

975,657.

F. H. TREAT.  
GAS PRODUCING APPARATUS.  
APPLICATION FILED APR. 12, 1909.

Patented Nov. 15, 1910.

5 SHEETS—SHEET 1.

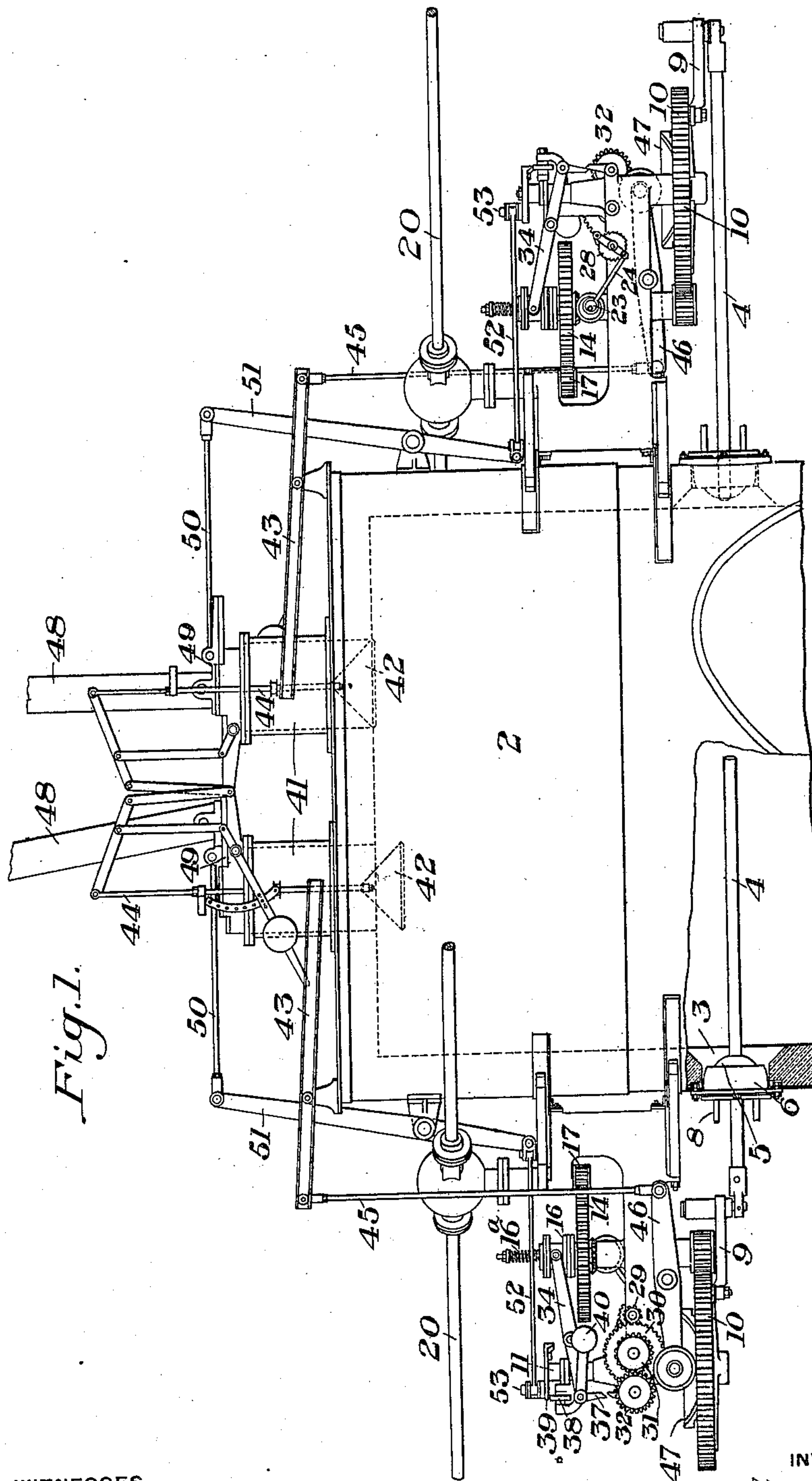


Fig. 1.

