

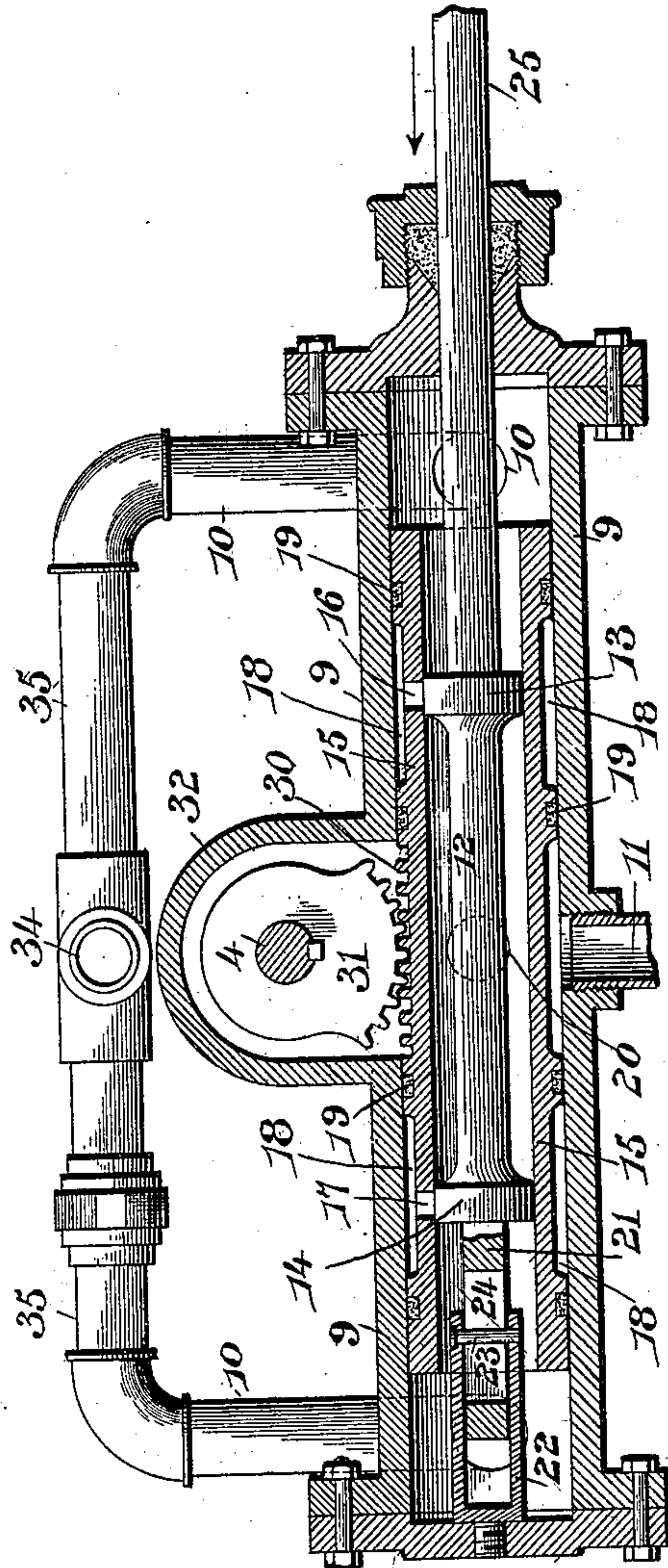
