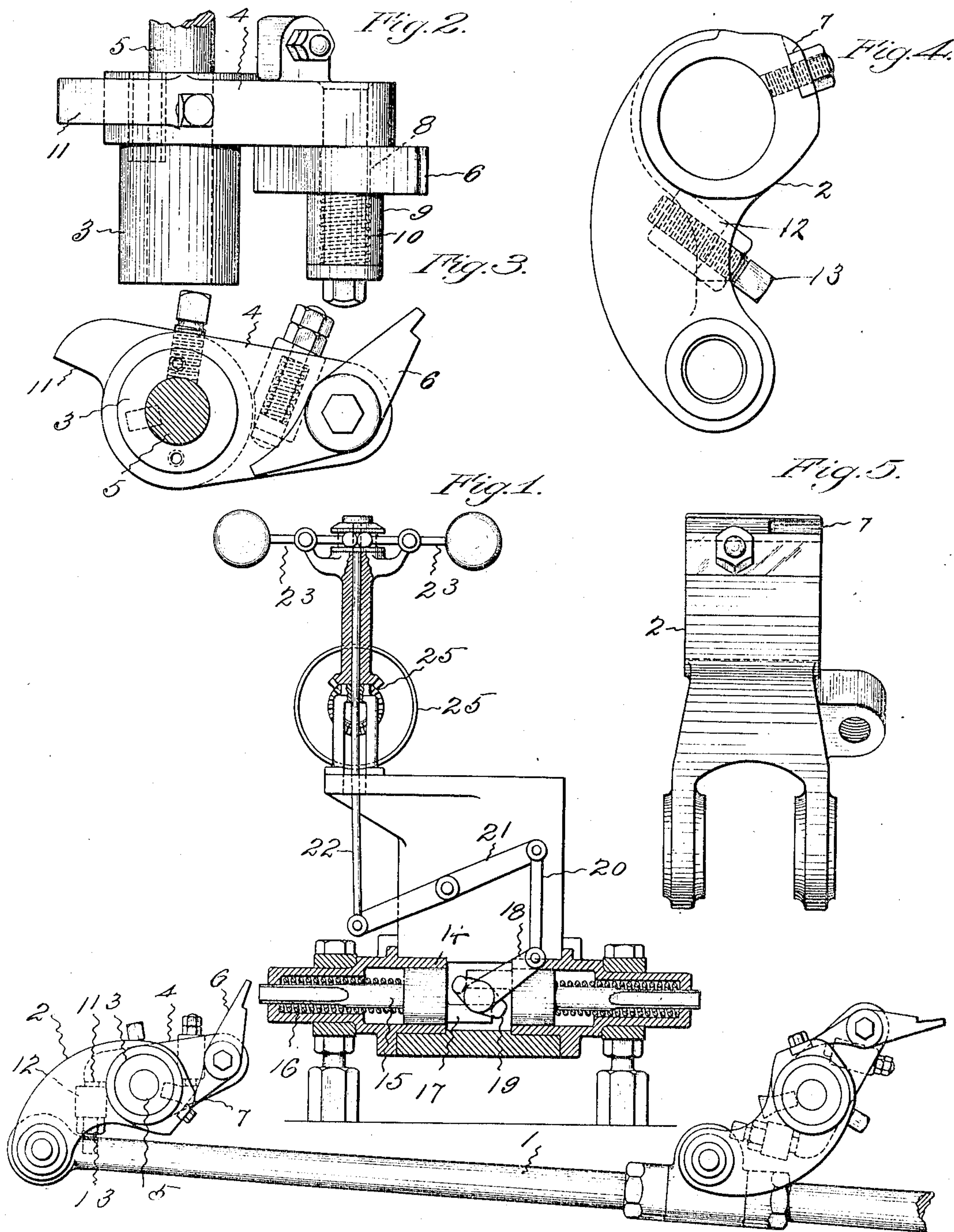


No. 844,801.

PATENTED FEB. 19, 1907.

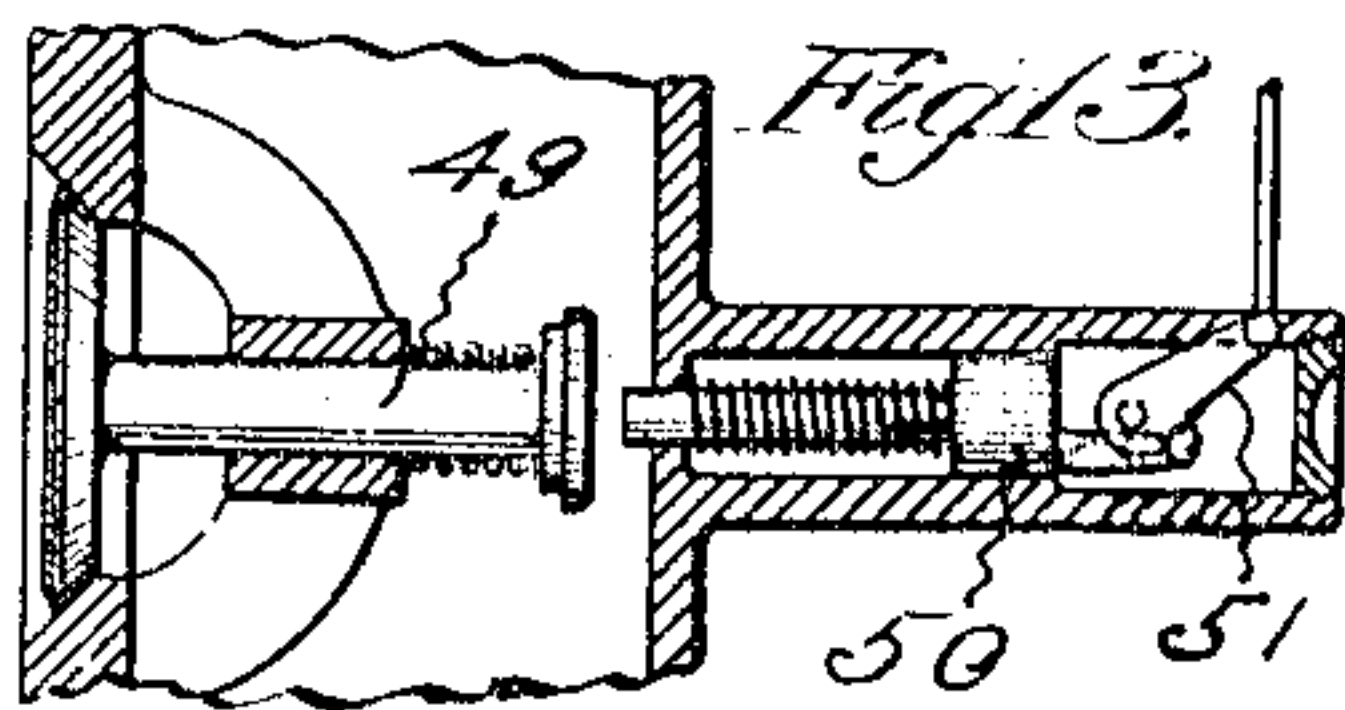
E. HILL.
AIR COMPRESSOR GOVERNOR.
APPLICATION FILED NOV. 7, 1906.

