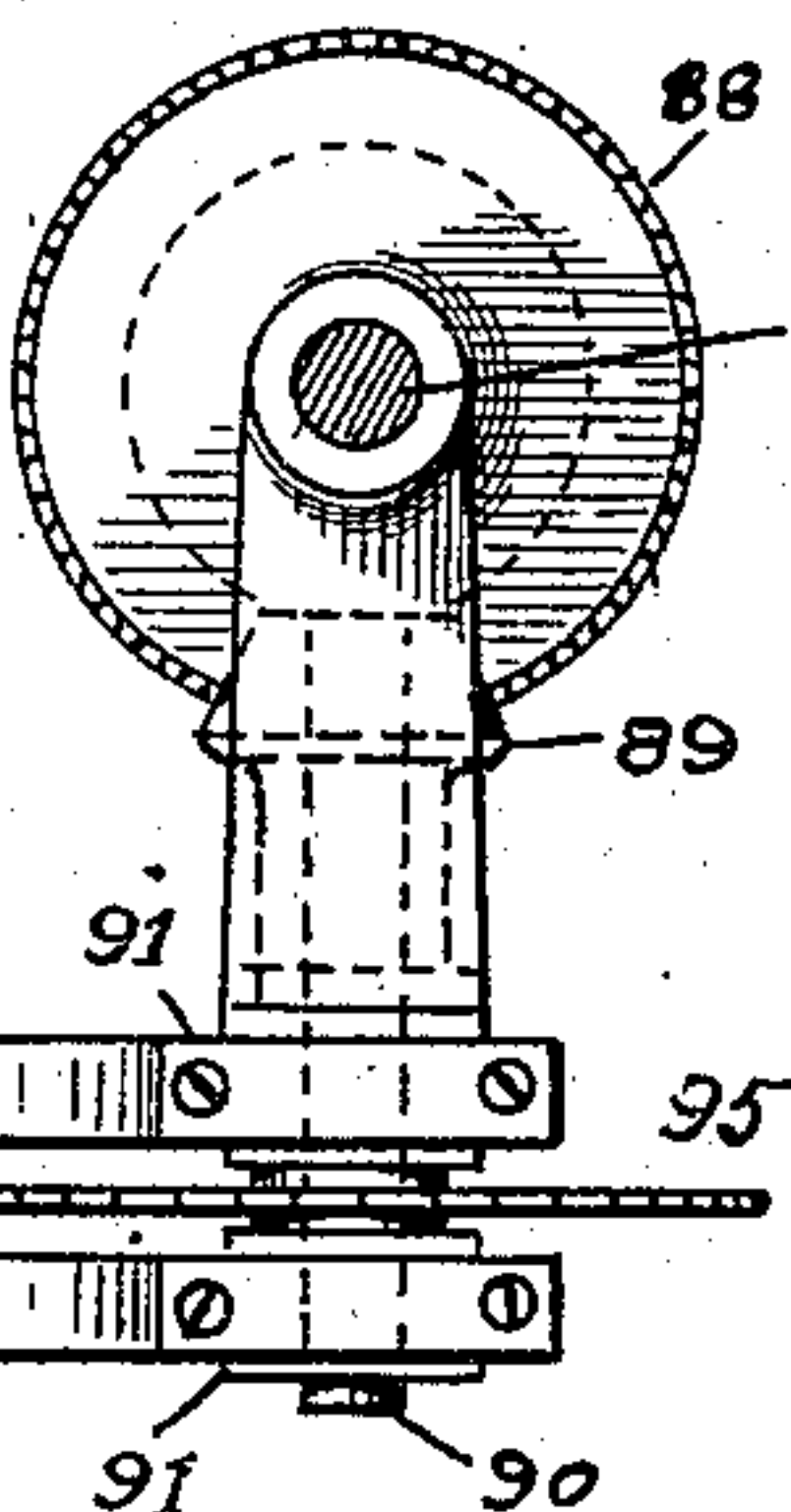


Fig. 11.



Witnesses.

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UNITED STATES PATENT OFFICE.

CHARLES G. HIGHTOWER, OF SAN FRANCISCO, CALIFORNIA.

APPARATUS FOR CALKING SEAMS OF VESSELS.