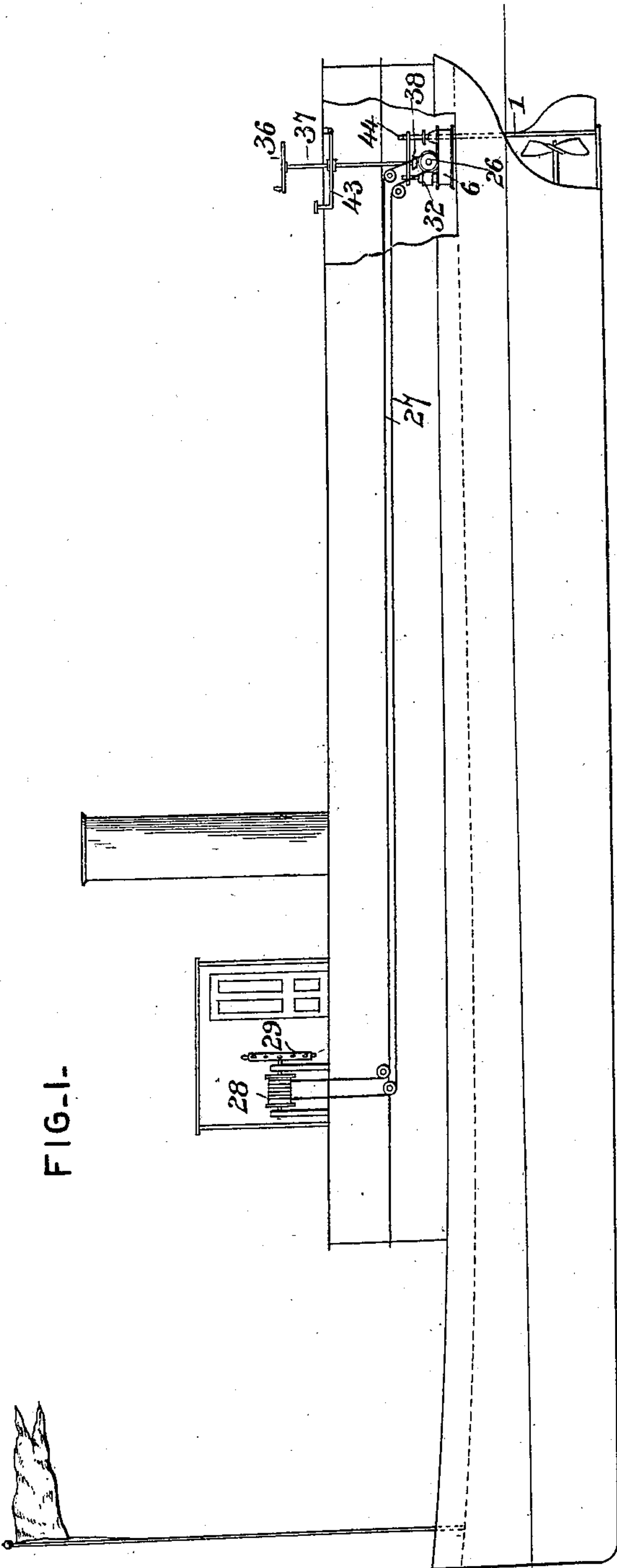
(No Model.)