4 SHEETS—SHEET 1.



Witnesses.

C. F. Storrs.
Edhel M. Lowe.



Inventor.

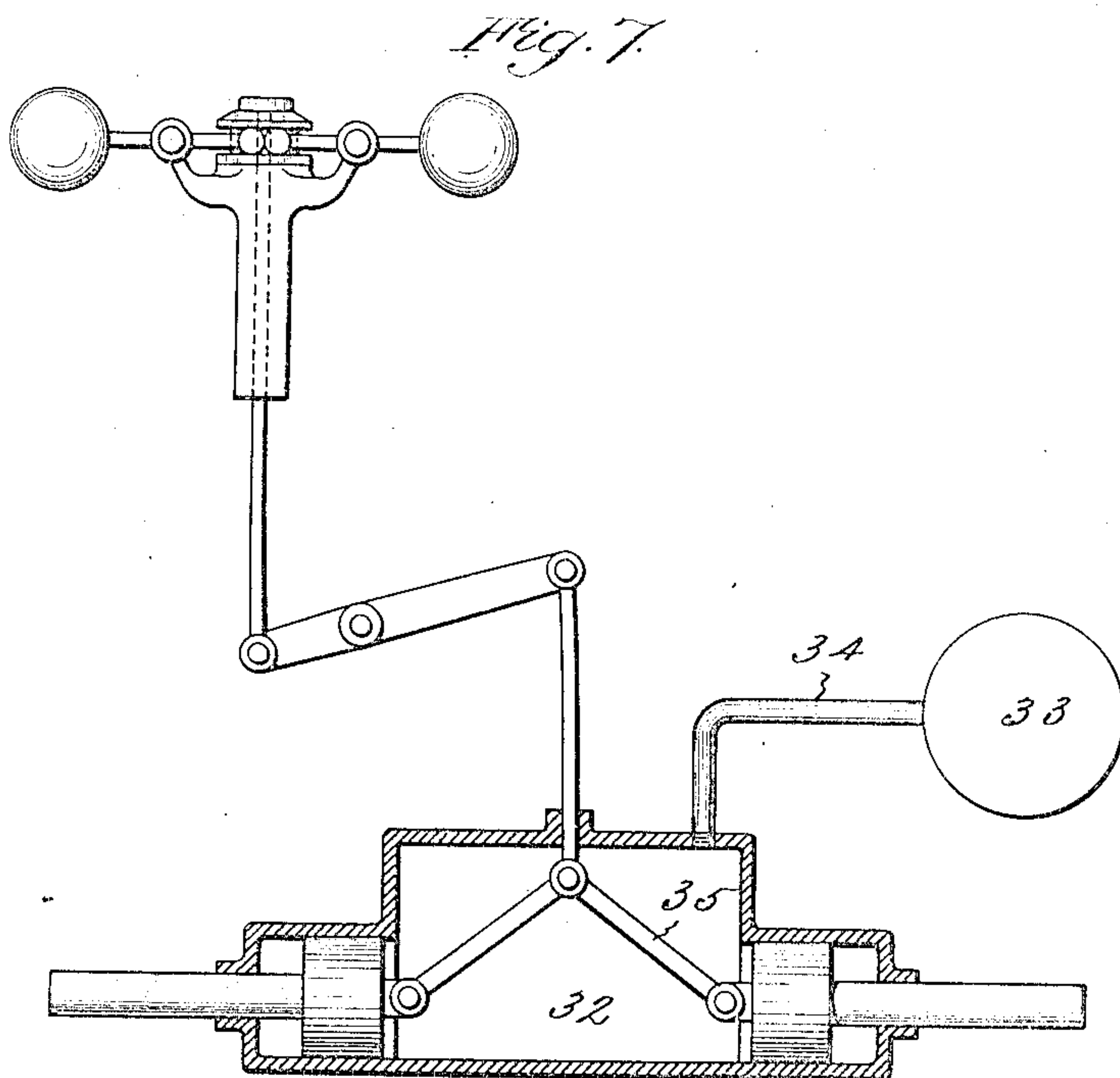
