No. 779,812. PATENTED JAN. 10, 1905.

W. I. STAAF.

BOURDON STEAM GAGE.

APPLICATION FILED FEB. 19, 1904.

4 SHEETS—SHEET 1.

Fig. 1.

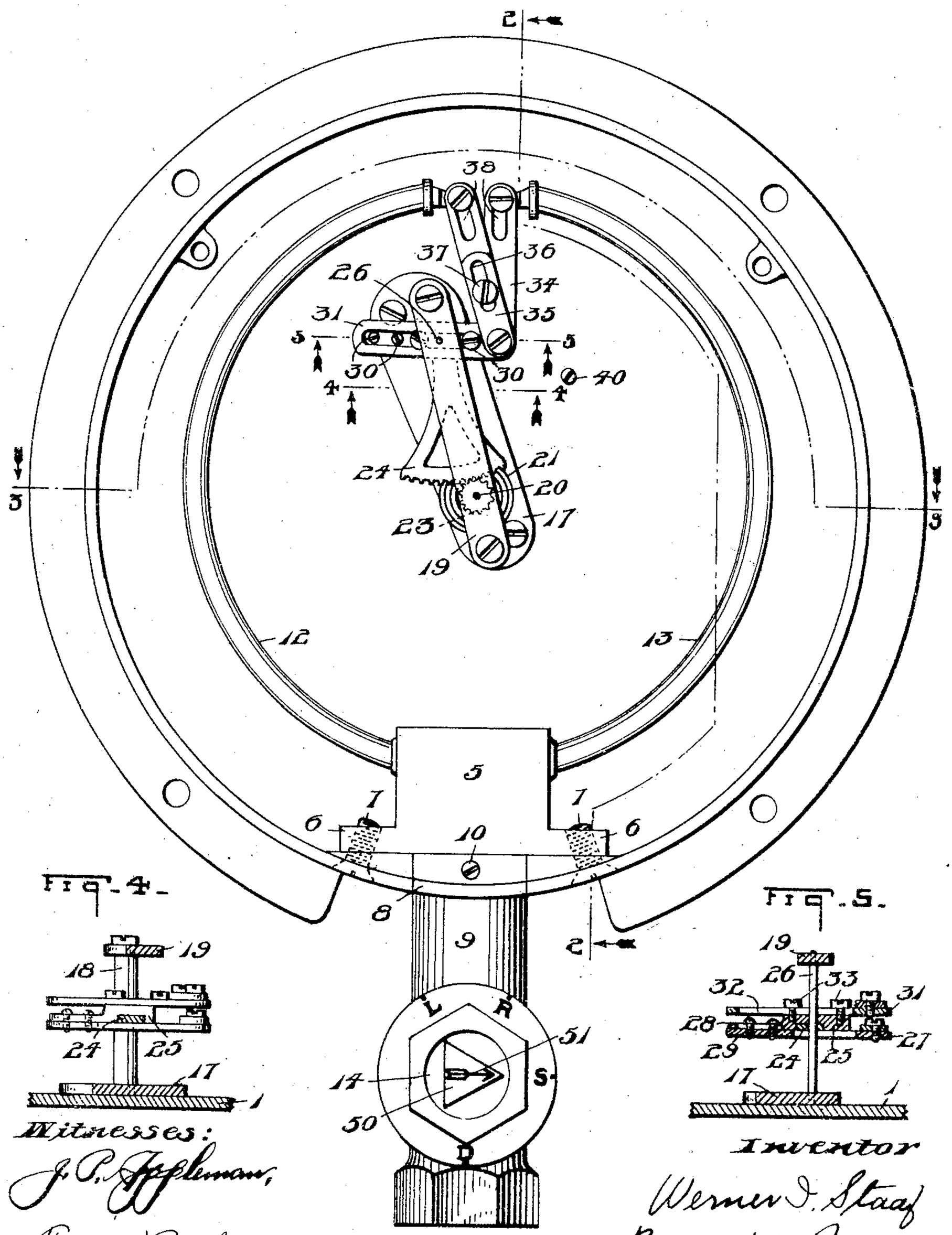

Fig. 4.

Fig. 5.

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4 SHEETS—SHEET 2.