4 Sheets—Sheet 1.

C. E. BERGMAN.
STEERING GEAR.

No. 557,539.

Patented Apr. 7, 1896.



Inventor

Chas. E. Bergman

By his Attorneys,

C. A. Snow & Co.

Witnesses
Jas. H. McLathran
J. D. [Signature]

(No Model.)

4 Sheets—Sheet 2.

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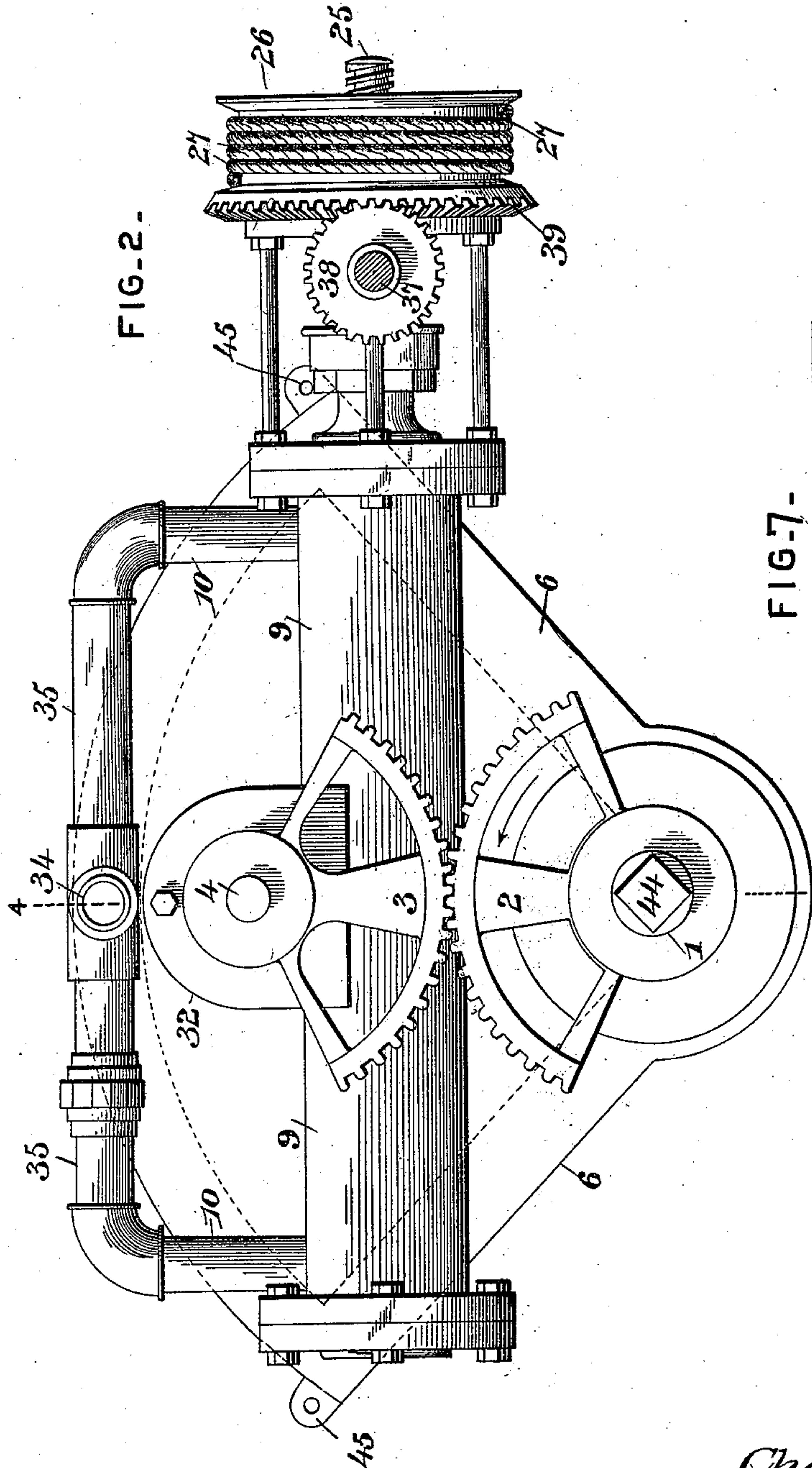
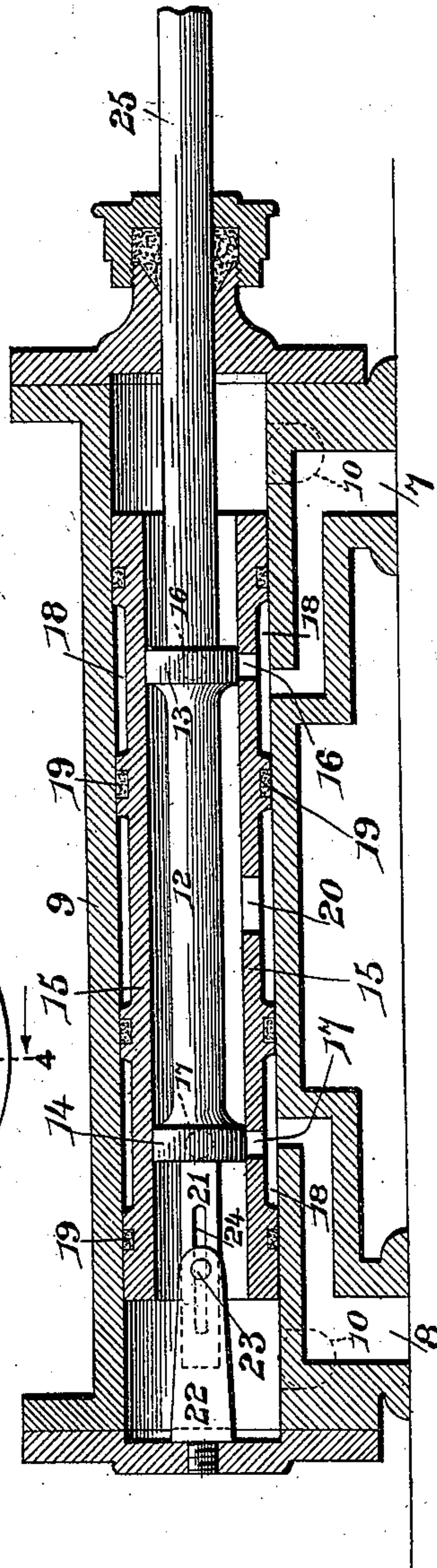


FIG. 7-



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(No Model.)

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FIG. 3.