SPECIFICATION forming part of Letters Patent No. 725,340, dated April 14, 1903.

Application filed June 10, 1901. Serial No. 63,907. (No model.)

To all whom it may concern:

Be it known that I, CHARLES G. HIGHTOWER, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented certain new and useful Apparatus for Calking Seams of Vessels; and I do hereby declare the following to be a full, clear, and exact description of the same.

10 The present invention relates to a new and useful apparatus for use in calking seams of ship-decks or work of like character or where it is desired to make water-tight the opening between planks; and the object of the invention is to enable the oakum or calking material to be driven with greater rapidity, more uniform, and with compactness unattainable by hand-calking.

20 The calking of vessels is at present done by hand, expert calkers being required for such purpose. As a result the oakum is not driven with uniformity, inasmuch as it is impossible for the calker to drive the oakum with an even blow throughout the entire work. However, the main objection to this manner of calking is the slowness with which the work is accomplished and the expense attached thereto, as an expert calker is unable to cover more than about one hundred and fifty feet for a day's work. In addition to the calker an expert puttier is required to putty the calked oakum after the calker has completed his portion of the work, and where the work is to be performed upon an old vessel a workman must be employed to remove the old oakum from the seams before the calker is enabled to apply the new oakum therein. These various steps require that much time be devoted to the work of properly calking a vessel and the expenditure of considerable money therefor.

45 While the present invention performs the work of calking the seam, it is likewise adapted to apply putty to the calked seam, and in case of an old vessel being recalked means are provided for removing the old oakum from within the seam, so as to clear the same in advance of the calking mechanism.

50 Practical experience has demonstrated that by the employment of the hereinafter-described apparatus about fifteen hundred feet

may be successfully calked and puttied in one day, and that without the aid of expert calkers.

55 The hereinafter-described apparatus is believed to be the first automatically-operated means whereby the work of calking the seams of vessels is mechanically performed by forcing the oakum into the seam under a uniform pressure. Hence the intent is to cover this feature broadly, whether the apparatus be employed simply for the operation of calking or in connection with the reaver and puttier attachments or in combination with either of said attachments.

60 In order to comprehend the invention, reference should be had to the accompanying sheets of drawings, wherein—

70 Figure 1 is a side view of the calking apparatus with the reaver attachment for removing the old oakum and the attachment whereby the calked seam is puttied applied thereto. Fig. 2 is an enlarged longitudinal sectional top plan view taken on line *xx*, Fig. 1, the reaver and puttier attachment being removed. Fig. 3 is a broken part sectional-view, in side elevation, of the apparatus Fig. 2, showing the puttier attachment; Fig. 4, a broken front end view in elevation of the apparatus, partly in section, the reaver attachment and seam-gage finger being removed; Fig. 5, a detail view of the front guide-roll with seam-gage finger; Fig. 6, a vertical sectional view illustrating the calking-tool and its guide-sleeve secured to the frame, the sleeve being in section. Fig. 7 is an enlarged detail side view of the tucker for the oakum and the calking-tool, the drive mechanism for the tucker being removed. Fig. 8 is a vertical sectional view taken on line *vv* of Fig. 7 of the drawings, the drive mechanism for the tucker being in position; Fig. 9, a detail side view of the drive mechanism for the tucker removed from Fig. 7. Fig. 10 is an enlarged broken top plan view, partly in section, on line *ww*, Fig. 1, with reaver-motor removed; Fig. 11, an enlarged detail plan of the reaver with its drive-shaft. Fig. 12 is an enlarged detail sectional view, partly broken, of the hammer-cylinder, showing the valve mechanism for driving the hammer; Fig. 13, a vertical sectional view of the motor for driving the reaver; Fig. 14, a

horizontal sectional top plan view of the motor; Fig. 15, a side view in elevation of the adjusting device for the drive mechanism of the tucker. Fig. 16 is a top plan view of the adjusting means illustrated by Fig. 15, and Fig. 17 a detail view of the three-way valve for the branch supply-pipe.