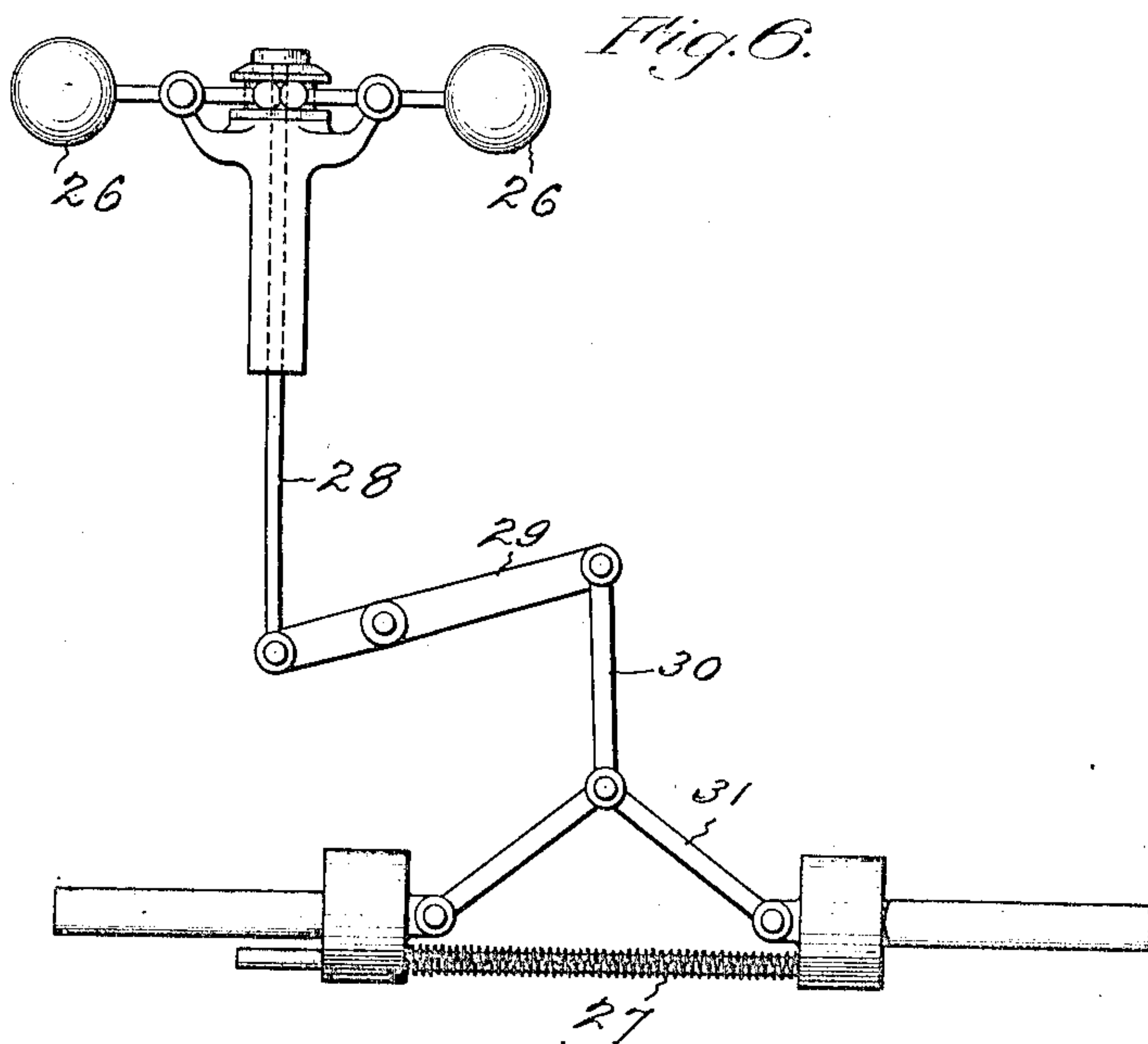
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4 SHEETS—SHEET 2.