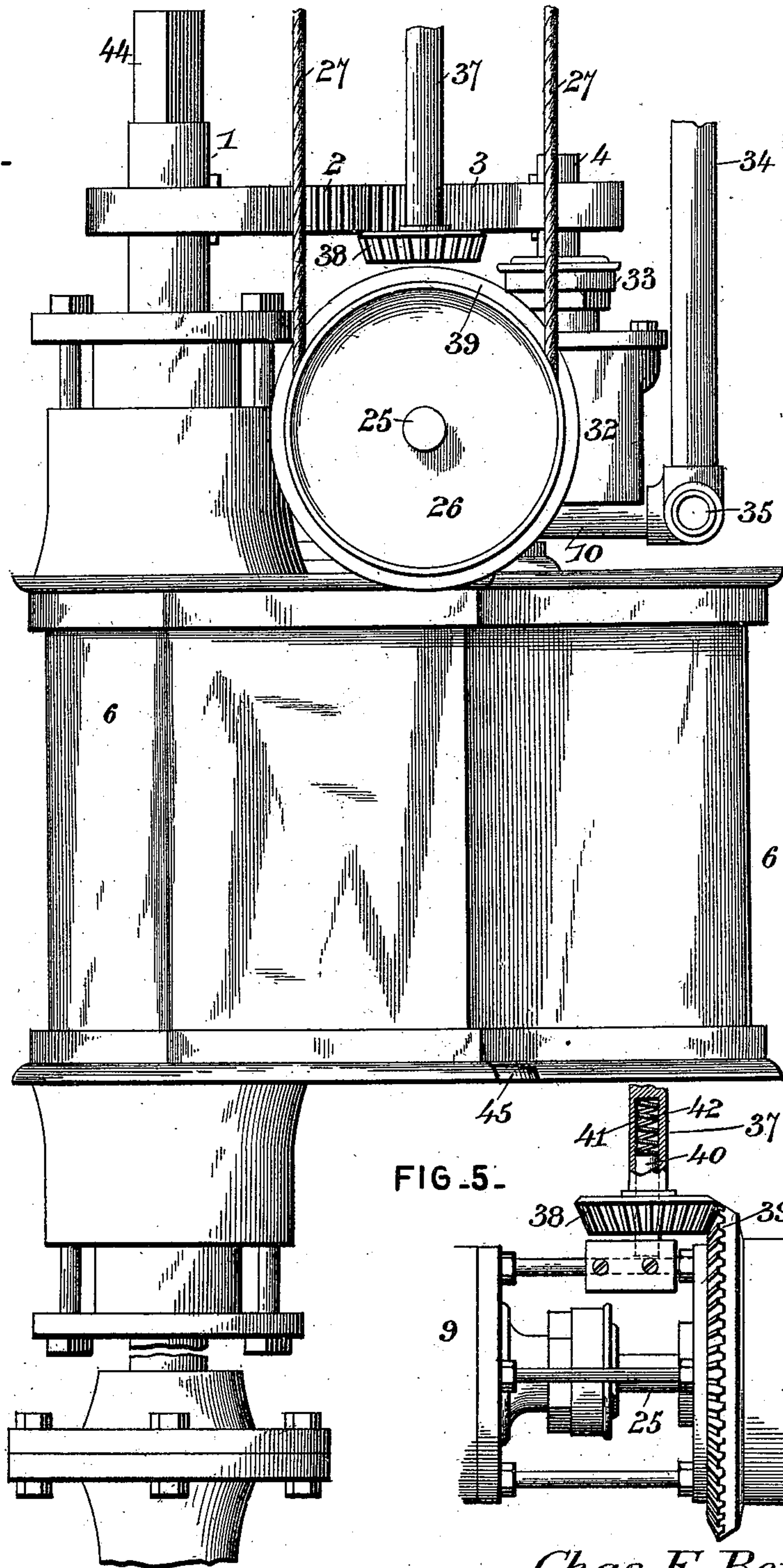
