

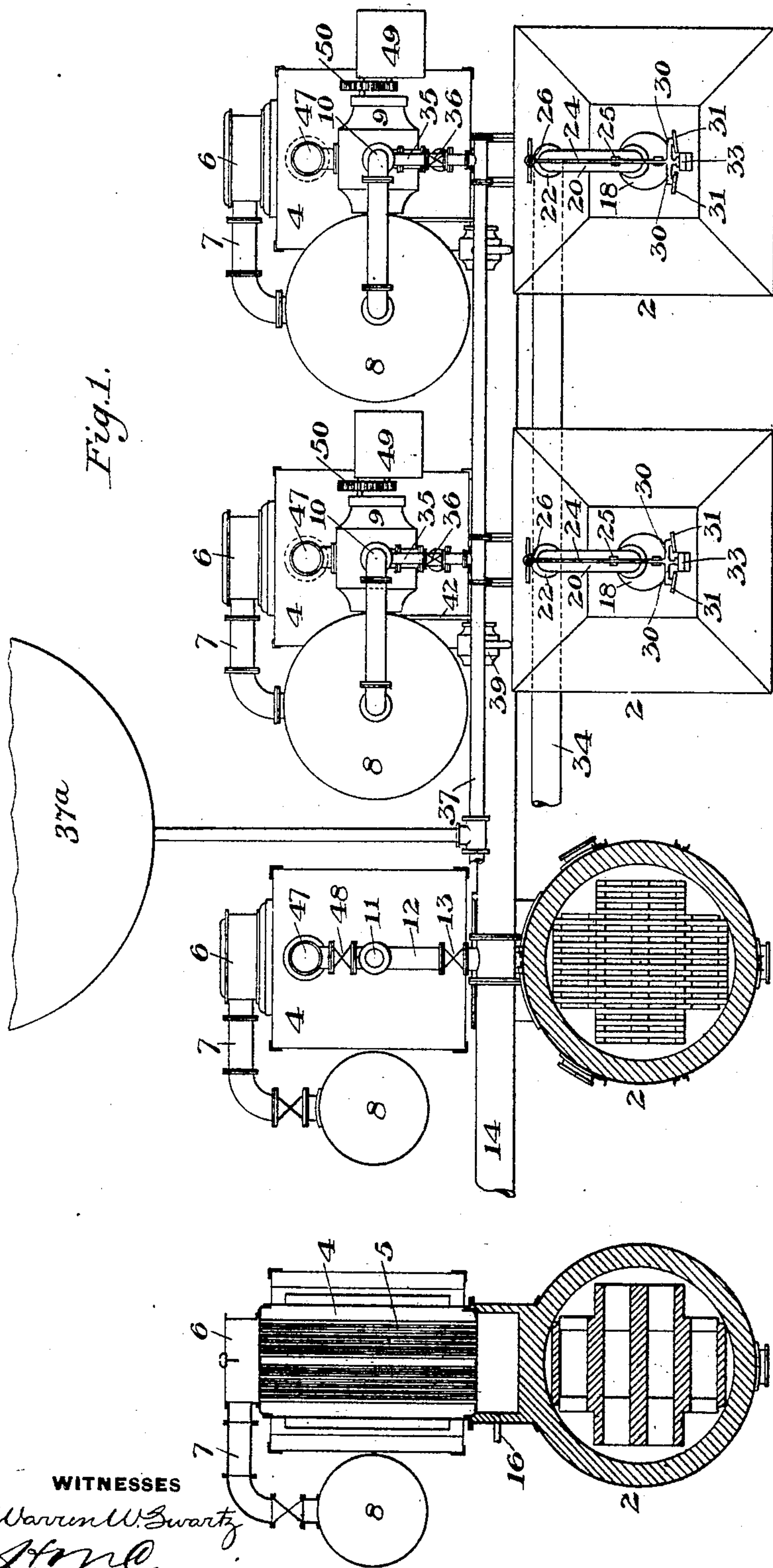
No. 835,293.

PATENTED NOV. 6, 1906.