Witnesses.

C. H. Storrs.

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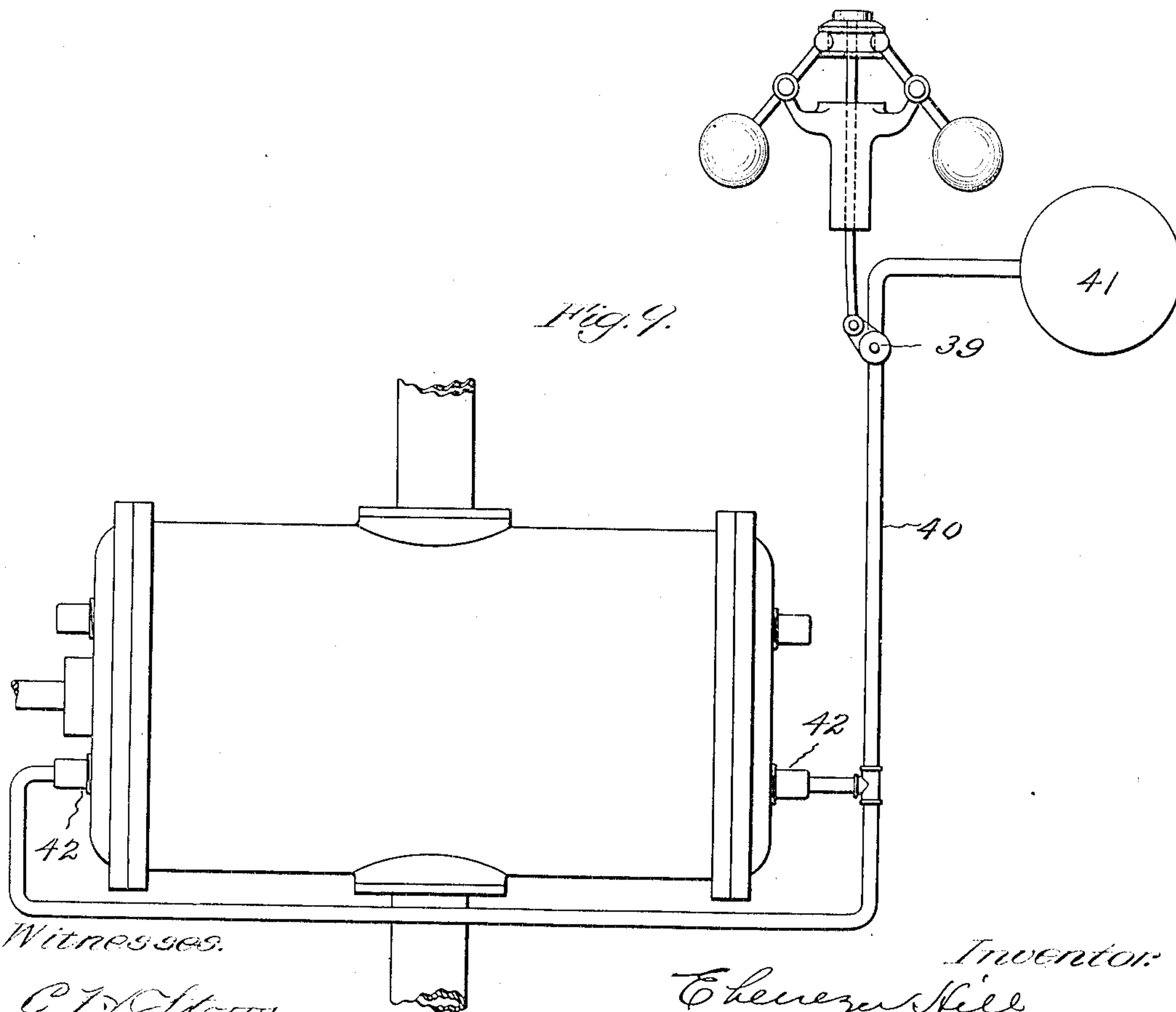
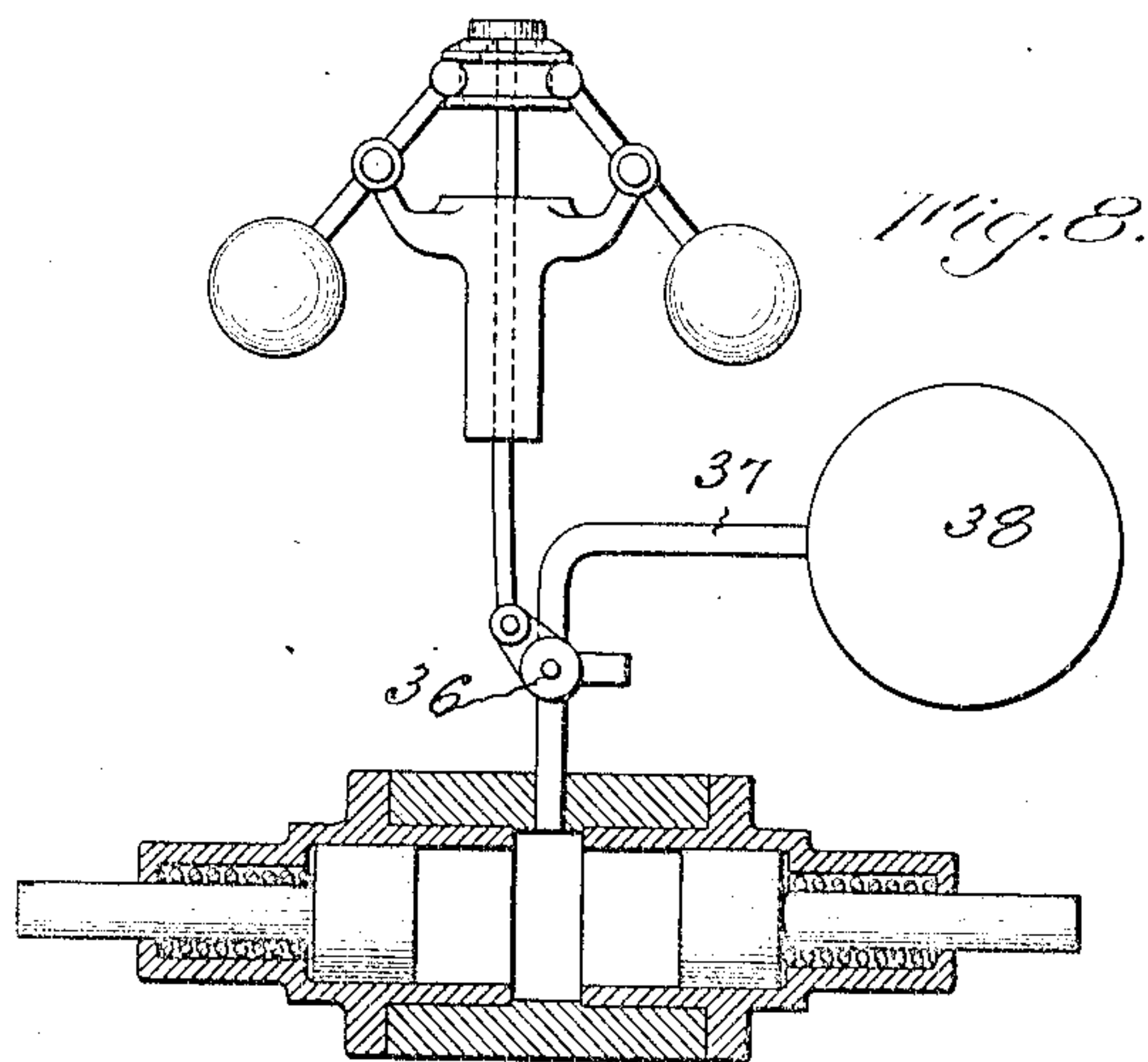
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APPLICATION FILED NOV. 7, 1905.

4 SHEETS—SHEET 3.



Witnesses.

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Inventor.