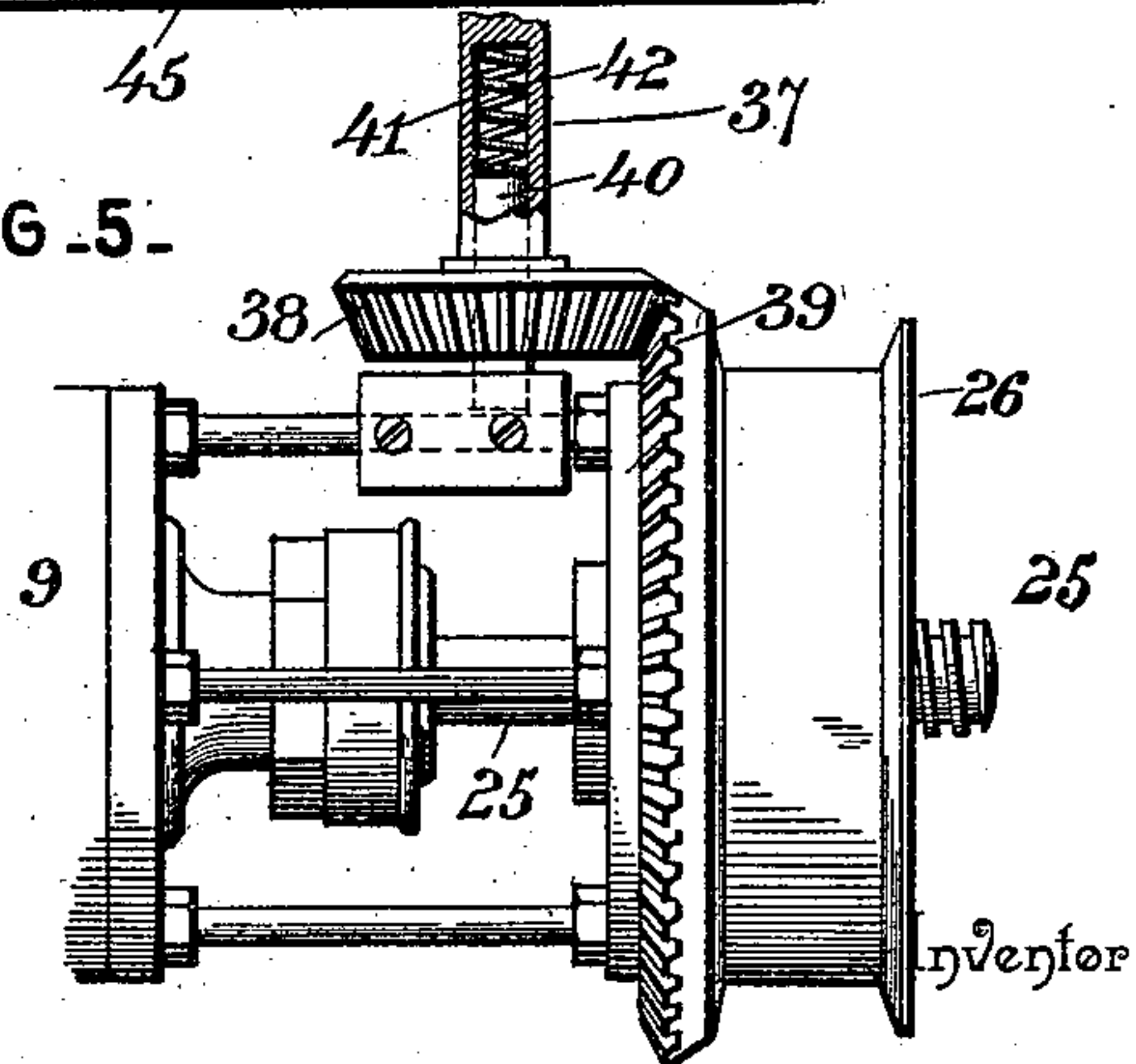