WITNESSES

R. A. Balderson.  
W. W. Swartz

INVENTOR

J. H. Treat.  
by Baker, Byrnes & Parmelee.  
his Attys.

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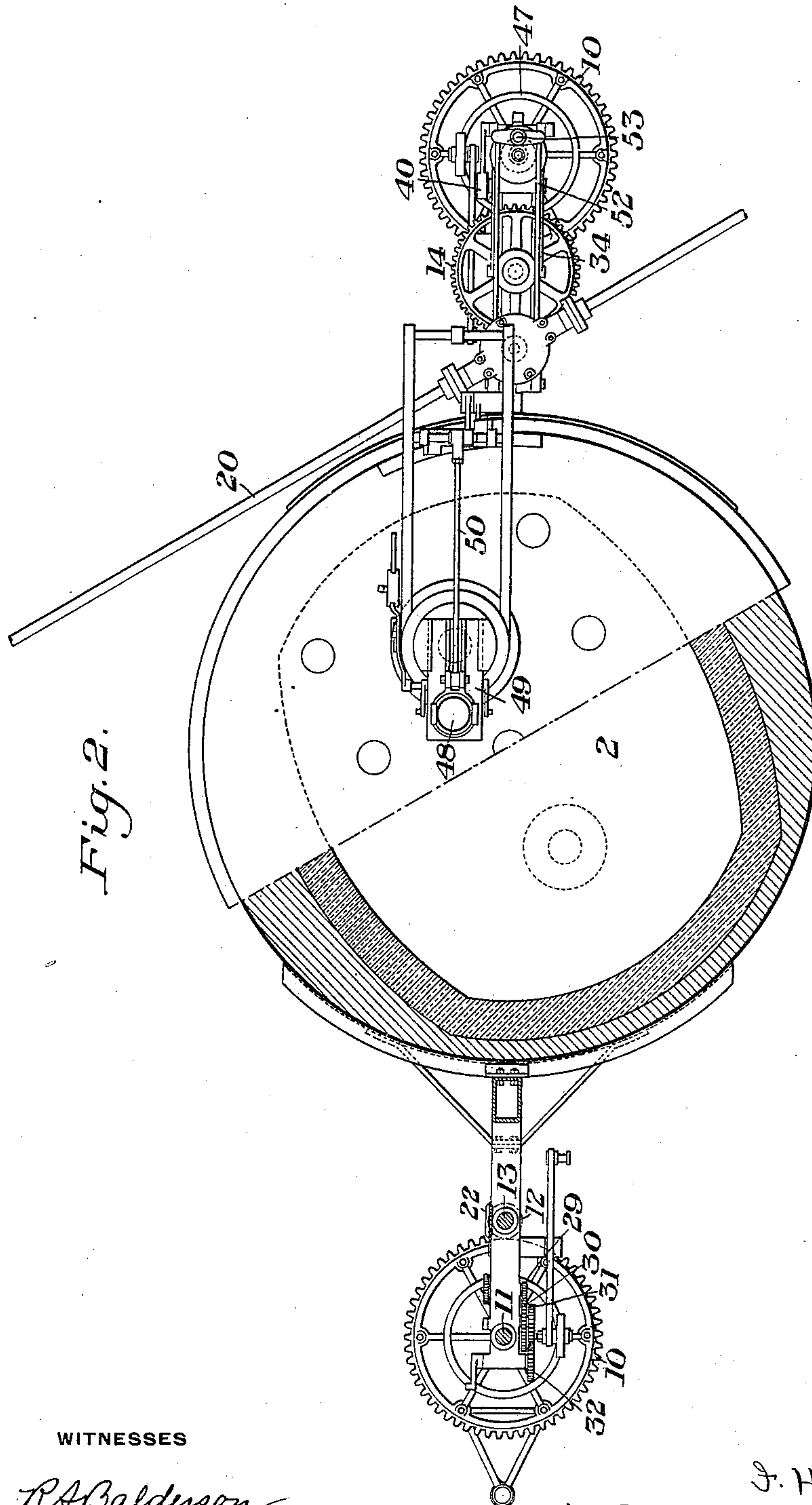


Fig. 2.