The numeral 1 is used to indicate the frame or base plate of the machine, supported by the rollers 2 and 3. The frame or base plate has secured thereto the uprights or standards 4 4', which carry the cylinder 5. In the present case the frame-plate, standards, and cylinder are made integral. This, however, is immaterial, as the said parts may be cast separately and united in any suitable manner. Within the cylinder 5 works the piston 6, to the stem 6' of which is connected the hammer 7. This hammer is provided with a removable head 8, which is dovetailed thereto. The hammer is provided with the side extensions 9, which work within the guides or ways 10, cut in the inner face of the standards or uprights 4 4', Fig. 1 of the drawings. The hammer acts upon the stem 11 of the calking-tool 12 during the reciprocating motion of the piston 6. Said stem 11 works within a sleeve 13, fitted in a vertical opening 14 in the frame or base plate 1, being held therein by the tightening-screw 15. The tool is prevented from dropping out of its sleeve or shell by means of the screw 16, extending therethrough and into a vertical slot 17, cut in the face of stem 11. The said stem is held upward by the pressure of the recoil-spring 17', which bears against its enlarged head 12'. Thus the calking-tool is normally held out of and above the seam to be calked and, being spring-actuated, automatically returns with the upward movement of the hammer, Fig. 6 of the drawings. In the present case the calking-tool is detachably connected to its stem 11. Consequently the tool may be removed therefrom for any desired purpose.

The cylinder 5 is provided with the inlet and outlet openings 18 19, Fig. 12 of the drawings, which openings are controlled by the rotatable cage-valve 20. This valve is open at its bottom, and through the side wall thereof the inlet and outlet ports 20' 21 are cut, which register, respectively, with the openings 18 19 of the cylinder. When port 21 registers with opening 19, so as to open same, port 20' is out of register with opening 18 and said opening is held closed. This valve is rotated in order to open and close said ports during the stroke of the piston 6, its flat stem 22 working within the hollow portion 23 of the piston. This stem 22 is formed with a twist, and it extends through the elongated opening 23' in the end plate 25 of the piston.

The cage-valve rests upon the seat 26 and is held in place against longitudinal movement by the cylinder-head 26'. During the reciprocating movement of the piston the valve-

stem 22 is turned to the right or left, depending upon the direction of the piston's stroke. Inasmuch as the stem is rigid with the cage-valve, the movement of said stem rotates the cage-valve 20, so as to open or close inlet and outlet openings 18 19.

In the wall of the cylinder is the passageway 27, which leads from the inlet-opening 18 and communicates with the interior of the cylinder at a point below the downstroke of the piston. With the inlet 18 is connected the main supply-pipe 28, Figs. 1, 2, 10, and 12 of the drawings. This supply-pipe is provided with a valve 29, by means of which the admission of the motive fluid to the main cylinder is controlled.

Any suitable motive power may be utilized to operate the apparatus, although pneumatic or compressed air is preferred. An air-compressor (not shown) is located at any convenient point, and the compressed air is supplied by means of the flexible tube 30, which connects the air-compressor with the main supply-pipe 28.

The supporting-rolls 2 3 are secured to axles 30' 31, which work in bearings of the frame or base 1. In the present case the rolls 2 constitute the drive-rolls of the apparatus, being driven by the worm 32, which meshes with worm-gear 33, mounted upon axle 30'. The worm 32 is carried by the worm-shaft 34, which shaft works within the tubular casing 35. This casing is fulcrumed by pin 36 to the upright or standard 4', Figs. 1 and 3 of the drawings.

The upper end of the worm-shaft 34 is attached to the bracket 36', located within the motor-casing 37. Said bracket carries the gears 38 39, which are driven by the intermeshing pinion 40, Fig. 13 of the drawings. This pinion is attached to spindle depending from disk 42 within the casing, said spindle extending through a central opening in the diaphragm 43, which divides the casing. Within the casing and attached to the disk 42 are located the air-cylinders 44, in each of which works a piston. This constitutes an air-motor of well-recognized type, and specific description thereof and as to its workings is not required. The casing is formed with an air-inlet port 48, through which air is admitted for the working of the pistons of the air-cylinders, the air under pressure entering the cylinders through the ports 49. The exhaust from the cylinders makes its escape from the casing through the opening 42'.

To the air-inlet port 48 connects the hose 50, leading from point 51 of the branch air-supply pipe 52. By means of the valve 52' the supply of air to the drive-motor is controlled. This branch supply 52 is connected with the main supply-pipe 28, the flow of air from said main supply-pipe through the branch supply-pipe into hose 50 being regulated by the said valve 52'.