FIG. 5.



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(No Model.)

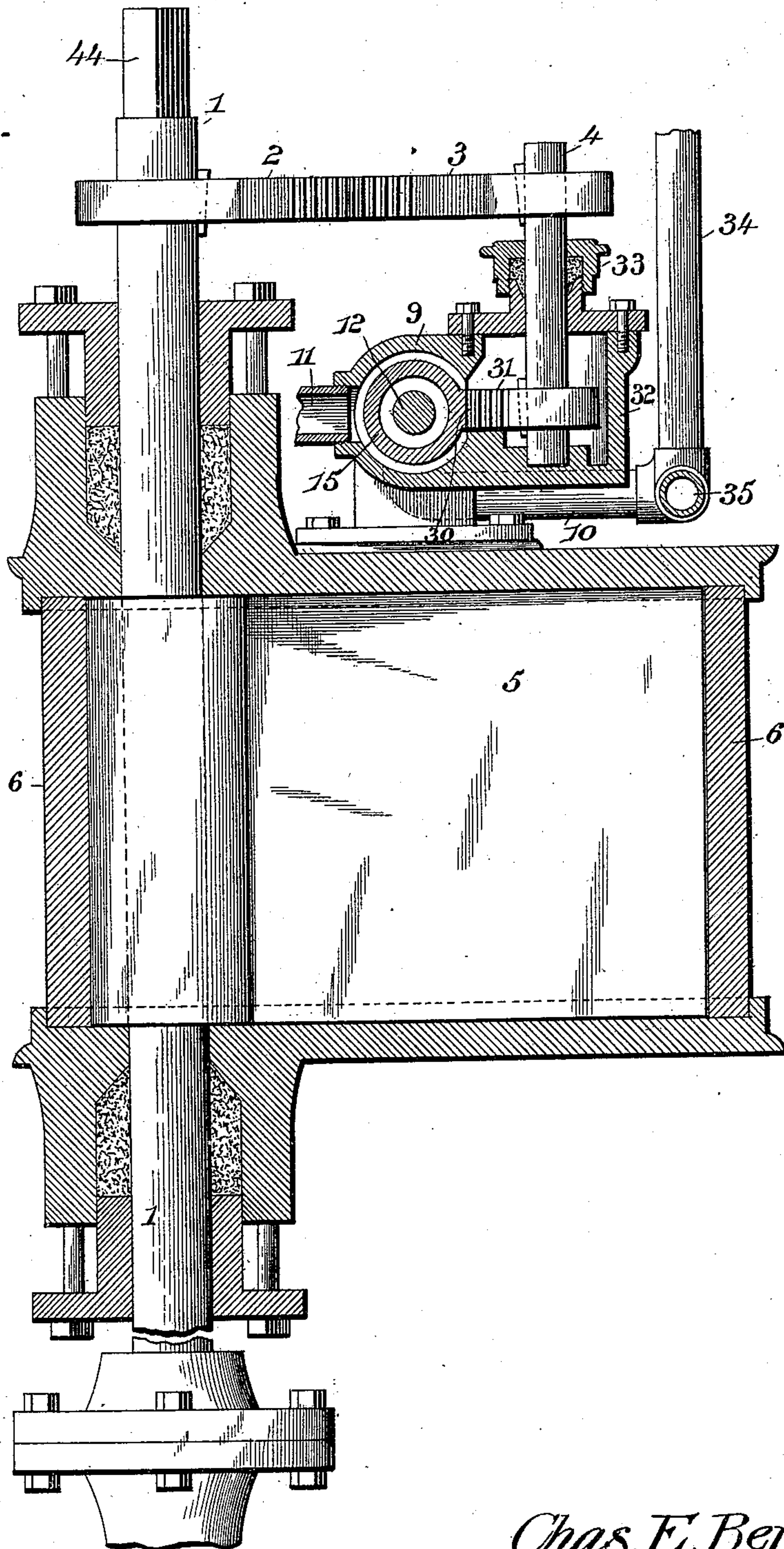
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FIG. 4.



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UNITED STATES PATENT OFFICE.

CHARLES E. BERGMAN, OF EVERETT, WASHINGTON.

STEERING-GEAR.

SPECIFICATION forming part of Letters Patent No. 557,539, dated April 7, 1896.

Application filed July 31, 1895. Serial No. 557,733. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. BERGMAN, a citizen of the United States, residing at Everett, in the county of Snohomish and State of Washington, have invented a new and useful Steering-Gear, of which the following is a specification.

My invention relates to steering-gear for vessels, and has for its object to provide fluid-operated steering mechanism designed to facilitate the operation of a rudder and give to the pilot increased control with a minimum application of power to the pilot-wheel, the present invention consisting in an improvement upon that shown and described in my application, Serial No. 546,755, filed April 22, 1895.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a diagrammatic view of a steam-launch, showing the steering mechanism embodying my invention applied thereto in the operative position. Fig. 2 is a plan view of the steering mechanism, showing the connections between the rudder shaft or post and the controlling or auxiliary valve. Fig. 3 is a side view of the same. Fig. 4 is a vertical section on the line 4 4 of Fig. 2. Fig. 5 is a rear view, partly in section, of the drum and means for communicating motion thereto from a hand-operated spindle. Fig. 6 is a horizontal section of the valve mechanism. Fig. 7 is a vertical section of the same.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

1 designates the rudder-shaft, to which is keyed a segment-gear 2, meshing with a similar segment-gear 3, which is keyed to a spindle 4, whereby rotary movement of the rudder-shaft is communicated in the opposite direction to the spindle 4. Also keyed to the rudder-shaft is a swinging piston 5 operating in a quadrant-cylinder 6 arranged in a horizontal position upon the deck of the vessel, and communicating with said cylinder upon opposite sides of the plane of the piston are the ports 7 and 8 of the valve-chamber 9. This valve-chamber is tubular in construction

and is provided with inlet-ports 10 and an exhaust-port 11.