WITNESSES

*R. A. Balderson*  
*W. W. Swartz*

INVENTOR

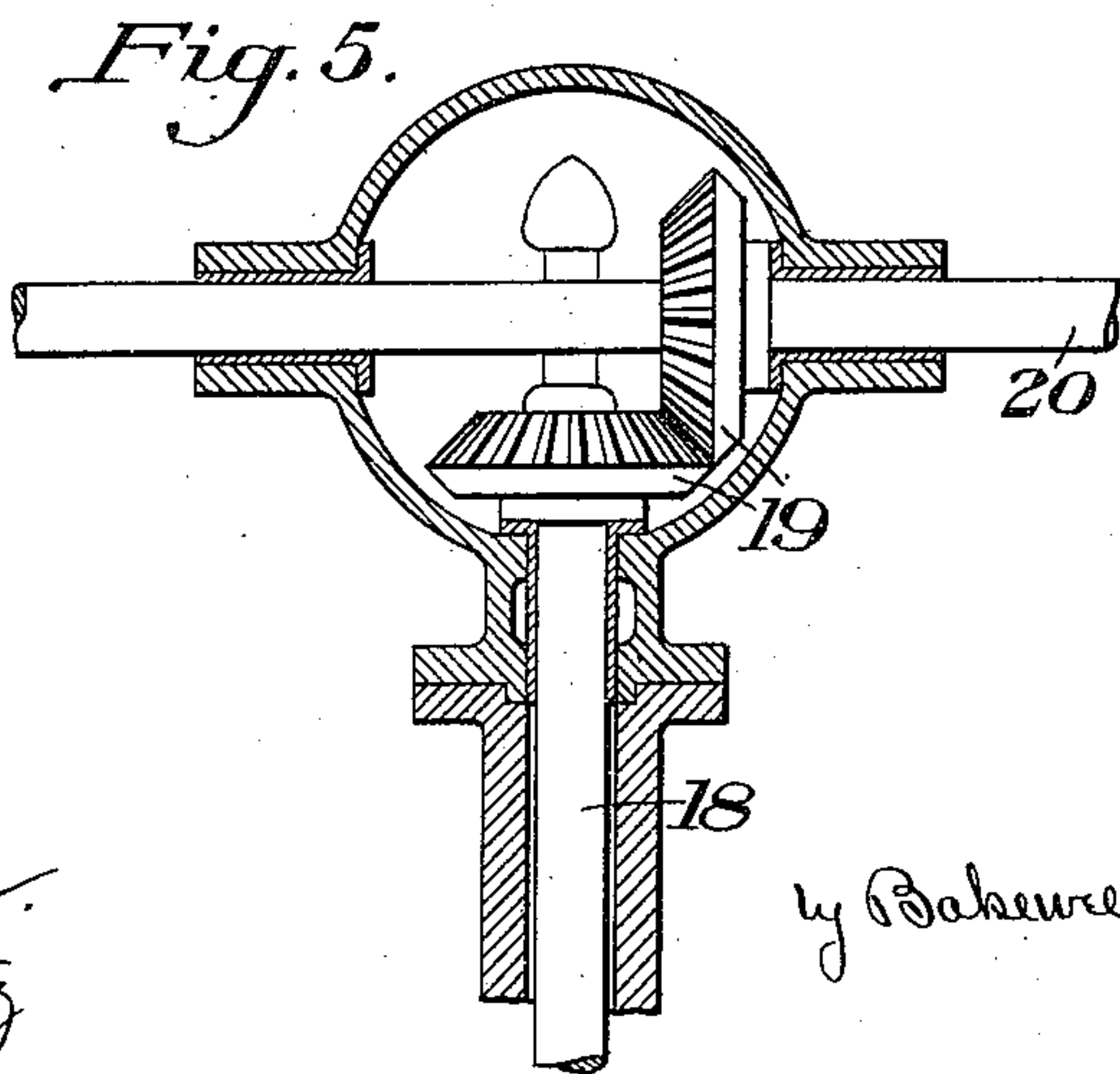
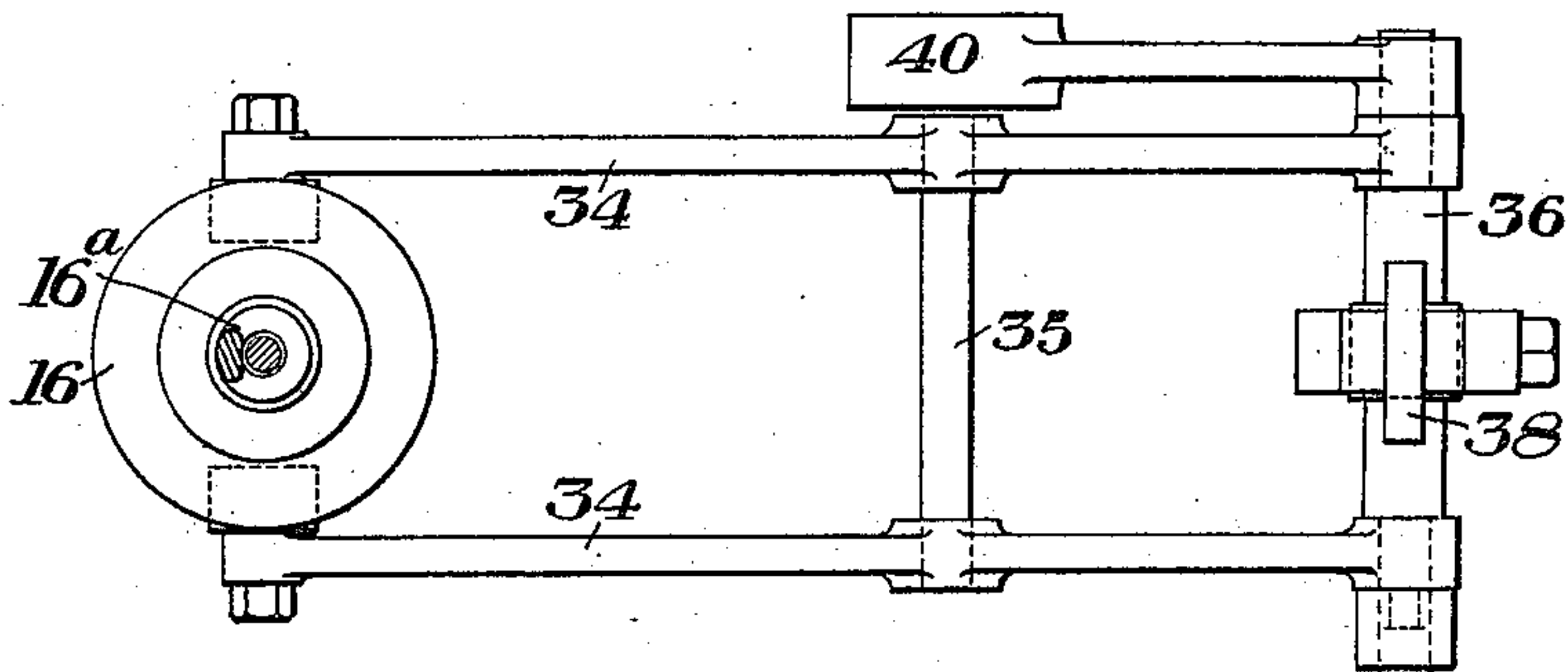
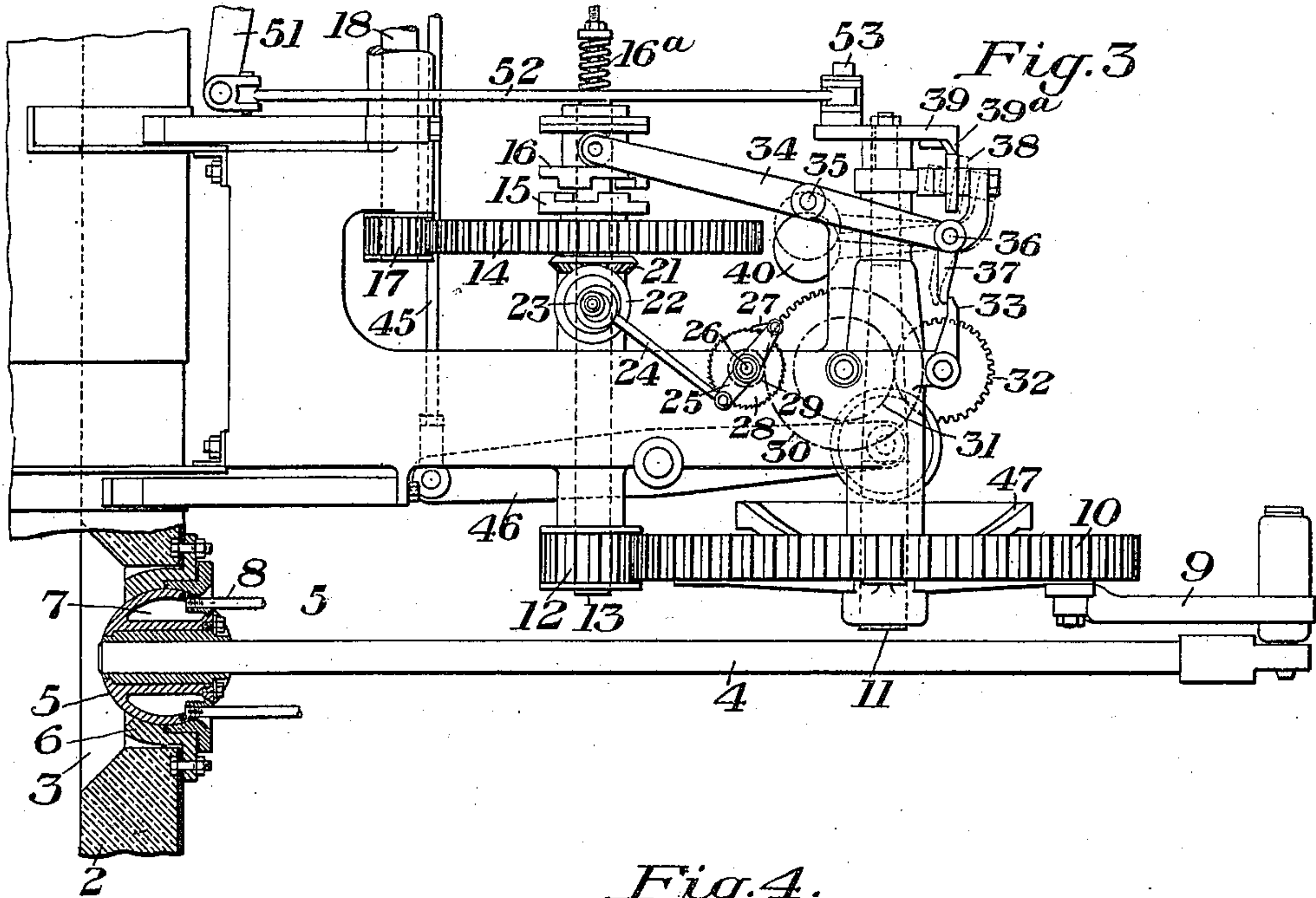
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5 SHEETS—SHEET 3.