Fig. 2.

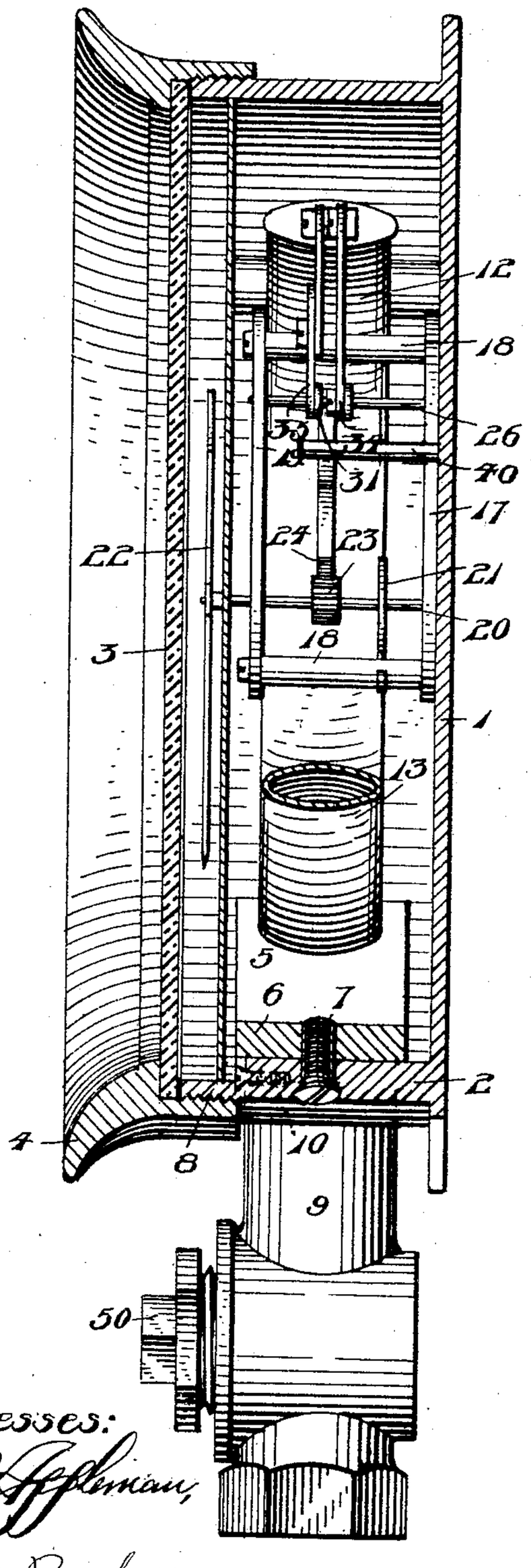
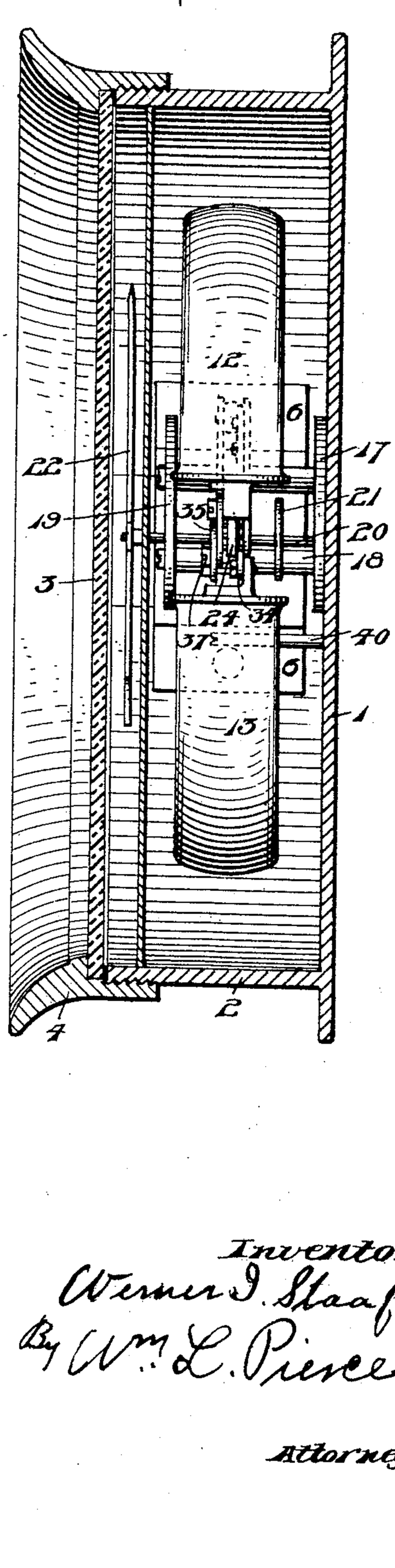


Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 6.

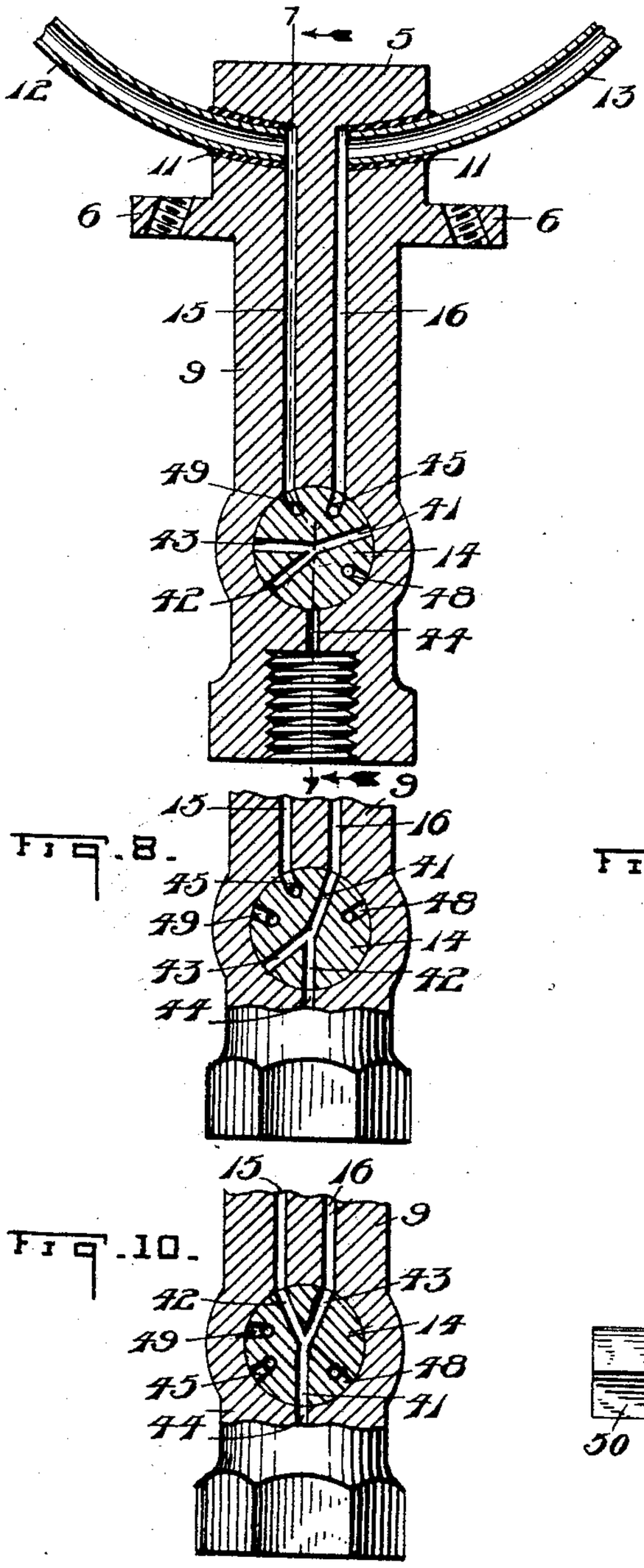

Fig. 7.