Operating in the valve-chamber is a piston-valve 12 having heads 13 and 14 to control the passage of fluid from the interior of the chamber through the ports 7 and 8 to the cylinder, and coöperating with said piston-valve is a tubular auxiliary or compensating valve 15, in the bore of which the heads 13 and 14 of the piston-valve fit to slide. The auxiliary or compensating valve is provided with ports 16 and 17 communicating with counterbores 18, which in turn communicate with the ports 7 and 8, whereby the auxiliary valve may move through a distance equal to its entire movement without throwing the ports 16 and 17 out of communication with the ports 7 and 8. The ports 16 and 17 are adapted to be closed by the piston-heads 13 and 14, respectively, said piston-heads having a small lap of approximately one thirty-second of an inch. The auxiliary valve is provided with packing-rings 19 arranged, respectively, upon opposite sides of the planes of the ports 16 and 17, and at its center with an outlet-opening 20 to communicate with the exhaust-port of the chamber.

In order to prevent the piston or main valve from turning in the auxiliary valve, it is provided at one end with a cross-sectionally angular extension 21, fitting in a socket formed by parallel side plates 22, said side plates being connected by a key 23, which extends through a longitudinal slot 24 in the extension to limit the longitudinal movement of the valve.

The stem 25 of the piston or main valve is threaded near its extremity for engagement by corresponding threads in the bore of a drum 26, said drum having reeled thereon the intermediate portion of an operating-cable 27 adapted to pass around suitable direction-pulleys and extend to a similar drum or spool 28, which is operated directly by the pilot-wheel 29 in the pilot-house, whereby the rotation of the pilot-wheel will be communicated through the cable to the spool and by reason of the engaging-threads of the drum and valve-stem will communicate longitudinal movement to the valve to open one of the ports of communication with the cylinder, and thereby allow steam or other actuating fluid

to pass to the cylinder upon one side of the piston and thereby communicate motion to the rudder-shaft.

The auxiliary valve carries a rack 30, with which meshes a segment-pinion 31 on the lower extremity of the spindle 4, said spindle extending into a box 32 communicating with the valve-chamber and passing through a suitable stuffing-box 33. From this arrangement of parts it will be seen that when the main valve is operated to allow actuating fluid to pass to the cylinder upon one side of the piston the motion imparted to the rudder-shaft will be communicated through the intermeshing gears 2 and 3 to the spindle 4 and from thence through the pinion 31 to the auxiliary valve, whereby said auxiliary valve will move in the same direction as the main valve has been moved, or, in other words, will follow the main valve. Hence when a sufficient quantity of the actuating fluid has passed through the inlet-port into the cylinder to move the auxiliary valve a distance equal to the main valve the ports 16 and 17 will again be closed by the piston-heads 13 and 14, and the movement of the parts will be checked. A steam-supply pipe 34 is provided with branches 35, which communicate, respectively, with the inlet-pipes 10.

In addition to the above-described means for communicating motion to the main valve I provide direct-operating devices consisting of a hand-wheel 36 arranged approximately over the rudder and having a shaft 37 carrying a bevel-pinion 38 to mesh with a bevel-gear 39 on the drum. This bevel-pinion is normally held out of engagement with the bevel-gear by means of a pin 40 forming a journal for the lower end of the shaft 37 and fitting in a bore 41 of said shaft, and a spring 42 also arranged in said bore between the upper extremity of the pin 40 and the contiguous end of the bore. The effect of this spring is to raise the shaft 37 and hence the bevel-pinion sufficiently to disengage the latter from the bevel-gear, and the shaft is depressed to secure engagement of the gears by means of a foot-lever 43 preferably arranged near the deck of the vessel contiguous to the shaft, whereby it may be depressed with facility by the pilot while operating the hand-wheel. Furthermore, the rudder-shaft is provided at its upper end with an angular seat 44 for engagement by the eye of an ordinary tiller bar or lever when, by reason of the steering-gear being disabled, it is necessary to operate the rudder by direct means.

This being the construction of the improved steering-gear, the operation thereof is as follows: When the pilot-wheel is turned to communicate motion through the flexible connections or cables to the drum, the latter being rotated in a direction necessary to impart motion to the valve-stem in the direction indicated by the arrow in Fig. 6, the piston-head 13 opens the ports 16, and hence allows steam or other motive agent to pass through the port