WITNESSES

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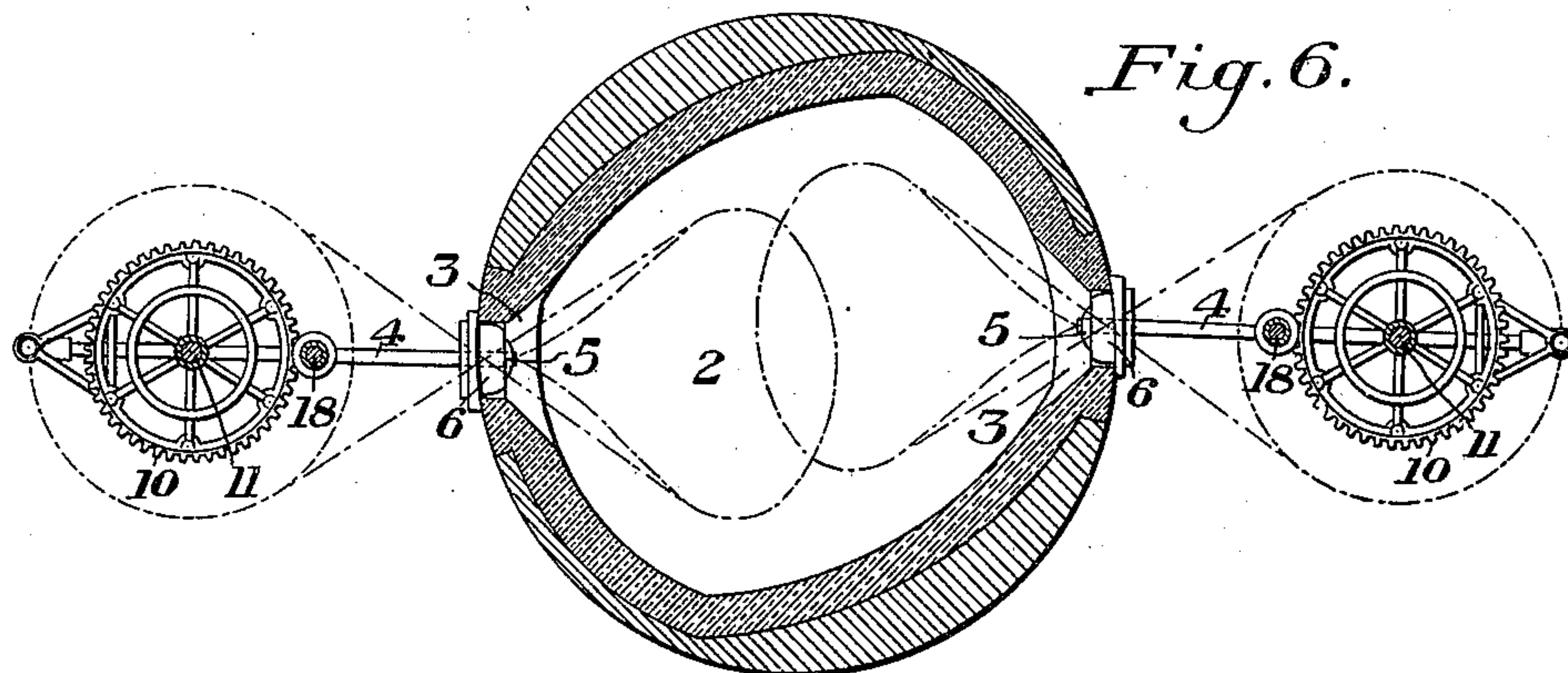