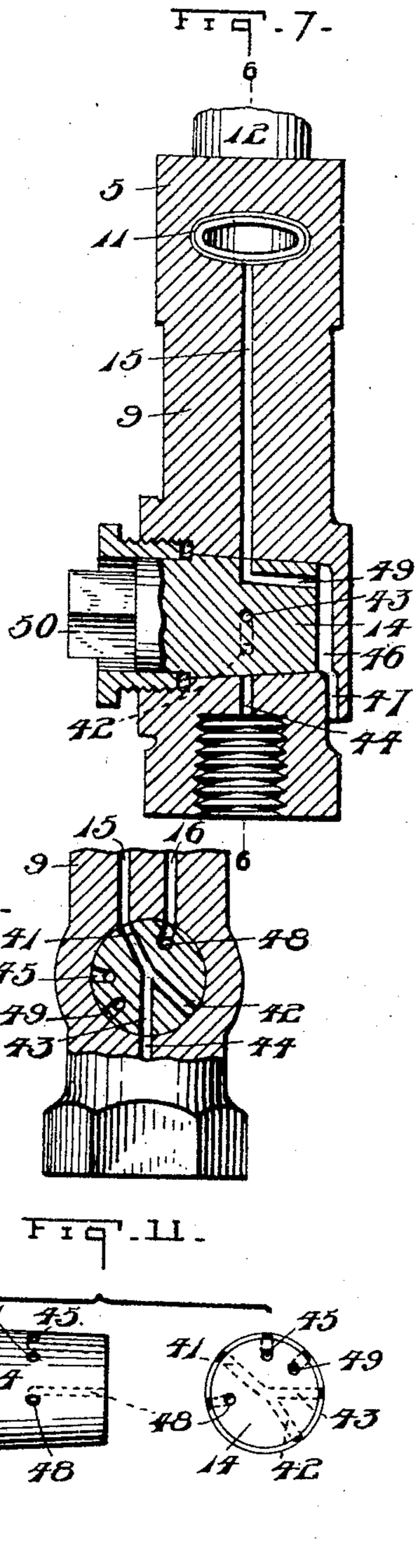

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

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4 SHEETS--SHEET 4.

Fig. 12.