7 to the cylinder. This causes the partial rotation of the rudder-shaft in the direction indicated by the arrow in Fig. 2, and this motion is communicated through the intermeshing gears 2 and 3 to the spindle 4 and from thence through the segment-pinion to the auxiliary valve, whereby the latter is also moved in the direction indicated by said arrow in Fig. 6. Hence the movement of the main valve, which allows the motive agent to pass to the cylinder, causes a succeeding and corresponding movement of the auxiliary valve, whereby the ports of the auxiliary valve follow the movement of the heads of the main valve. This following movement of the auxiliary valve continues as long as the motive agent continues to enter the cylinder, the fluid upon the opposite side of the piston in the cylinder escaping through the port 8 and ports 17 to the interior tubular auxiliary valve, and thence through the exhaust-opening 20 and port 11. In the same way the movement of the piston by which motion is communicated to the rudder-shaft continues as long as steam or other agent is admitted to the cylinder, and hence as long as the ports 16 of the auxiliary valve are exposed by the piston-head 13, and, therefore, when the auxiliary valve has advanced the same distance as the main valve has previously been moved the ports 16 will again be closed by the head 13 and the parts will be held from further movement. Thus the connections between the piston, which is connected to the rudder-shaft, and the auxiliary or compensating valve are such as to cause a movement of the auxiliary valve equivalent to the previous movement of the main valve, whereby when the auxiliary valve has moved through a distance equal to the main valve the steam or other motive agent will be automatically cut off and the piston and other parts of the mechanism will remain fixed in the positions which they then occupy. If the expansion of the steam admitted upon one side of the piston carries the latter beyond the above-mentioned position of rest, the auxiliary valve will be carried beyond the position at which its ports are closed by the heads 13 and 14, and, therefore, the motive agent will be admitted at the opposite side of the piston, and hence will cause an equalization of pressure and a consequent return of the parts to their proper positions. In the same way the reduction of pressure upon one side of the piston, caused by condensation or otherwise, will produce a movement of the piston which, being communicated to the auxiliary valve, will allow motive agent to enter the cylinder upon that side of the piston upon which the condensation has occurred, thereby returning the parts, as before described, to their normal positions with the ports of the auxiliary valve closed by the heads of the main piston, and hence with the pressure upon opposite sides of the piston equalized.

Any suitable means for securing the quadrant-cylinder to the deck or timbers of the

vessel may be employed, such as ears 45, (shown in Figs. 2 and 3,) and adapted to be engaged by bolts or their equivalents.

Various changes in the form, proportion, 5 and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I 10 claim is—

1. The combination with a piston connected to a shaft and operating in a cylinder, of a valve-casing having ports in communication with the cylinder, a main piston-valve operating in the casing, an auxiliary valve hav- 15 ing ports communicating with the ports in the casing and adapted to be closed by the heads of the main valve, a pinion meshing with a rack on the auxiliary valve, and inter- 20 meshing gears carried, respectively, by the shaft to which the piston is connected and the spindle of said pinion, substantially as specified.

2. The combination with a piston adapted 25 to be connected to a rudder-shaft and operating in a cylinder, of valve mechanism for controlling the admission of fluid to the cylinder and including a slide-valve, a drum threaded upon the stem of said valve and 30 adapted when rotated to communicate longitudinal movement to the valve, and means for communicating rotary motion to the drum, substantially as specified.

3. The combination with a piston adapted 35 to be connected to a rudder-shaft and operating in a cylinder, of valve mechanism for controlling the admission of fluid to the cylinder and including a slide-valve having a threaded stem, a drum having a threaded 40 bore engaging said stem and adapted to impart movement to the valve, a pilot-wheel, a

second drum adapted to receive rotary motion from the pilot-wheel, and flexible connections between said drums, substantially as specified.

4. The combination with a rudder-shaft and 45 a piston connected to the shaft and operating in a cylinder, of valve mechanism for controlling the admission of fluid to the cylinder and including a slide-valve, a rotary member 50 threaded upon the stem of said valve and adapted by rotation to communicate longitudinal movement to the valve, a hand-wheel having a spindle carrying a gear adapted to mesh with a gear on said rotary member, a 55 pin forming the trunnion of said spindle and fitting in a bore thereof, a spring arranged in the bore of the spindle between said pin and the contiguous extremity of the bore to normally hold the said gears out of engage- 60 ment, and means for depressing the spindle to cause engagement of the gears, substantially as specified.

5. The combination with a valve-casing, of a piston-valve mounted for sliding movement 65 therein, a drum threaded upon the stem of said valve and adapted to communicate movement to the valve, means for operating the drum, and guiding devices for the valve, the same including a cross-sectionally angular 70 extension fitting in a socket at one end of the casing, and a guide-pin arranged transversely in the socket and engaging a longitudinal slot in said extension, substantially as specified.

In testimony that I claim the foregoing as 75 my own I have hereto affixed my signature in the presence of two witnesses.

CHARLES E. BERGMAN.

Witnesses:

WM. G. SWALWELL,
D. J. SWALWELL.