From points 54 55 56, respectively, of the

branch pipe extend the hose connections 57 58, and 59, the two former of which connect with the putty-cylinder 60, while the latter connect with the air-motor 61 for driving of the reaver attachment. The putty-cylinder 60 is supported in brackets 62, extending from standard or upright 4', while the motor 61 is held within bracket 63, extending from standard or upright 4, which bracket also supports the oakum-reel 64, Fig. 1 of the drawings.

By preference the putty-cylinder is made in sections 65 66, united by bolts 67', the sections being separated by diaphragm 68. In the lower section 66 of the cylinder is placed the putty which is to be delivered to the seam after the oakum has been driven therein. Within the lower cylinder-section works the piston 69, while in the upper section of the cylinder works the piston 70. These pistons are connected by stem 71, and they are gradually forced downward by the pressure of the air entering the cylinder from the connections 57 and 58, that from connection 57 being admitted into the upper section above piston 70 and that from connection 58 being admitted into the lower section above the piston 69. The air thus admitted causes the pistons to move downward and gradually force the putty from the lower section through its tapering outlet 72 into and through tubular extension 73. This extension is held within guide-openings 74, and to the lower end thereof is attached the putty-guide 75, Figs. 1 and 3 of the drawings. To raise the pistons within the cylinder-sections, the hose connection 58 is disconnected from inlet-pipe 75 and connected with pipe 76, which enters the cylinder above diaphragm 68, and air thus admitted to the cylinder below piston 70, the pressure of which forces said piston and piston 69 through the medium of connecting-stem 71 upward. This is only necessary when it is desired to replenish the lower section with putty. During the upward stroke of the pistons the lower section exhausts through pipe 75, while the upper section exhausts through an outlet controlled by cock 79. The flow of air from branch supply to the cylinder through the connections 57 and 58 is controlled by the valves 79 80, respectively. During the downward movement of the pistons the exhaust or outlet of the cylinder is through pipe 76, which is normally an open one. To refill the lower section of the cylinder with putty, the upper section is disconnected and the piston removed therefrom, when free access may be had to the interior of the lower section of the cylinder.

By means of the valve 80' the admission of air from the branch supply 52 through the connection 59 to the reaver-motor 61 is controlled. The motor employed for operating the reaver is the same as that described in connection with the motor for driving the apparatus, Figs. 13 and 14 of the drawings. When used to drive the reaver, the form of gears and pinion used to drive the worm-shaft

is dispensed with and the depending spindle 78 of the rotating disk works in bearings of the bracket 81 and has secured thereto the gear-wheel 82. This gear-wheel meshes with pinion 83, secured to the upper end of drive-shaft 84, which shaft extends through guide-opening in bracket 81 and guide-opening 85 in bracket 86, extending laterally from frame 87. To the lower end portion of the drive-shaft is keyed or otherwise secured the crown gear-wheel 88, which meshes with crown-pinion 89 of cross-shaft 90. This cross-shaft works in the adjustable bearing-boxes 91, fitted to slide between the arms 92 of the frame 87. Said boxes are raised and lowered by means of the screw-bolts 94. Upon the cross-shaft 90 between the adjustable bearing-boxes is secured the reaver 95, which is held a slight distance in advance of the gage-plate 96. The reaver is in line with the seam to be calked during the operation of the apparatus, and its function is to remove from the seam the old oakum and putty, thus presenting a free seam to be calked. When the seam is that of a new vessel or being calked for the first time, the reaver is not necessary. In such case it may be raised clear of the seam or the entire reaver attachment may be removed.

In the main frame or base plate near each end the cylinders 97 and 98 are located. Within cylinders 97 works piston 99, which is held outwardly or downwardly pressed by spring 100. The stem 101 of each piston projects beyond the cylinder and its lower end is bifurcated, and between the arms of stem working in cylinder 97 the guide-roll 102 is held. This guide-roll fits within the seam to be calked and guides the apparatus, so as to hold the calking-tool in line therewith. To said stem in advance of the guide-roll is attached the gage-plate 96, which works in the seam to be calked in advance of the forward guide-roll. The object of said gage-plate is to clear the seam of loose putty or oakum left by the reaver.