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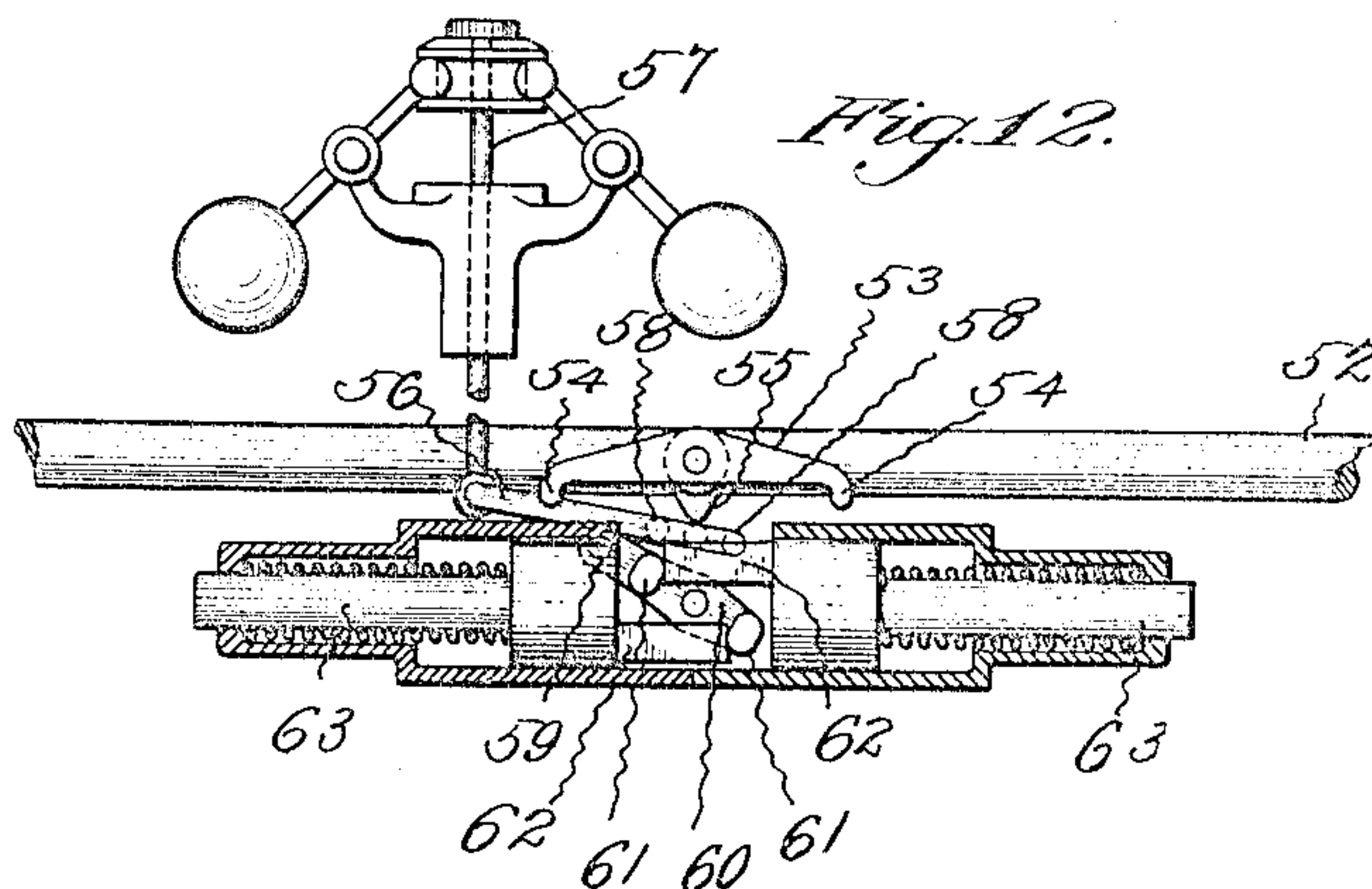
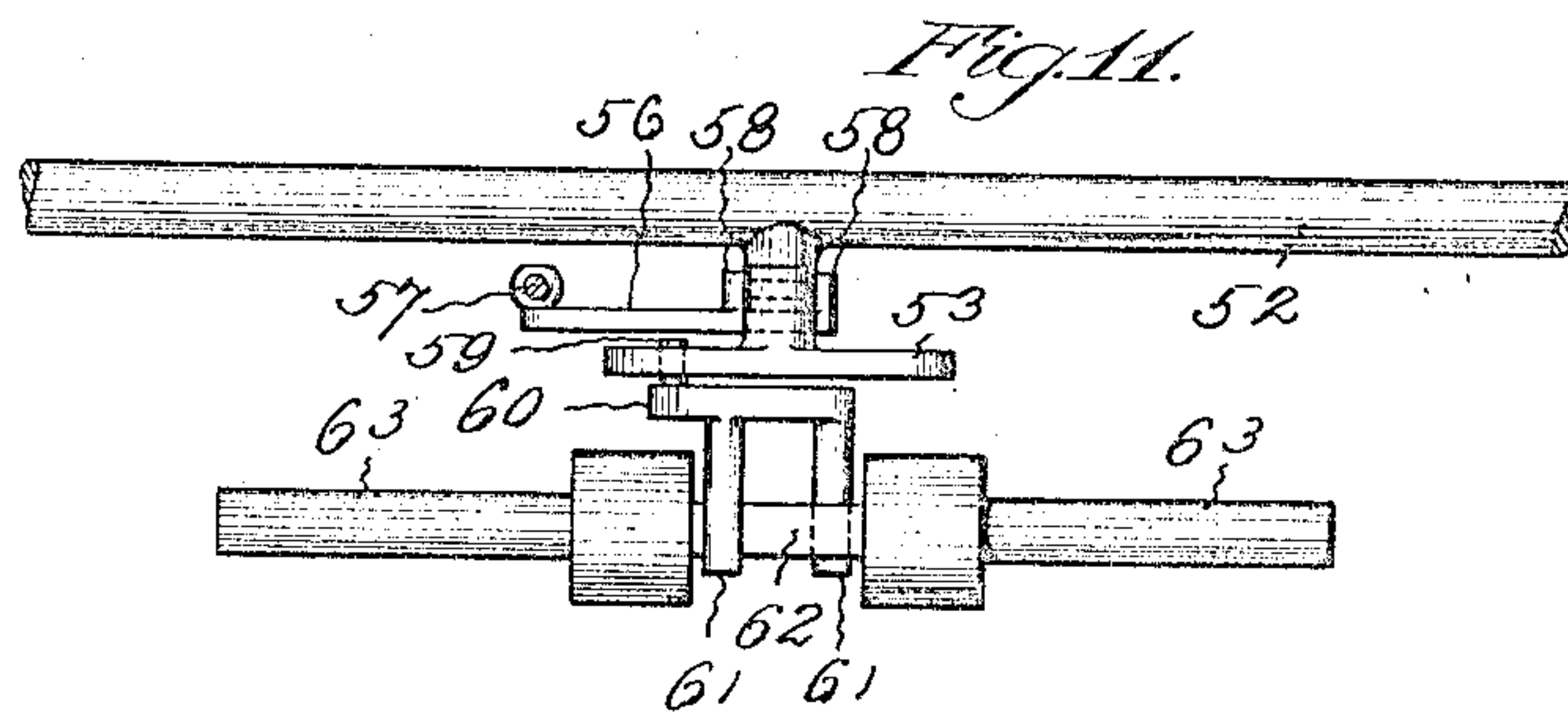