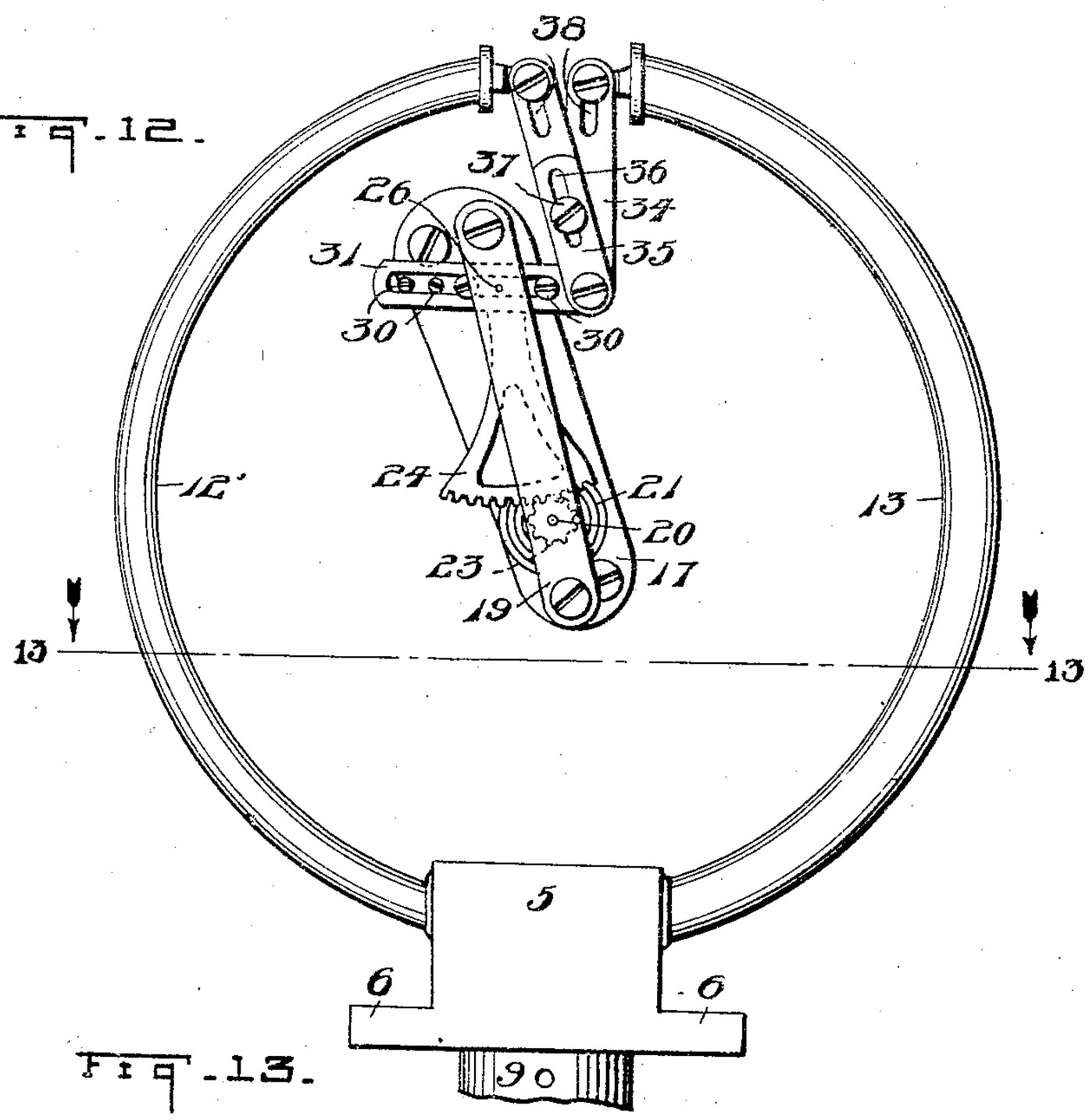


Fig. 13.

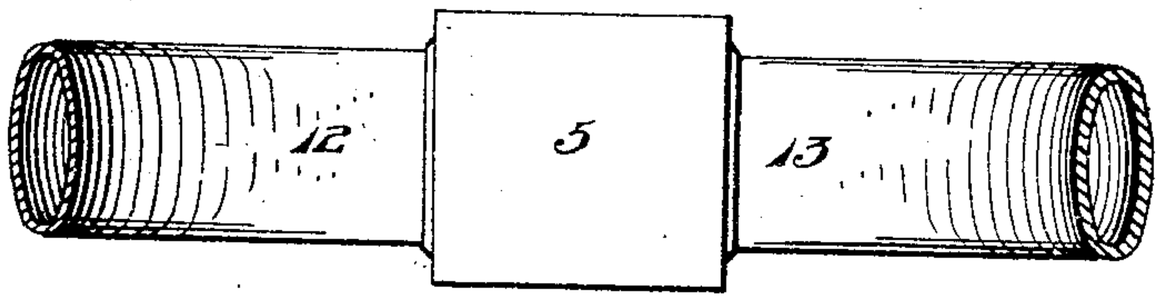
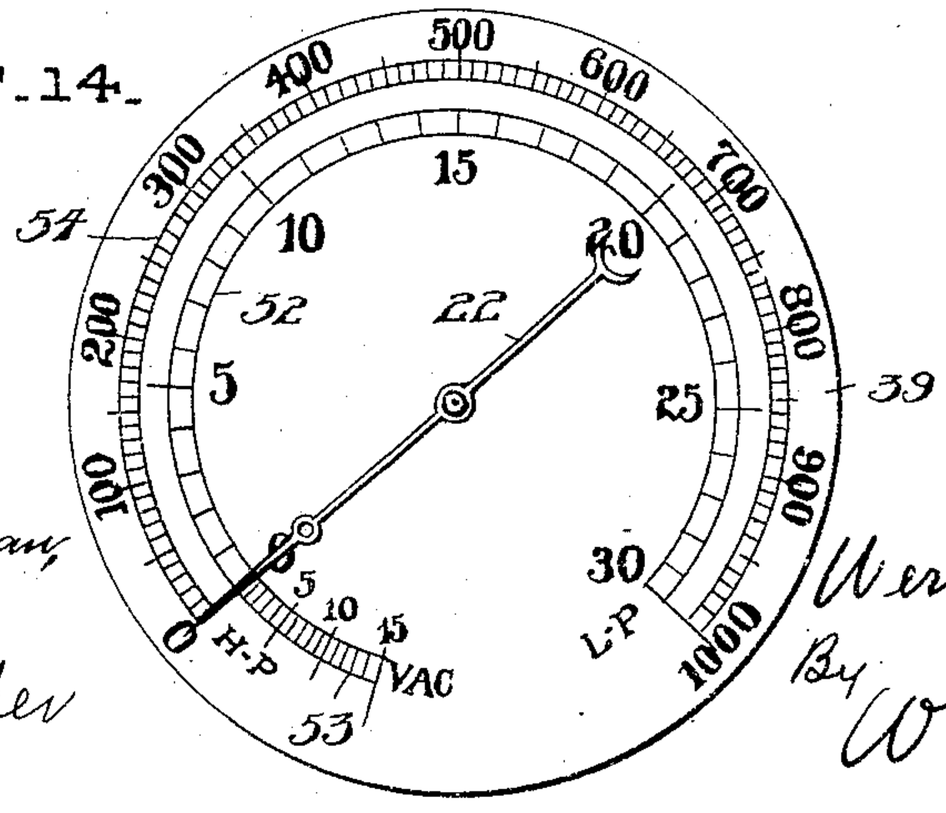