Between the cylinders 97 98 are located cylinders 98', and in each of said cylinders works the piston 103, held down by spring 104. The stem 103' of said pistons, like those of pistons 99, extends below the main frame or base plate, and the lower end of each stem is bifurcated and carries between its arms the roll 105, said roll having a grooved periphery. The forward roll acts as feed-roll for the oakum thread 106. Two feed-rolls for the oakum are illustrated in view of the fact that the feed of oakum may be from either end of the apparatus, the forward end thereof being that in the direction of travel.

Intermediate the guide-rolls 105 are arranged the rolls 107 and 108, which are used to move the apparatus transversely or from one seam to another. After a seam has been calked its entire length the apparatus must be moved to the next seam to be calked. For this purpose the rolls 107 108 are provided.

These rolls are carried by the stems 109 110 of pistons 111, which work within cylinders 113. These pistons are held upward within the cylinders by springs 115, so that the rolls 107 108 are normally held clear of the deck. When the pistons are forced downward, the rolls 107 108 bear against the deck and raise or jack the entire apparatus clear thereof. As thus raised a workman by exerting slight pressure thereon may easily roll the apparatus to the seam to be calked. The rolls 107 108 are lowered by the air-pressure admitted to cylinders 113 above the pistons 111. Air is supplied to the cylinders through ports 116 117 by means of the connections 118 119, which connections are attached to the branch supply-pipe at points 120 121, respectively. The supply of air to the cylinders is controlled by the three-way valve 122, which admits air from the branch supply-pipe to the connections simultaneously. At the same time air is admitted within the cylinders 97, 98, and 98' in order to raise the stems 101 and 103' and the rolls carried thereby. The air is admitted below the piston of each cylinder through the couplings 123 124, which connect, respectively, with the said cylinders and the connections 118 119. The moment the three-way valve 122 is turned to cut off the supply of air from the branch supply-pipe communication is established between the connections 118 119 and the exhaust 125 of said branch supply. The pressure of springs 100, 104, and 115 returns the pistons to their normal position, the air from the cylinders escaping through exhaust 125.

The thread of oakum as unwound from the reel 64 passes through guide-tube 126 to the feed-roll 105 and is held in proper position below the calking-tool 12 and presented in a straight line thereto by means of the shoe 126'. This shoe is provided with a tool-opening 127 in its bottom and is supported below frame 1 by means of the rods 128, which work within seats 129 and are held pressed outward by springs 130. By means of these springs the shoe is held firmly pressed against the deck being calked. Within this shoe is located the tucker-wheel 131, which is mounted upon the shaft 132. This wheel engages the oakum fed through the shoe and tucks or bunches same within the shoe over the outlet-opening. The object of this tucking or bunching the oakum is that a ball, so to speak, of oakum may be presented to the action of the calking-tool in case of a wide seam and necessity of repeating the act of calking avoided, which would be required in case only a strand of oakum should be driven into the seam at each stroke of the calking-tool. By thus tucking or bunching the oakum a sufficient quantity of oakum is driven into the seam with each stroke of the tool to fill the same. The tucker-wheel is actuated by the stroke of the hammer 7. This hammer carries a lug 133, which during its upstroke engages with the collar 134, secured to rod 135, and lifts the said

rod a given distance. Said rod is connected at its lower end to link 136, Figs. 3 and 9 of the drawings, which link is loosely mounted upon shaft 137. To the rod 135 is attached the pawl 138, which engages with the pawl-gear 139, secured to shaft 137. With each upward stroke of the hammer the rod 135 is lifted, which in turn through its pawl mechanism rotates the gear 139. The rotation of this gear imparts a corresponding rotation to shaft 137, which carries the larger gear 140. This gear meshes with pinion 141, so as to impart rotation to shaft 132, to which the tucker-wheel 131 is secured. Thus with each upward stroke of the hammer 7 it will be seen that the tucker-wheel is driven by a step rotation. The length of the stroke of rod 135 may be increased or decreased by means of the lever 142, fulcrumed to one of the standards of the apparatus, Fig. 15. This lever is connected at its outer end to upper end of the rod 135, and at its inner end portion is provided with the spring-catch 143, which catch engages with quadrant 144. By raising or lowering the actuating-rod 135 through its adjusting mechanism the distance of collar 137 from lug 133 is increased or decreased and a longer or shorter throw imparted to the pawl mechanism and the travel of the tucker-wheel with each throw of the said mechanism correspondingly increased or decreased. The tucking or bunching of the oakum is heavy or light, depending upon the amount of travel given the tucker-wheel.