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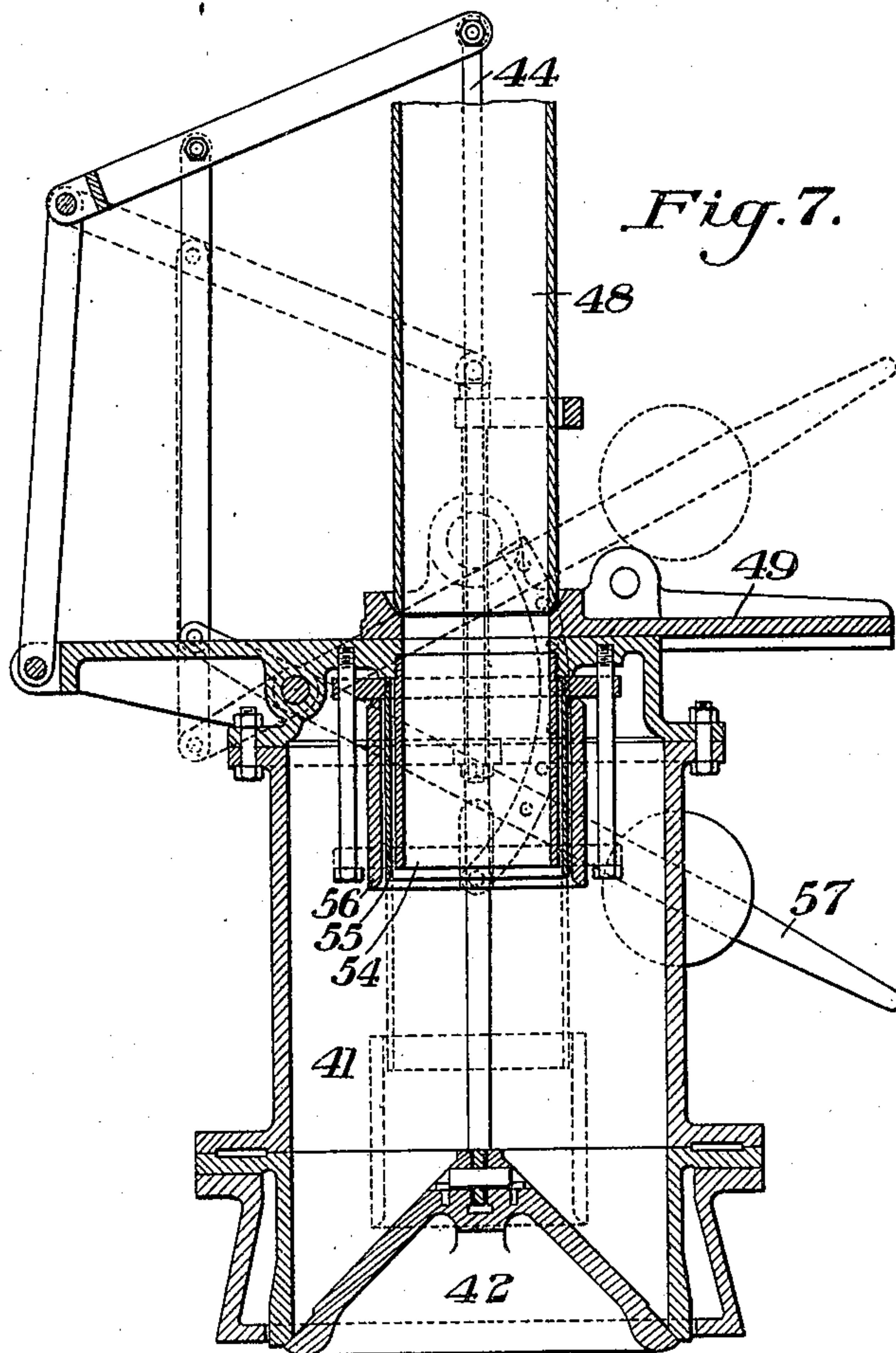
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5 SHEETS—SHEET 4.



*Fig. 6.*



*Fig. 7.*

WITNESSES

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*W. W. Swartz*

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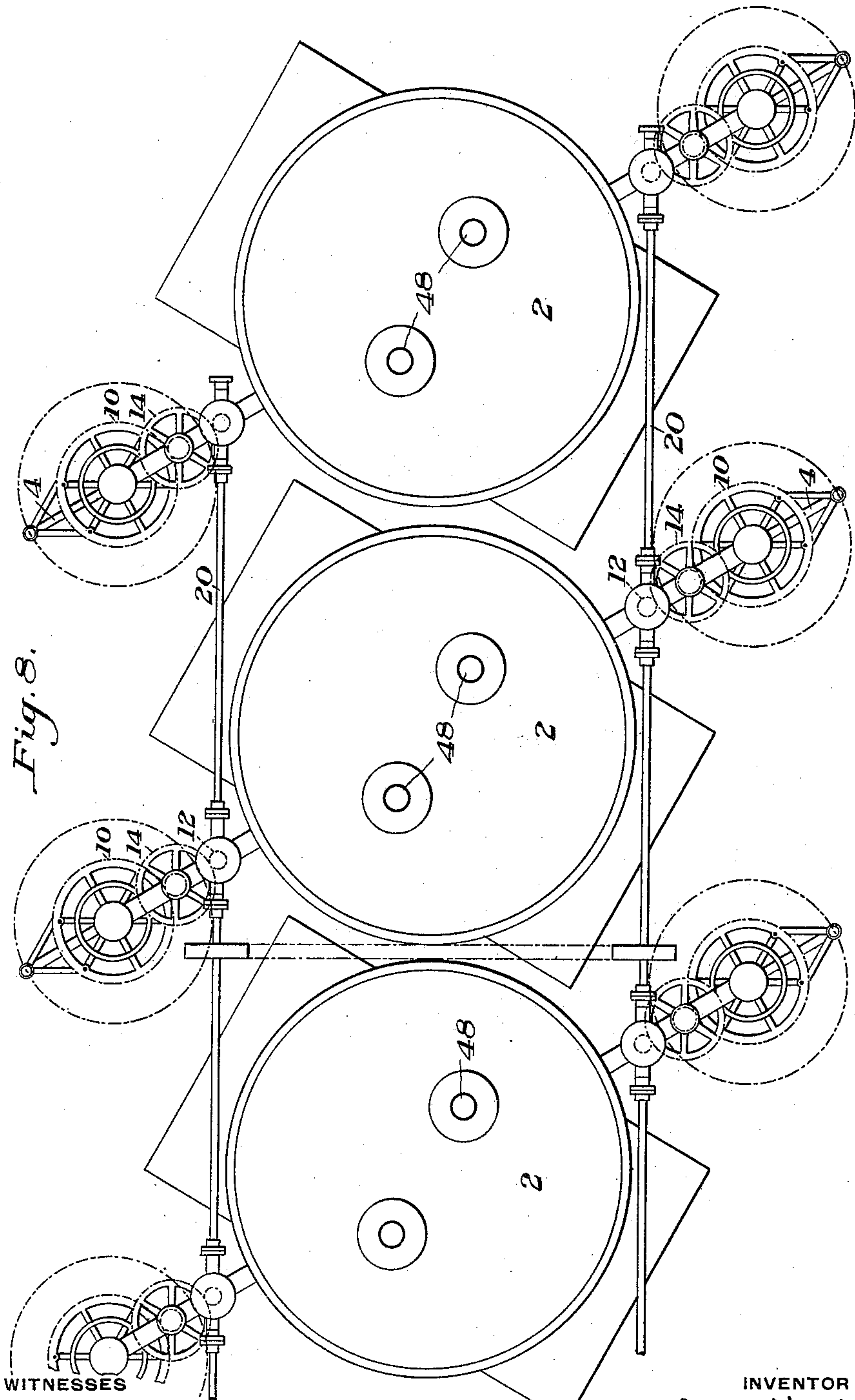
*F. H. Treat,*  
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5 SHEETS—SHEET 5.