Fig. 14.



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No. 779,812. Patented January 10, 1905.

UNITED STATES PATENT OFFICE.

WERNER I. STAAF, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO PITTSBURG GAGE AND SUPPLY COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

BOURDON STEAM-GAGE.

SPECIFICATION forming part of Letters Patent No. 779,812, dated January 10, 1905.

Application filed February 19, 1904. Serial No. 194,327.

To all whom it may concern:

Be it known that I, WERNER I. STAAF, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered new and useful Improvements in Bourdon Steam-Gages, of which the following is a specification.

My invention relates to Bourdon gages.

The objects of my invention are, first, to produce a gage of that type provided with two springs or arms, either or both of which may be connected with the pressure to be registered; second, to permit or allow instant drainage of either or both springs when either or both springs are disconnected from the pressure; third, to provide a valve by which the aforesaid objects may be attained; fourth, to combine into an integral construction the valve-casing and the socket or head to which the springs are attached; fifth, to provide a Bourdon gage with two arms, one registering vacuum and low pressures and the other high pressures; sixth, to make a novel dial from which these three indications may be read, and, seventh, to provide mechanism whereby the indicating or registering mechanism may be adjusted.

Referring to the drawings, Figure 1 is a plan view of one form of my invention, showing both springs substantially alike, the dial and the parts above it being removed; Figs. 2 and 3, sections on the lines 2 2 and 3 3 of Fig. 1, the dial and parts above being in place; Figs. 4 and 5 sections on the lines 4 4 and 5 5 of Fig. 1; Fig. 6, a section through the valve and socket on the line 6 6 of Fig. 7; Fig. 7, a section on the line 7 7 of Fig. 6; Figs. 8, 9, and 10, sections through the passages in the valve and its casing, showing the valve in its different positions; Fig. 11, a side and end view of the valve; Fig. 12, a plan view of a second form of my invention, wherein I employ springs of different strengths, the stronger one for use where high pressure is to be measured and the weaker one where vacuum or low pressure is to be measured; Fig. 13, a section on the line 13 13 of Fig. 12, and Fig. 14 a plan view of the registering-dial for use with the mechanism of Fig. 12.

The registering portion of my invention is inclosed within a circular casing having the base or bottom 1 and the round or flange-like side 2, supported on the base. The glass cover 3 is clamped on the top of the side 2 by means of a screw-ring 4. At the lower side of the side 2 is the socket 5, having the two lateral ears 6, through alined holes in which and the side 2 the screws 7 are passed to secure the socket to the side. The portion 8 of the side 2 is separable from the main body thereof and may be secured to the shank 9 of the socket by the screw 10. The upper end or head of the socket has opposite lateral holes 11 somewhat elliptical in cross-section, in which are brazed or otherwise secured the lower ends of the hollow curved Bourdon springs 12 and 13. The holes 11 do not meet each other in the socket, but each communicates with a passage running longitudinally downward to a rotary valve 14. The hollow of spring 12 communicates with the passage 15 in the socket and the hollow of spring 13 with the passage 16.