F. H. TREAT.
GAS GENERATING SYSTEM.
APPLICATION FILED DEC. 14, 1904.

6 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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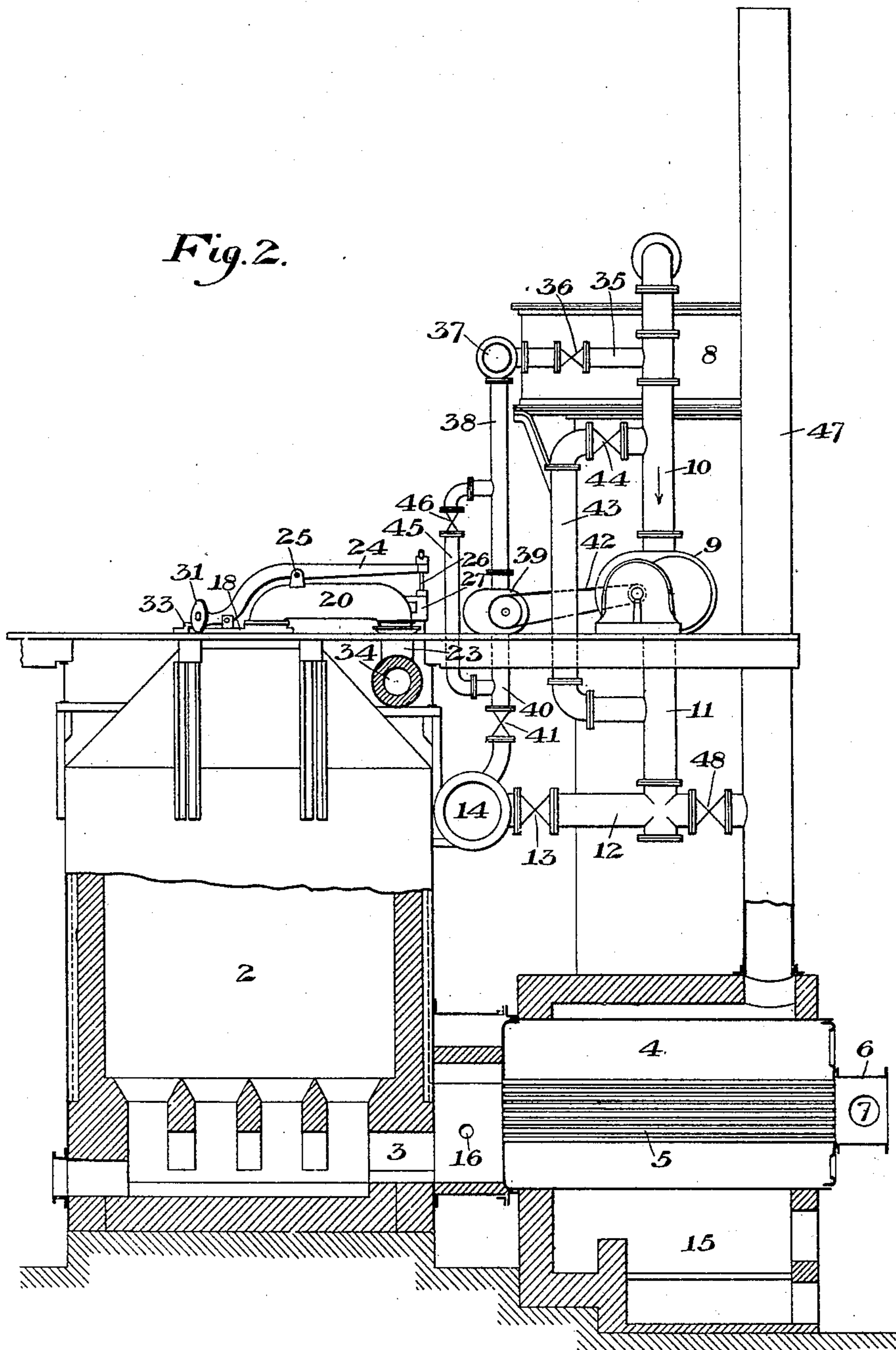
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6 SHEETS—SHEET 2.