During the operation of calking it is desired that the oakum be oiled, so as to preserve the life thereof while in the seam. For this purpose there is an oil passage-way formed in the seats 129, Figs. 1 and 7 of the drawings, with which connect oil-tubes 146. These tubes lead from the oil-cup 147. The oil fed to the seats 129 gradually escapes therefrom and saturates the oakum held within the shoe 126'.

It is possible that during the work of calking the calking-tool 12 may stick in seam 148 of deck 149 when driven therein by the hammer 7 and the pressure of recoil-spring 17' be insufficient to raise the tool therefrom. To provide against this, there is attached to the head 12' of tool-stem 11 the lift-rod 150, Fig. 1 of the drawings. In this rod is cut a slot 151, within which works a lug 152, projecting from the hammer 7. This lug 152 in case the pressure of recoil-spring 17' should prove insufficient to remove the calking-tool during the upstroke of the piston 6 engages with the upper end of slotted lift-rod prior to the piston completing its upstroke and carries the same therewith. This upward movement of the lift-rod suffices to release the calking-tool from the seam, when the pressure of the recoil-spring will return the tool to its normal position.

As the hammer is driven at a high rate through the medium of the actuated piston 6, the calking-tool will have correspondingly a

rapid reciprocating motion imparted thereto, and as the blow of the hammer is a uniform one the oakum will be driven into the seam 148 under an even and much greater pressure than can be obtained by hand-calking. During the operation of calking the apparatus is driven longitudinally by means of the hereinbefore-described worm mechanism along the deck. As the apparatus performs the work of calking putty is forced from the putty-cylinder 60 by the air-pressure acting upon the pistons 69 70 through extension 73 and guide 75 onto the oakum within the seam. The putty thus forced within the calked seam is properly smoothed and pressed by the spreader 153, secured to the lower end of stem 101, working within cylinder 98, Figs. 1 and 3 of the drawings.

In case the deck to be puttied is a new one then the reaver attachment is not required, and the same may be removed from the apparatus or the reaver raised by its adjusting devices, so as to clear the deck to be calked. The reaver attachment is only designed for use during the calking of old seams or such seams as require the old oakum to be removed.

It is not required that the puttier be used at the same time as the calking mechanism, although it is preferred so to use same. If desired, the work of calking may be completed and the puttying done thereafter as a distinct operation.

With the present apparatus three distinct operations may be performed—to wit, the reaving of the old oakum, calking of the oakum, and puttying of the calked seams. These operations can be conducted at the same time or separately, as the work may require.

When desired to stop the longitudinal travel of the apparatus, the worm 32 is thrown out of mesh with worm-gear 33 by means of hand-lever 154. This hand-lever is attached to eccentric 155, over which fits link 156. Said link is connected to lower end portion of fulcrumed casing 35, which contains the worm-shaft 34. As the hand-lever 154 is thrown upward the eccentric 155, is turned so as to draw the link 156 inward. The inward movement of said link carries the lower end of casing 35 therewith and places worm 33 out of mesh with its worm-gear. When thus thrown out of gear, travel of the apparatus ceases.

The operation of the various parts is controlled by the admission of the air from the main supply-pipe to the respective pistons and motors.

As before stated, any suitable style of mechanism may be employed for imparting motion to the apparatus and operating its various parts, although compressed air is preferred, owing to its ease of handling.

The air for operating the calking-tool is admitted to the cylinder 5 above and below the piston-head 6 through port 20' and pas-

sage-way 27. While port 20' is opened the air admitted to the cylinder through passage-way 27 is sufficient to form an air-cushion for the downstroke of the piston. The moment the said port is closed the full pressure of air is admitted through said passage-way in order to force the piston upward.

Having thus described the invention, what is claimed as new, and desired to be protected by Letters Patent, is—

1. An apparatus for calking seams of vessels or the like, comprising a movable frame, means for imparting longitudinal travel thereto, an automatically-operated calking-tool, feed devices actuated by the calking-tool, whereby the oakum is automatically fed thereto and means whereby reciprocating motion is imparted to the calking-tool.