WITNESSES

*R. A. Balderson*  
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# UNITED STATES PATENT OFFICE.

FRANCIS H. TREAT, OF CLEVELAND, OHIO.

GAS-PRODUCING APPARATUS.

975,657.

Specification of Letters Patent.

Patented Nov. 15, 1910.

Application filed April 12, 1909. Serial No. 489,361.

*To all whom it may concern:*

Be it known that I, FRANCIS H. TREAT, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful Improvement in Gas-Producing Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation partly in section of a gas producer having my invention applied thereto; Fig. 2 is a view of the same partially in plan and partially in horizontal section; Fig. 3 is a side view showing the feed and agitator controlling mechanism on a larger scale; Figs. 4 and 5 are detail views of portions of the mechanism hereinafter referred to; Fig. 6 is a sectional and diagrammatic view illustrating the action of the agitating mechanism or poker, when two of them are applied to one furnace; Fig. 7 is a vertical section showing one form of feed mechanism; and Fig. 8 is a plan view partly in diagram showing the application of the invention to a plurality of adjacent producers.

My invention relates to gas producers and is designed to provide a producer having agitating or poker mechanism and feed mechanism operated mechanically and in relation to each other.

The purpose of the invention is, so far as possible, to render the operation of the producer mechanical or independent of the efficiency and judgment of the operator, to thereby provide for a more equal action of the producer and greater uniformity in the quality and thermal value of the gas.

The nature of my invention will be best understood by reference to the accompanying drawings, in which I have shown one embodiment thereof, it being premised, however, that the invention is susceptible of various changes in its details of construction and arrangement by those skilled in the art, without departing from the spirit and scope thereof, as defined in the appended claims.

In these drawings, the numeral 2 designates a producer furnace which may be, in general, of any desired construction, the side walls of the furnace being provided with one or more holes or openings 3, (see Fig. 6) through each of which extends an agitator or poker bar 4. In the particular furnace illustrated, I have shown the furnace as provided with two of these openings arranged

opposite to each other with an agitator or poker bar extending through each opening, but it will be understood that one bar may be used or that more than two may be employed, according to the size and character of the furnace. Each of these bars 4 extends through a ball 5, which is seated in a spherical socket 6, secured to the outer wall of the furnace, the bar sliding freely through the ball to give it the desired longitudinal movement, and the ball turning in the socket to permit of the lateral sweep of the bar, indicated by the dotted lines of Fig. 6. These balls or sockets may be formed with interior chambers 7, as shown in Fig. 3, with inlet ports 8 to provide for the circulation of water or other cooling fluid. The balls 5 extend through the sockets, as shown in Fig. 3, so as to clear themselves and avoid the formation of pockets for lodgment of the fuel therein. Inasmuch as the mechanism for operating and for controlling the operation of these two bars is the same, I will proceed to describe one of these mechanisms and will apply corresponding reference characters to the corresponding parts of both mechanisms. Each bar 4 is connected at its outer end to a crank arm 9, of a gear wheel 10, mounted on a vertical shaft 11, and driven by a pinion 12 on a parallel shaft 13. The shaft 13 has loosely mounted thereon a gear wheel 14, provided with a clutch hub 15, designed to be engaged by a clutch member 16, which is secured to the shaft to rotate therewith and which is movable longitudinally thereon into and out of engaging position with the clutch hub 15. The gear wheel 14 is constantly driven by a pinion 17, on a shaft 18, which is connected by bevel gearing 19 (see Fig. 5) or in any other suitable manner with a line or power shaft 20. As shown in Fig. 8, there are two of these line or power shafts 20 extending at opposite sides of the series of furnaces and to which the operating mechanisms for all the poker bars are geared. The gear wheel 14 also has secured thereto a bevel gear wheel 21, which meshes with a gear wheel 22, having an eccentric 23. This eccentric is engaged by the strap of an eccentric rod 24, whose opposite end is connected to a lever 25, fulcrumed on a shaft 26 and carrying a pawl 27, which engages the teeth of the ratchet wheel 28, mounted on the shaft 26. Also secured to the shaft 26 is a pinion 29, which meshes with the teeth of a spur gear wheel 30. Secured to this gear



wheel 30 is a smaller spur gear 31, which meshes with a second spur gear 32, carrying a tappet arm 33. The clutch member 16 has its hub engaged by shifting levers 34 pivoted at 35 and having their opposite ends engaging a floating rock shaft 36. Secured to the rock shaft 36 is a rocker having one arm 37, designed to be engaged by the tappet 33, in the manner hereinafter described, and another arm 38 projecting upwardly underneath a cam disk 39, mounted at the upper end of the shaft 11. The shaft 36 is provided with a counterweight 40, which normally holds the arm 38 in the position shown in Fig. 3.

The furnace is shown as provided with two feed hoppers 41, each of which has a vertically movable closing bell 42. Each of these bells is operated by a connection with the mechanism at one side of the furnace, above described, through the medium of a lever 43, engaging its operating rod 44, said levers having their shorter arms connected by a rod 45 with a lever 46, engaging a cam 47, secured to the gear wheel 10, which carries the crank 9. These connections are so arranged that when the lever 46 is on the lower part of the cam 47, as shown at the left hand side of Fig. 1, the corresponding bell 42 will be lowered to its discharging position, as shown in dotted lines in said figure, while when the lever 46 is on the high part of the cam 47, as shown at the right hand side of Fig. 1, the bell will be closed. These hoppers 41 may, in so far as my present invention is concerned, be supplied with fuel in any desirable manner. The hoppers shown are supplied by means of the swinging supply pipe 48, connected at their lower ends to the horizontal cut-off slides 49, each of these slides being connected by a rod 50 with one arm of a lever 51, whose opposite and lower arm is connected by a rod 52 with a crank 53 on the cam plate 39 before referred to.

The particular application of feed hopper shown in Fig. 7 and which forms the subject matter of a separate application is provided with a series of telescoping feed sections 54, 55 and 56, by means of which the quantity of fuel supplied to the hopper 41 at each charge may be varied. That is to say, by lowering the telescoping sections to a greater or less extent, the space between the lower end of the lowermost section and the top of the bell 42 may be changed so as to enable the hopper to receive a larger or smaller charge as may be desired. These sections can be controlled in any desirable manner, as by the counterweighted lever 57.