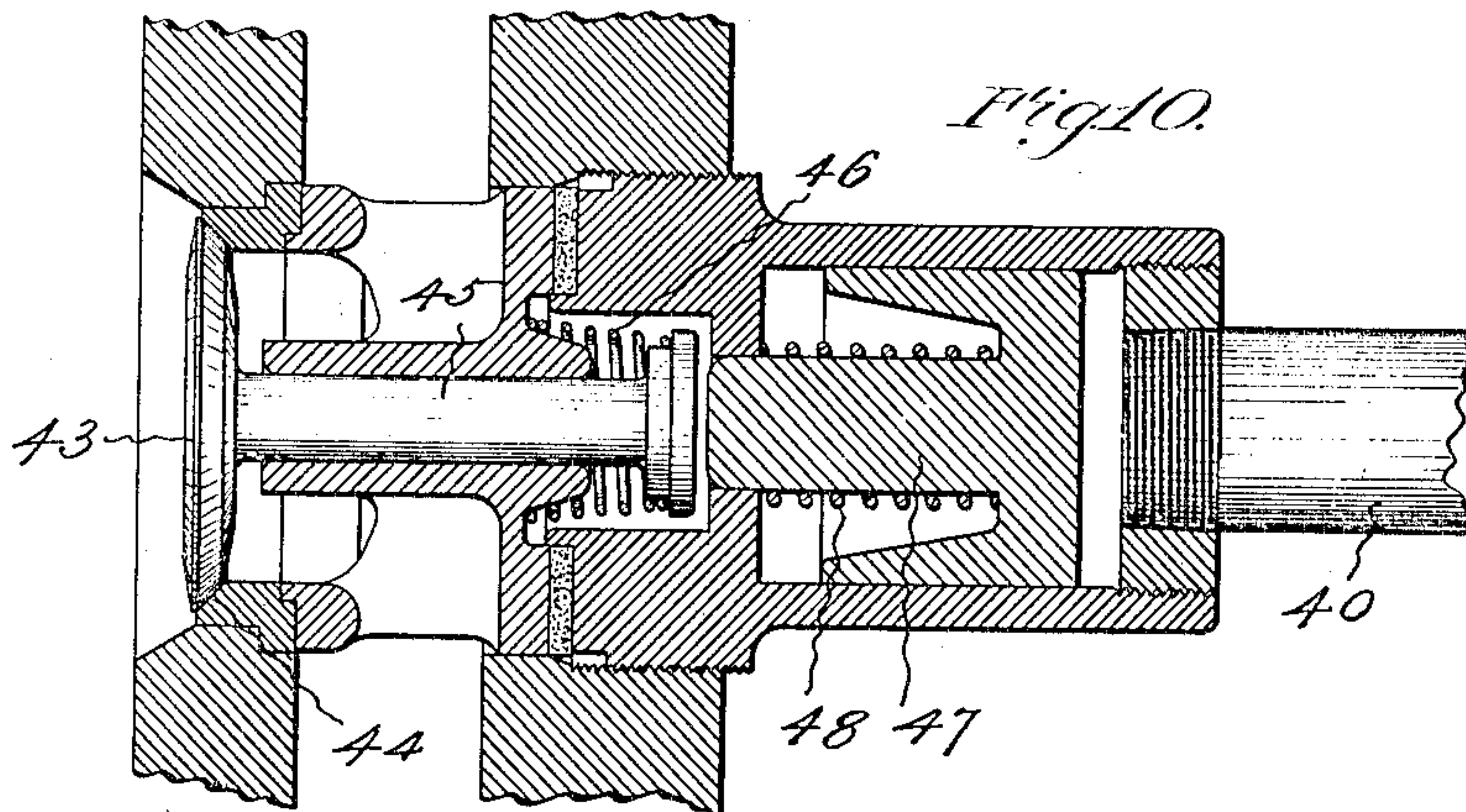
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E. HILL.
AIR COMPRESSOR GOVERNOR.