Secured to the base 1 is a plate 17, on which is mounted the two posts 18, supporting the top plate 19. Journaled in the plates 17 and 19 is the index-spindle 20, having the spring 21 to return the pointer 22 on the spindle back to zero of the scale. The spindle carries a pinion 23, which gears with the segment 24, secured in the block 25 on the spindle 26, pivoted in the plates 17 and 19. To the bottom of the block 25 is secured the plate 27, slotted for the reception and adjustment on the spindle 26. The block has an arm 28, through a slot 29 in which the screws 30 are passed to secure the plate 27 at any selected place. To the top of the block 25 is secured a plate 31, having the slot 32, through which screws 33 pass into the block. The plate 31 can be adjusted longitudinally by means of the said screws. The right-hand end of the plate 27 is connected by a link 34 to one of the springs, as 13, and the plate 31 is connected to the other spring, as 12, by the link 35, the lat-

ber being shown in two sections, made adjustable by the slot 36 and set-screw 37. The links 34 and 35 have slots 38 at the joint connecting them to the springs 12 and 13 in order that the action of one spring may operate the pointer, if the other spring is not in use. By adjusting the plates 27 and 31 and the sections of the link 35, if necessary, the pointer can be caused to indicate the same pressure, whether either or both springs are in use. If the spring 12 only be in use, the pressure within it will slightly straighten it, causing the link 35 to rise and a registration to be made. At the same time the link 34 will rise, its slot 38 moving up on its pivotal connection with the spring 13. In case both springs are in use each link will be lifted by its respective spring.

39 represents the dial-plate beneath the pointer 22, and 40 is a stop-pin to prevent the segment 24 passing out of mesh with the pinion 23.

The valve 14 is a rotary plug having transversely through it the passage 41, having the two branches 42 and 43. The passage 41 extends from the periphery well into the body of the valve and then forks in the branches 42 and 43, which are capable of registering, respectively, with the passages 15 and 16, as shown in Fig. 10. When the passages 15 and 16 register with the branch passages 42 and 43, the passage 41 registers with the passage 44 in the lower part of the shank 9. The passage 44 is to be connected to a source of pressure to be measured. When the valve stands as in Fig. 10, the pressure is admitted to both springs 12 and 13, whereupon both links 34 and 36 take part in operating the pointer 22. When the valve is turned as in Fig. 8, pressure is admitted to the spring 13 only by way of the passage 16. The passage 15 is at the same time connected with the passage 45 in the valve, the latter passage opening freely to the atmosphere at the end thereof, which is spaced at 46 slightly from the back of the valve-casing, as shown in Fig. 7, the space 46 being provided with the vent 47 open to the air. When the valve is turned as in Fig. 9, the pressure passes by way of passage 15 to the spring 12, and the passage 16 and spring 13 are open to the air by way of the passage 48 in the valve, the space 46, and the vent 47.

The vent 47, the space 46, and the passages 45, 48, and 49 act as exhaust-passages for the springs and connected passages 15 and 16. If both springs have been in use, as indicated in Fig. 10, and both are to be cut off, the turning of the valve to cause the exhaust-passages 45 and 49 to register with the passages 15 and 16 at once allows the steam or gas in the springs to expand and force all the liquid out, so that there will be no liability of the passages being stopped with ice or any part of the gage being broken by ice. When only one spring is in use, the other spring is permitted to discharge freely all gases and liquids therein. If for any reason one of the springs 12 or 13 should become inaccurate or damaged, the valve can be at once turned and the other spring used without in the least impairing the accuracy of the gage or without requiring a new gage to be put in. In case it is desired to use one spring only at a time the other spring will at all times be ready when needed.

As shown on Fig. 1, the end of the valve has a triangular stem 50, carrying the index-arrow 51. The letters "L," "R," "S," and "D" around the valve-stem and on the valve-casing are arranged so that when the index 51 stands at "L" the left-hand spring is supplied with the pressure, as in Fig. 9, when it stands at "R" the right-hand spring is in communication with the pressure, as in Fig. 8, when it stands at "S" both springs are shut off from pressure, as in Figs. 6 and 7, and when it stands at "D" both springs are open to pressure, as in Fig. 10.