The operation is as follows: As above stated, the gear wheel 14 of the mechanism is continuously rotated by its connection with the line shaft 20, but does not operate the mechanism except at such time as its

clutch hub 15 is engaged by the clutch member 16. When this clutch is thrown in in the manner hereinafter described, the shaft 12 is rotated thereby rotating the gear wheel 10, and actuating the crank 9 to cause the agitating or poker bar 14 to make one operation within the furnace in the manner indicated by the dotted lines in Fig. 6. The revolution of the gear wheel 10 actuates the cam 47, and thereby the lever 46 to lower the bell 42, and discharge the contents of the hopper 41 into the furnace. The rotation of the gear wheel 10 also rotates the cam plate 39, and through the connections 50, 51 and 52 moves the slide 49 and the feed supply pipe 48 into the position shown at the left hand side of Fig. 1, thereby cutting off the supply of fuel to the hopper 41, this operation taking place before the bell commences to open. When the wheel 10 has made one complete revolution, the bell 42 will be closed and the bar 4 will have been withdrawn from the furnace, as shown at the right-hand side of Fig. 1.

The engagement of the clutch members 15 and 16 is controlled as follows. When the cam plate 39 has made its complete revolution, the cam projections 39<sup>a</sup> thereon engage the rocker arm 38, in the manner shown in Fig. 3, and as this point of engagement is directly over the free ends of the levers 34, these ends of the levers are depressed, thereby elevating their opposite ends and raising the clutch member 16, out of engagement with the clutch member 15. The wheel 14, which is constantly rotating through the action of the bevel gears 21 and 22 and the eccentric 23, actuates the pawl 27 to turn the ratchet wheel 25, a distance equal to one tooth for each revolution of the gear wheel 22. This ratchet wheel effects the operation of the slow speed train of gearing 29, 30, 31 and 32, until the wheel 32 has been revolved to a position to cause its tappet arm 33 to engage with the rock arm 37. This engagement moves the rock shaft 36 to withdraw the arm 38 out of engagement with the cam projections 39<sup>a</sup>, and the clutch member 16 is at once thrown into engagement with the clutch member 15, by the action of the spring 16<sup>a</sup>. It will be seen that until such time as the rock arm 38 is moved by the action of the tappet 33, its engagement with the cam projections 39<sup>a</sup> will prevent the spring 16<sup>a</sup> from acting and the clutch will be held disengaged.

As will have been observed, the two poker and feed controlling and operating mechanisms are shown as arranged to operate alternately, but this is not essential to my invention as they may both be set to operate in unison, if desired. The two agitator bars or pokers will then pass each other in the furnace in the manner indicated by dotted lines in Fig. 6. The interior cross section of



the furnace may be adapted in each case, if necessary, to the movement of these pokers, or the movement of the pokers may be adapted to the shape of the furnace. In Fig. 6, I have shown the furnace as having an interior cross section of oblong oval form, so that the major portion of the area of the fuel bed contained within the furnace is subject to the action of the pokers.

As will appear from Fig. 8, the invention is readily applicable to a series of adjacent furnaces.

It will be seen that by a proper arrangement of the gearing, the pokers and feed mechanisms may be arranged to operate at any desired intervals, these intervals being made as long or short as may be desirable. Ordinarily the intervals between the operations of the furnace are of considerable duration, as it will be seen that the slow speed gearing which controls the operation of the clutch will require some time after one operation to bring the tappet arm in position to effect a subsequent operation, and the length of these intervals will depend upon the size of the producer, the kind of fuel used, etc. At each operation of the pokers, they advance obliquely in a substantially horizontal plane into the fuel bed, and then sweep around in the same horizontal plane toward the opposite side of the furnace, where they are retracted. In this manner, each sweep covers a relatively large area of the fuel bed, breaking down the walls of and filling up all holes or cavities which may have formed in said bed. It will be noted that the balls 5 are set well into the walls of the producer, thus enabling the pokers to have a maximum width of sweep with a minimum cutting away of the furnace walls. This inseting of the balls also prevents the necessity for deep pockets in the walls in which the fuel would collect and jam, and tend to interfere with the movements of the pokers. The balls, by reason of the water cooling, are prevented from destruction.

The operation of the pokers or agitator bars is to reduce the fuel to a homogeneous condition and to cause a ready and regular discharge of the ash, thus keeping the contents of the fuel in a uniform condition and thereby improving the action of the producer and giving a greater uniformity in the character and thermal value of the gas produced. It will be noted that the agitating bars during their intervals of non-action are withdrawn from the furnace by the actuating mechanism so that they are prevented from becoming unduly heated by remaining too long in contact with the heated fuel bed.

It will be apparent that many changes may be made in the details of construction and arrangement of my invention. Thus, I do not wish to limit myself to the par-

ticular means which I have shown for the control of the clutch, since this may be done in various ways. The connections for operating the cut-off slides and the closing bells may also be varied and any suitable arrangement of feed mechanism may be employed.

I claim:—

1. In a gas producer, a poker fulcrumed on one of the side walls and arranged to extend through said wall into the producer, and means for imparting a lateral sweeping or swinging movement to the poker in a substantially horizontal plane within the fuel bed of the producer, the actuating means also guiding and restricting the poker in and to such movement substantially as described.

2. In a gas producer, a poker fulcrumed on one of the side walls and arranged to extend through said wall into the producer, and means for imparting a lateral sweeping or swinging movement to the poker in a substantially horizontal plane within the fuel bed of the producer, the actuating means also guiding and restricting the poker in and to such movement, the actuating means being further arranged to advance and retract the poker; substantially as described.

3. In a gas producer, a poker fulcrumed on one of the side walls and arranged to extend through said wall into the producer, and means for periodically imparting a lateral sweeping or swinging movement to the poker in a substantially horizontal plane within the fuel bed of the producer, the actuating means also guiding and restricting the poker in and to such movement; substantially as described.

4. In a gas producer, a plurality of pokers fulcrumed in the lateral wall of the producer, and mechanism for swinging the pokers in a substantially horizontal plane within the fuel bed of the producer, said pokers each operating in a different segment or section of such bed, and the actuating mechanisms having timing means for causing the pokers to act in successive order; substantially as described.