2. A device for calking the seams of vessels or the like, the same comprising a reciprocating calking-tool, means for imparting a blow to the calking-tool, and devices actuated by the reciprocating motion of the calking-tool whereby the oakum is automatically fed to the said calking-tool.

3. The combination with the automatically-operated calking mechanism, of feed devices actuated by the stroke of the calking mechanism whereby the oakum is fed to the said calking mechanism below the tool thereof and rotary means arranged in advance of the calking mechanism for removing the old oakum from the seam to be calked.

4. In an apparatus for the described purpose, the combination with the automatically-operated calking mechanism, of devices whereby oakum is fed to the calking mechanism, and controlled means for automatically supplying putty under pressure to the seam during the calking operation.

5. In an apparatus for the described purpose, the combination with the calking mechanism, of devices whereby oakum is fed to the calking mechanism, rotating means for removing the old oakum from the seam to be calked and mechanism whereby putty is supplied under pressure to the calked seam.

6. The combination with the calking mechanism, of devices whereby oakum is fed to the calking mechanism, and a tucker by which the oakum is tucked prior to its being forced within the seam to be calked.

7. The combination with the calking mechanism, of devices for supplying oakum thereto, means whereby the oakum is tucked prior to being forced into the seam to be calked, and devices whereby the movement of the tucking means is regulated.

8. In an automatically-operated apparatus for the described purpose, the combination with the calking-tool, of means for imparting a reciprocating motion thereto, devices operated by the reciprocating movement of the calking-tool and by means of which the oakum is fed to the calking-tool, and a guide-shoe through which the oakum is fed.

9. The combination with the calking mech-

anism, of devices whereby the oakum is fed to the calking mechanism, and means for delivering oil to the oakum as fed to the calking mechanism.

5 10. The combination with the calking mechanism, of devices whereby the oakum is fed to the said mechanism, means by which the oakum is tucked prior to being acted upon by the calking mechanism, and devices for
10 supplying oil to the oakum prior to its being pressed into the seam to be calked.

11. The combination with the reciprocating hammer, of a vertically-movable spring-pressed calking-tool actuated thereby to drive
15 the oakum into the seam to be calked, and mechanism, connected with and actuated by the movement of the calking-tool, by means of which the oakum is fed to the calking-tool.

12. The combination with the reciprocating
20 hammer, of the calking-tool actuated thereby, means for feeding oakum to the calking-tool, and connection between the hammer and calking-tool whereby the calking-tool is extracted from the seam during the upward
25 stroke of the hammer.

13. The combination with the calking mechanism, of means for supplying air thereto for the purpose of actuating same, devices whereby oakum is delivered to the calking mechanism, and means for tucking the oakum as fed
30 to the calking mechanism.

14. In an apparatus for the described purpose, the combination with calking mechanism, of means for supplying air thereto for
35 the purpose of actuating same, and devices connected with and operated by the movement of the calking mechanism for feeding oakum to said mechanism.

15. The combination with the calking-tool,
40 of means for imparting a reciprocating motion thereto, and a tucker for tucking the oakum delivered to the calking-tool.

16. The combination with the calking mechanism, of devices for feeding oakum thereto,
45 means for removing the old oakum from the seam to be calked, and a gage-plate interposed between the calking mechanism and the reaving means.

17. The combination with pneumatic calking mechanism, of a reaver for cleaning the seam to be calked, of means for operating said
50 reaver, of devices whereby oakum is delivered to the calking mechanism, and a guide-shoe for the oakum.

18. The combination with pneumatic calking mechanism, of a reaver located in advance of the calking mechanism, of means for operating the reaver, of devices whereby oakum is delivered to the calking mechanism, and a spring-pressed guide-shoe for the
60 oakum.

19. The combination with the calking-tool, of means whereby a reciprocating motion is imparted thereto, of devices for feeding oakum
65 to the calking-tool, and a spring-pressed guide-shoe for the oakum.

20. The combination with the calking-tool,

of means for imparting a reciprocating motion thereto, of devices whereby oakum is fed to the calking-tool, a spring-pressed guide-shoe
70 for the oakum, a tucker for the oakum working within the guide-shoe, and means for operating the tucker.