APPLICATION FILED NOV. 7, 1905.

4 SHEETS—SHEET 4.



Witnesses.

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UNITED STATES PATENT OFFICE.

EBENEZER HILL, OF NORWALK, CONNECTICUT.

AIR-COMPRESSOR GOVERNOR.

No. 844,801.

Specification of Letters Patent.

Patented Feb. 19, 1907.

Application filed November 7, 1905. Serial No. 286,185.

To all whom it may concern:

Be it known that I, EBENEZER HILL, a citizen of the United States, residing at Norwalk, in the county of Fairfield and State of Connecticut, have invented a new and useful Air-Compressor Governor, of which the following is a specification.

This invention relates to a governor mechanism which operates to temporarily relieve an air or gas compressor of work. It is particularly designed for compressors which are driven by motors that are inefficient and incapable of taking up the necessary load until they have attained practically full speed.

The object of the invention is to render the active—that is, the intake or discharge—valves of the compression-cylinder inoperative when the compressor is idle or running at a low rate of speed and allow them to become effective, so that the piston can do work only when the compressor is speeded up.

The devices shown in the drawings as illustrating the invention have a ball-governor arranged to control means so connected with the intake-valves of a compressor that those valves are held open when the balls droop as a result of no motion or but little motion, but are allowed to operate effectively when the balls fly out as a result of rapid motion. When the intake-valves remain open, air or gas simply flows in and out through the intake-valve ports as the piston is reciprocated without requiring the piston to do any work, so it is not until the machine has attained sufficient speed to throw out the balls the required amount—that is, when the motor has reached full speed—that the valves are allowed to operate normally. The effect of this is that when the compressor starts it is unloaded and has no load until it gets up to speed.

Figure 1 of the accompanying drawings shows a side elevation with parts cut in section of so much of one form of a compressor valve mechanism and governor as is necessary to understand this invention. Fig. 2 shows a plan of a valve-stem arm and a latch which is used to connect the eccentric-rod arm with the valve-stem arm of this form of valve mechanism. Fig. 3 shows a side view of this valve-stem arm and latch. Fig. 4 shows a side view of one of the eccentric-rod arms. Fig. 5 shows an edge view of this eccentric-rod arm. In the forms shown in Figs. 1 to 5 the governor is so arranged that

when the balls droop plungers which are normally drawn in by springs are pushed out by the governor mechanism and caused to effect a disengagement of the eccentric-rod arms from the stems of positively-operated rotary plug intake-valves at such times that the valves will remain open whenever the balls droop, but will open and close normally whenever the balls fly out. Fig. 6 indicates a form of the invention in which the plungers are drawn in by the governor and pushed out by a spring, this action being the reverse of the action in the form first shown. Fig. 7 indicates a form of the invention in which the plungers are pushed out by air-pressure and drawn in by the drooping of the governor-balls. Fig. 8 indicates a form in which the plungers are drawn in by springs and the governor controls a cock in a pipe leading from a reservoir of compressed air, which when the cock is opened by the drooping of the balls forces the interfering-plungers outwardly. In all of the above-described forms the invention is shown as arranged for controlling rotary intake-valves. In Fig. 9 the governor is shown as arranged to control air-pressure, which is used to effect the action of puppet intake-valves. Fig. 10 shows a view, on larger scale, of one of the puppet intake-valves and the plunger which is moved by compressed air to effect its action. Fig. 11 shows a plan of a form of the invention in which the governor controls a hook carried by a moving part of the machine in such location that it connects or disconnects the moving part with mechanism that will open the intake-valves when the balls droop as a result of low speed. Fig. 12 shows a side elevation with parts in section of this form of the invention. Fig. 13 indicates a method of connecting the governor-control with a plunger arranged to hold open a puppet intake-valve at the desired time.

In the first form of the invention illustrated, 1 indicates an eccentric-rod of ordinary construction, that is connected with the valve-eccentric in the usual manner. The reciprocations of this rod are utilized to open and close the intake-valves at the proper times. Hinged at the end and also some distance from the end of the eccentric-rod are forked arms 2. Each of these eccentric-rod arms turns loosely on a hub 3, which extends outwardly from a valve-stem arm 4. Each valve-stem arm is fastened to the stem of a rotary plug intake-valve of common

construction, so that the oscillations of the valve-stem arms will open and close the intake-valves.

The valves themselves being of ordinary form and their specific construction forming no part of this invention they are not shown.

Mounted on each valve-arm is a latch 6, the lower end of which is adapted to engage a notch 7 in the eccentric-arm in such manner that the swinging of the eccentric-arm when engaged by the latch will turn the valve-arm so as to open the intake-valve to which the arm is attached.

Each latch turns on a stud 8, which projects from the valve-arm. In a barrel 9, fastened to this stud, is a spring 10, which has one end connected with the barrel and the other end with the latch. The tension of the spring is such as to cause the lower end of the latch to engage the notch in the eccentric-arm, so that when the eccentric-arm is swung in one direction through the latch it will turn the valve-stem arm and valve.

Extending outwardly from each valve-arm is a finger 11, and turning in a lug 12, that projects from each eccentric-arm, is a set-screw 13. The set-screws carried by the eccentric-arms are turned up against the fingers projecting from the valve-arms. When the eccentric-rod is reciprocated, the movement of the eccentric-arms in one direction is communicated to the valve-arms through these screws and fingers, and the movement of the eccentric-arms in the opposite direction is communicated to the valve-arms, as described, by the latches.

Held by a casing 14 are two horizontally-movable plungers 15. The outer ends of these plungers are in line with the upper ends of the latches carried by the valve-arms. Springs 16 tend to thrust these plungers toward each other and draw the ends into the casing. When these plungers are forced outwardly against the pressure of the springs their outer ends move into the paths of the upper ends of the latches, which then as they are moved by the reciprocations of the eccentric-rod engage the ends of the plungers and are rocked so that their lower ends are disengaged from the notches in the eccentric-arms. Then the oscillations of the eccentric-arms will not oscillate the valve-stems, and consequently will not turn the valves. On the inner end of each of these plungers is a lug 17, and pivoted to the casing adjacent to these lugs is a lever 18, which has two inwardly-projecting lugs 19. These latter lugs are so arranged that when the lever is in one position they do not interfere with the plungers, but when the lever is turned to another position they engage and push the plungers outwardly, so that their outer ends will be engaged by the upper ends of the latches.