5. In a gas producer, a poker fulcrumed in and extending through one of the side walls of the producer, and mechanism for actuating said poker periodically to advance it into and withdraw it from the fuel bed of the producer, and for swinging the poker within the producer, said movements being all in a substantially horizontal plane, and successive movements being in the same portion or segment of the fuel bed; substantially as described.

6. A gas producer, having an opening in its side wall, a bearing in said opening, a hollow ball or sphere movably mounted in said bearing, a poker mounted in the ball or sphere, means for advancing and retract-



ing the poker, and circulating connections for supplying the interior of the ball or sphere in its different positions to thereby cool the bearing and to also cool the end portion of the poker when withdrawn there-  
5 in; substantially as described.

7. In a gas producer, a poker fulcrumed in the side wall of the producer, a crank wheel to which the outer end portion of the  
10 poker is connected, said crank wheel being journaled on a vertical axis and gearing for actuating the crank wheel; substantially as described.

8. In a gas producer, a poker fulcrumed  
15 in the side wall of the producer, and actuating gearing for advancing and retracting the poker, and for swinging the same within the fuel bed of the producer, said gearing having stop means for stopping the poker  
20 in its retracted position, and also having timing devices for again advancing the poker after a predetermined time interval; substantially as described.

9. In a gas producer, a poker fulcrumed  
25 in the side wall of the producer, a crank connected to the poker and arranged to move the poker into and out of the producer, and to swing it within the fuel bed of the producer, gearing for actuating the crank,  
30 clutch means for throwing such gearing out of operation after a retraction of the poker, and timing means for automatically throwing in the clutch after a predetermined time interval; substantially as described.

35 10. In a gas producer, pokers fulcrumed in the side wall of the producer at substantially opposite points, and arranged each to swing within the fuel bed in a substantially horizontal plane, and through substantially  
40 one-half of the area of said bed, and mechanism for actuating the two pokers, said mechanisms being timed to operate alternately; substantially as described.

11. In a gas producer, the combination  
45 with feed mechanism and agitating mechanism, of operating gearing for controlling the same, and means for effecting an intermittent operation thereof together with connections between the two mechanisms where-  
50 by they are operated in timed relation to each other, substantially as described.

12. In a gas producer, the combination with agitating mechanism and feeding mechanism, of means for operating said mechanism  
55 intermittently in timed relation to each other, substantially as described.

13. In a gas producer, an agitator bar arranged to move longitudinally and laterally within the furnace, mechanism for periodically operating said bar, and feed mechanism  
60 controlled by the action of the agitator and operating mechanism, substantially as described.

14. In a gas producer, an agitating bar or  
65 poker, feed mechanism, gearing for actuating

the agitator bar or poker and the feed mechanism, clutch mechanism for controlling the operation of the gearing, and means controlled by the gearing for effecting a periodic operation of the clutch, substantially as  
70 described.

15. In a gas producer, an agitator bar or poker, gearing for actuating the same, and feed mechanism also actuated by said gearing, said gearing including clutch mechanism, and a constantly driven member, together with means actuated by the constantly driven member for controlling the clutch mechanism, substantially as described.  
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16. In a gas producer, intermittently operated agitating or poker mechanism, intermittently operating feed mechanism, gearing for operating said mechanism, said gearing including a constantly rotating member and clutch means for throwing said member into and out of driving relation with the rest of the gearing, and means controlled by the rest of the gearing for controlling the clutch means, substantially as described.  
80 85

17. In a gas producer, poking or actuating mechanism, gearing for effecting the intermittent operation of the same, feed mechanism having a closing bell or valve, and operating connections for said bell or valve controlled by said gearing, substantially as  
90 95 described.

18. In a gas producer, agitating or poking mechanism, gearing for intermittently operating the same, a feed hopper having closing means, and connections between said  
100 closing means and the said gearing, whereby the closing means will be operated in timed relation to the agitating mechanism, substantially as described.

19. In a gas producer, an agitator or  
105 poker, gearing for effecting an intermittent operation thereof, feed mechanism having a cut-off slide, a closing means, and operating connections between the cut-off slide and the closing means and the gearing, substantially  
110 as described.

20. A gas producer provided with a plurality of openings in its side wall at different points within the circumference of the furnace, a longitudinally and horizontally  
115 movable agitating or poking bar extending through each of said openings, and means for operating said bar, said furnace having its interior cross section modified with respect to the paths of movement described  
120 by said bars within the furnace to thereby provide for the horizontal sweep of the bars throughout a maximum portion of the fuel bed, substantially as described.

21. A gas producer provided with a plurality of openings in its side wall at different points within the circumference of the furnace, a horizontally swinging agitating or poking bar extending through each of  
125 said openings, and means for operating said  
130



bar, said furnace having its interior cross section modified with respect to the horizontal paths of movement described by said bars within the furnace to thereby provide for the sweep of the bars throughout a maximum portion of the fuel bed, substantially as described.

22. In a gas producer, an agitator bar or poker, gearing for actuating the same, said gearing including clutch mechanism, a constantly driven member, and means actuated by the constantly driven member for controlling the clutch mechanism, substantially as described.

23. In a gas producer, intermittently operating agitating or poking mechanism, gearing for operating said mechanism, said gearing including a constantly rotating member and clutch means for throwing said member into and out of driving relation with the rest of the gearing, and means controlled by the rest of the gearing for controlling the clutch means, substantially as described.

24. In a gas producer, a poker fulcrumed in one of the side walls of the producer, a motive device for actuating the poker, and a connection between the motive device and the poker for sweeping or swinging it laterally in a horizontal plane within the fuel bed of the producer and for guiding it to such movement; substantially as described.

25. In a gas producer, a poker fulcrumed in one of the side walls of the producer, toothed gearing for actuating the poker, and a connection between the toothed gearing and the poker for sweeping or swinging it laterally in a horizontal plane within the fuel bed of the producer and for guiding it to such movement; substantially as described.

In testimony whereof, I have hereunto set my hand.

FRANCIS H. TREAT.

Witnesses:

P. J. WARDNER,  
LIRSIE MAXWELL.