21. In an apparatus for the described purpose, the combination with the calking mechanism, of devices for feeding oakum to said
75 mechanism, a putty attachment for supplying putty to the calked seam, means for forcing the putty from said attachment, and a spreader for evening the putty applied to the
80 calked seam.

22. The combination with the calking mechanism, of devices whereby oakum is fed to the calking-tool thereof, a tucker for the oakum, and connection between the tucker and calking mechanism by means of which the tucker
85 is rotated during the operation of the calking mechanism.

23. An apparatus for the described purpose, the same comprising calking mechanism, means whereby putty is delivered to the calked seam, devices for feeding oakum to the calking mechanism and controlled connections whereby air under pressure is supplied to operate the calking mechanism and
90 cause putty to be supplied to the calked seam.

24. The combination with the calking mechanism, of devices for supplying oakum thereto, of means for tucking the oakum prior to its being forced into the seam to be calked,
100 and connection between the tucking means and the calking mechanism, whereby the tucker is actuated by the movement of said mechanism.

25. The combination with the calking mechanism, of devices connected with and operated by the movement of the calking mechanism for supplying oakum thereto, and devices for guiding the oakum and holding same
105 in line with the seam to be calked.

26. In an apparatus for the described purpose, the combination with means for imparting longitudinal movement thereto, of the reciprocating calking-tool carried thereby, mechanism whereby the calking-tool is
110 actuated to force oakum into the seam to be calked, devices connected with and actuated by the calking-tool and by means of which oakum is fed to the calking-tool, and means whereby putty under pressure is supplied to
115 the calked seam during the travel of the apparatus.

27. The combination with the reaver for removing old oakum from the seam to be calked, of devices whereby the reaver is raised or lowered, and means for imparting rotation to the
125 reaver.

28. The combination in an automatically-operated apparatus for the described purpose, of the calking-tool, of means for imparting a
130 reciprocating movement thereto, the spring-pressed guide-roll arranged in advance of the calking-tool, and means for raising the guide-roll clear of the seam.

29. The combination in an apparatus for the described purpose, of means for imparting longitudinal movement thereto, a spring-pressed guide-roll, a gage-plate held in advance thereof, and means for raising the guide-roll and gage-plate clear of the seam.

30. An apparatus for the described purpose comprising calking mechanism, devices by which oakum is fed to said mechanism, means for supplying putty to the calked seam, mechanism whereby longitudinal travel is imparted to the apparatus, and means for operating the calking mechanism during the travel of the apparatus.

31. In an apparatus for the described purpose, the combination with devices for imparting longitudinal movement thereto, of the calking mechanism, and means for feeding oakum to the calking mechanism, said means being actuated by the travel of the apparatus.

32. The combination with the calking-tool, of a hammer for imparting a blow thereto, a piston carrying the hammer, means whereby a reciprocating motion is imparted to the piston, and means for feeding oakum to the calking-tool.

33. The combination with the calking-tool, of the hammer for imparting a blow thereto, the piston carrying said hammer, means for supplying pressure within the piston-cylinder to actuate the piston, an admission-valve controlled by the movement of the piston, and devices by means of which oakum is fed to the calking-tool.

34. The combination with the hammer, of means for operating same, of a device for tucking the oakum prior to its being forced into the seam to be calked, and connection between the hammer and tucking device whereby the same is operated by the stroke of the hammer.

35. In an apparatus for the described purpose, the combination with the automatically-operated calking mechanism, of automatically-operated means whereby putty under pressure is supplied to the seam during the operation of driving the oakum therein.

36. The combination with the frame or base plate, of a calking apparatus, of mechanism whereby longitudinal movement is imparted thereto, of rolls by which the apparatus may be moved transversely, and means for raising and lowering said rolls for the described purpose.

37. In a device for automatically calking the seams of vessels, the combination with the calking mechanism, of means for imparting a reciprocating motion thereto, and devices connected with and actuated by the calking mechanism for feeding oakum to the calking-tool carried by said mechanism.

In witness whereof I have hereunto set my hand.

CHARLES G. HIGHTOWER.

Witnesses:

N. A. ACKER,
D. B. RICHARDS.