The lever 18 is by a link 20 connected with a lever 21, that is jointed to the lower end of

a governor-rod 22. This rod is raised and lowered by the weighted levers 23 of a common fly-ball governor, which is revolved by the gears 24, driven by the pulley 25, that is belted to any convenient revolving part of the compressor or other mechanism, the speed of which is to be utilized to control the effective action of the compressor.

When the compressor is idle or running slowly, the governor-balls droop and lift the governor-rod and so actuate the levers that the plungers are pushed outwardly into the paths of the latches. When the plungers are in these positions, the latches disengage the eccentric-arms from the valve-arms, so that the intake-valves will remain open. Under these conditions when the piston reciprocates air simply flows in and out through the intake-valve ports and the piston does no effective work. When the motor or the compressor reaches the necessary speed, the governor-balls will rise and depress the governor-rod and actuate the levers, so that the plungers may be drawn back by their springs into the casing out of the paths of the latches. Under these circumstances the intake-valves are opened and closed regularly, and the compressor then accomplishes its normal function.

Of course it is obvious that the action of the governor and the springs could be reversed—that is, the action of the springs could be to push the plungers out and the governor could act to draw the plungers back when the governor had attained its highest speed. This arrangement is shown in Fig. 6. When the balls 26 fall from slow motion, the plungers are allowed to be forced out by the action of the spring 27, so that their ends will be engaged by the latches which connect the valve-rod arms and the eccentric-rod arms. As the speed increases and the balls rise the governor-rod 28 oscillates the lever 29, which through the link 30 causes the toggles 31 to draw the plungers back into the casing out of the paths of the latches.

As shown in Fig. 7, the plungers could instead of being forced apart by a spring be forced apart by air-pressure. In this case when the balls droop air-pressure in the chamber 32 would force the plungers apart. This air-pressure could be obtained from a receiver 33, located anywhere and connected by a pipe 34. When the balls in this form rise as the speed increases, by means of the toggle 35, the plungers are drawn back out of the paths of the latches.

Instead of the governor actually throwing the plungers out, it can, as shown in Fig. 8, be made to act upon a three-way cock 36 in a pipe 37, leading from a reservoir 38, in which air is stored under pressure from some previous operation of the compressor. The downward movement of the governor-balls opens the valve and allows the air-pressure

to force the plungers apart against their springs, thereby accomplishing the result as though the governor itself actually threw the plungers out by direct connection.

5 In all of the forms previously described the governor is arranged to control the action of plungers acting upon the latch of a rotary plug-valve of the Corliss type.

10 In Fig. 9 the governor is arranged to operate a valve 39 in a pipe 40, leading from a reservoir 41 to plungers adjacent to puppet intake-valves 42.

15 A common form of puppet intake-valve is shown in Fig. 10. The valve-disk 43 opens inwardly and closes outwardly against a seat 44 and is guided by a stem 45. A spring 46 tends to draw the valve to its seat. Adjacent to the valve-stem may be arranged a plunger 47, that is drawn back by a spring 20 48. When the governor-balls droop and the cock 39 is open, air through the pipe 40 forces the plunger against the valve-stem and holds the stem open as long as the balls droop.

25 In Fig. 13, adjacent to the valve-stem 49, is a plunger 50. This plunger is adapted to be forced into engagement with the end of the valve-stem by a lever 51, connected directly with the governor.

30 If desired, the power for moving the plungers outwardly, so as to cause interference, could be obtained from a moving part of the compressor, this part being connected with the plunger-moving mechanism at the proper 35 time by the action of the governor. A mechanism operating in this manner is indicated in Figs. 11 and 12.

40 The rod 52 may be connected with any reciprocating part of the compressor. This rod may carry an oscillating lever 53, having hooks 54 at each end and a lug 55 at the center. Pivoted adjacent to this lever may be a lever 56, that is connected with the governor-rod 57. This lever may be provided with lugs 58, which when the lever is 45 lifted by means of the drooping of the governor-balls are engaged by the lug 55 of the lever 53 in such manner that the lever 53 is tipped so that either one hook or the 50 other will catch upon the lug 59 on the lever 60, that has lugs 61 arranged to engage with stems 62, projecting from the rear of the plungers 63. When the hook draws the lever 60 in one direction, the plungers are

forced outwardly. When the hook draws 55 this lever in the opposite direction, the plungers are drawn inwardly by their springs.

The invention is not limited to the specific form of ball-governor nor to the details of construction which are herein shown. 60

The invention claimed is—

1. The combination with an intake-valve of an air-compressor cylinder, of mechanism adapted to hold said valve open, a speed-governor, and means controlled by the gov- 65 ernor and connected with the aforesaid mechanism which when the governor is collapsed causes said mechanism to hold the valve open, substantially as specified.

2. The combination with an intake-valve 70 of an air-compressor cylinder, of a speed-governor, mechanism adapted to hold said valve open, and means connecting the governor and the aforesaid mechanism, said means being so organized that when the 75 governor is idle or is moving slowly the valve will be held open and when the governor is moving rapidly the valve will be allowed to operate normally, substantially as specified.

3. The combination with an intake-valve 80 of an air-compressor cylinder, of a fly-ball governor, mechanism adapted to hold said valve open, and means connecting the governor and the aforesaid mechanism, said 85 means being so organized that when the governor is idle or is moving slowly the valve will be held open and when the governor is moving rapidly the valve will be allowed to operate normally, substantially 90 as specified.

4. The combination with an intake-valve 95 of an air-compressor cylinder, of mechanism for opening and closing the valve, means for connecting the opening and closing mechanism with and disconnecting that mech- 100 anism from the valve, means for causing the disengagement of the connecting means, a speed-governor, and a connection between the governor and the means for causing the disengagement of the connecting means, 100 said means operating when the governor is idle or moving slowly to cause said disengagement and hold said valve open, substantially as specified.

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Witnesses:

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