On Sheet 4 of the drawings the mechanism is precisely the same as on the other sheets, except one of the springs is constructed of thinner or different material or otherwise so constructed that it will be sensitive to lower pressures than the other spring or will even indicate vacuum-pressures,

In Figs. 12 and 13 the spring 12′ is lighter than the spring 13 and would be used only when the valve-index is turned to "L," or so that the pressure is admitted to the spring 12′ only. The pointer 22 will in this case be read only in connection with the inner circle 52 of readings (shown running from "0" to thirty pounds) and are intended only for low pressures, (indicated by LP on Fig. 14.) If, as often occurs at gas-wells, a vacuum should exist, the pointer would move in the opposite direction along the fine scale 53, (marked VAC on Fig. 14.) In case pressure is supplied to the spring 13 only the readings will be taken from the outer circle 54, which runs from "0" to one thousand pounds. The provision of the inner or second scale of a short range is valuable, as there is usually some slack to be taken up in the mechanism before the pressures will be accurately registered and as it would be practically impossible to read small pressures accurately where a movement of, say, an eighth of an inch by the pointer would indicate ten pounds. With the other scale ten pounds is indicated by a movement of approximately one-thirtieth that by which the same pressure is indicated on the inner scale. So it is easily seen that low and vacuum pressures can best be measured on a separate scale or by a separate numeral on the same scale.

While I have described the precise mechanism shown, I do not desire to be restricted to the same in every particular, as the same may be departed from in various ways, as in

the number of parts or their location or size, without in the least departing from the spirit of my invention.

Having described my invention, I claim—

1. In a gage, a pair of Bourdon springs, a movable indicator and means connecting said indicator with both springs, and means in said connecting means for causing the indicator to be operated by either spring separately or by both jointly to indicate the pressure.

2. In a gage, a pair of Bourdon springs, a movable indicator, and means connecting said indicator with both springs, and means for permitting the independent adjustment of the action of each spring on the indicator.

3. In a gage, a pair of Bourdon springs, a movable indicator, a slotted slide in a connection between the indicator and each spring, and means in the slot for adjusting each slide to register correctly the pressure within each spring.

4. In a gage, a pair of Bourdon springs, a movable indicator, and a connection from the indicator to each spring, each connection including a loose joint which permits one spring alone to operate the indicator.

5. In a gage, a pair of Bourdon springs, a movable indicator, and a connection between each spring and the indicator, each connection including a link with a loose slotted joint which permits one spring alone to operate the indicator.

6. In a gage, a pair of Bourdon springs, a movable indicator, an oscillating device to operate the indicator, and links connecting the said device to each spring, said links having a loose sliding connection with the springs whereby one spring alone may operate the indicator.

7. In a gage, a pair of independent Bourdon springs, and a valve connecting each spring separately or both springs concurrently to the pressure to be measured.

8. In a gage, a pair of independent Bourdon springs and a valve connecting either spring to the pressure to be measured, and for connecting with the external air the spring not so connected.

9. In a gage, a pair of independent Bourdon springs and a valve connecting both springs with the pressure to be measured and for connecting both springs with the external air, each spring having a separate passage leading entirely to the valve.

10. In a gage, a pair of independent springs, a socket carrying the springs and provided with separate passages leading to the springs, a valve in the socket, provided with passages permitting either or both springs to be in use and with other passages whereby either or both of the springs may be connected with the external air.

11. In a gage, a pair of independent Bourdon springs, a valve for supplying or cutting off pressure to either or both springs at will, an indicator on the valve and a series of marks around the valve to coöperate with said indicator to show the position of the valve.

12. In a gage, a single indicating means, a pair of independent Bourdon springs, and means connecting the springs with the indicator, said connecting means containing provision to permit the indicator to be moved by either spring.

13. In a gage, a single indicating means, a pair of independent Bourdon springs, and means connecting the springs with the indicator said connecting means containing provision to permit the indicator to be moved by either spring separately or by both jointly.

Signed at Pittsburg, Pennsylvania, this 15th day of February, 1904.

WERNER I. STAAF.

Witnesses:

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