Fig. 2.



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6 SHEETS—SHEET 3.

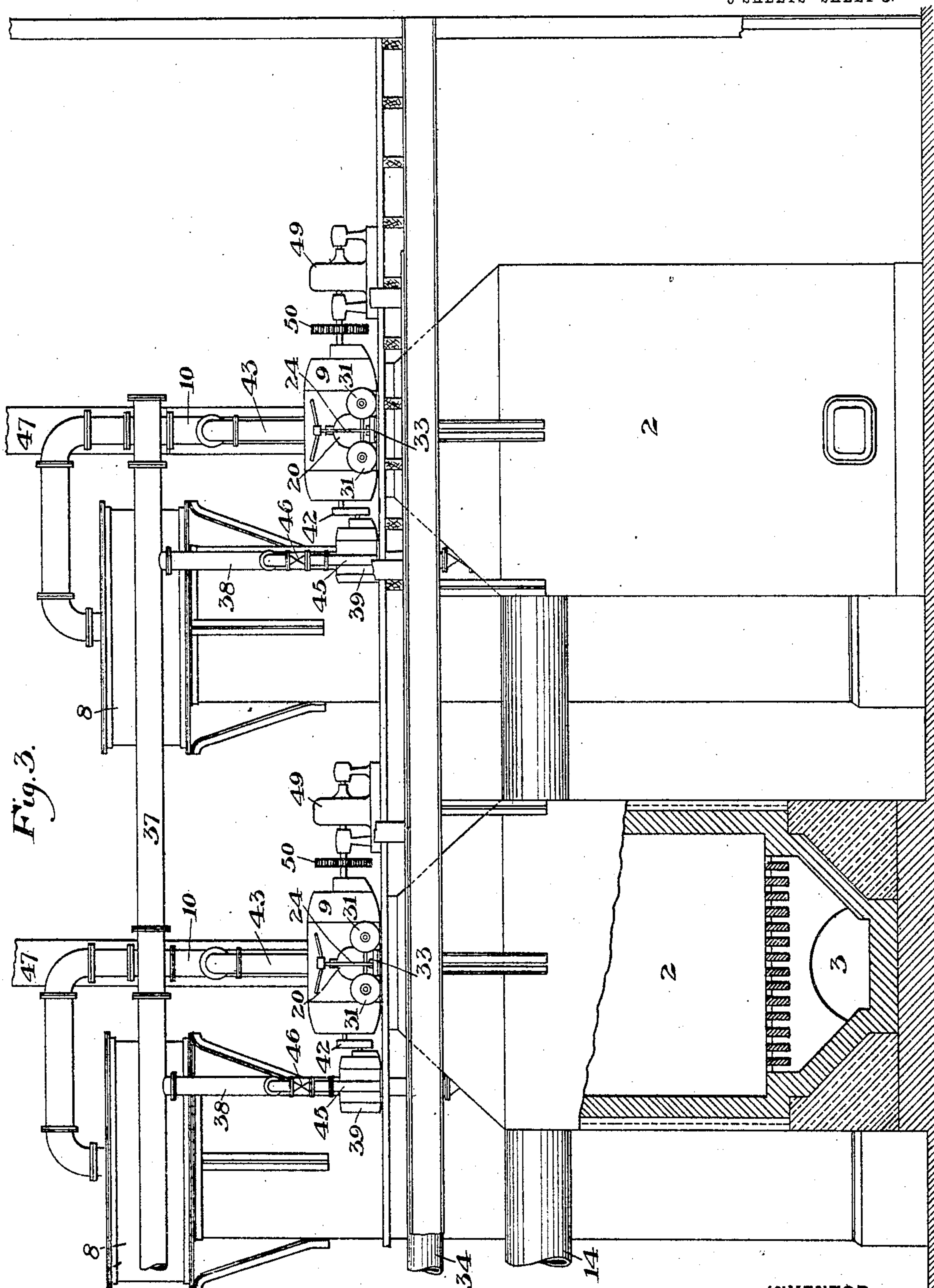


Fig. 3.

WITNESSES

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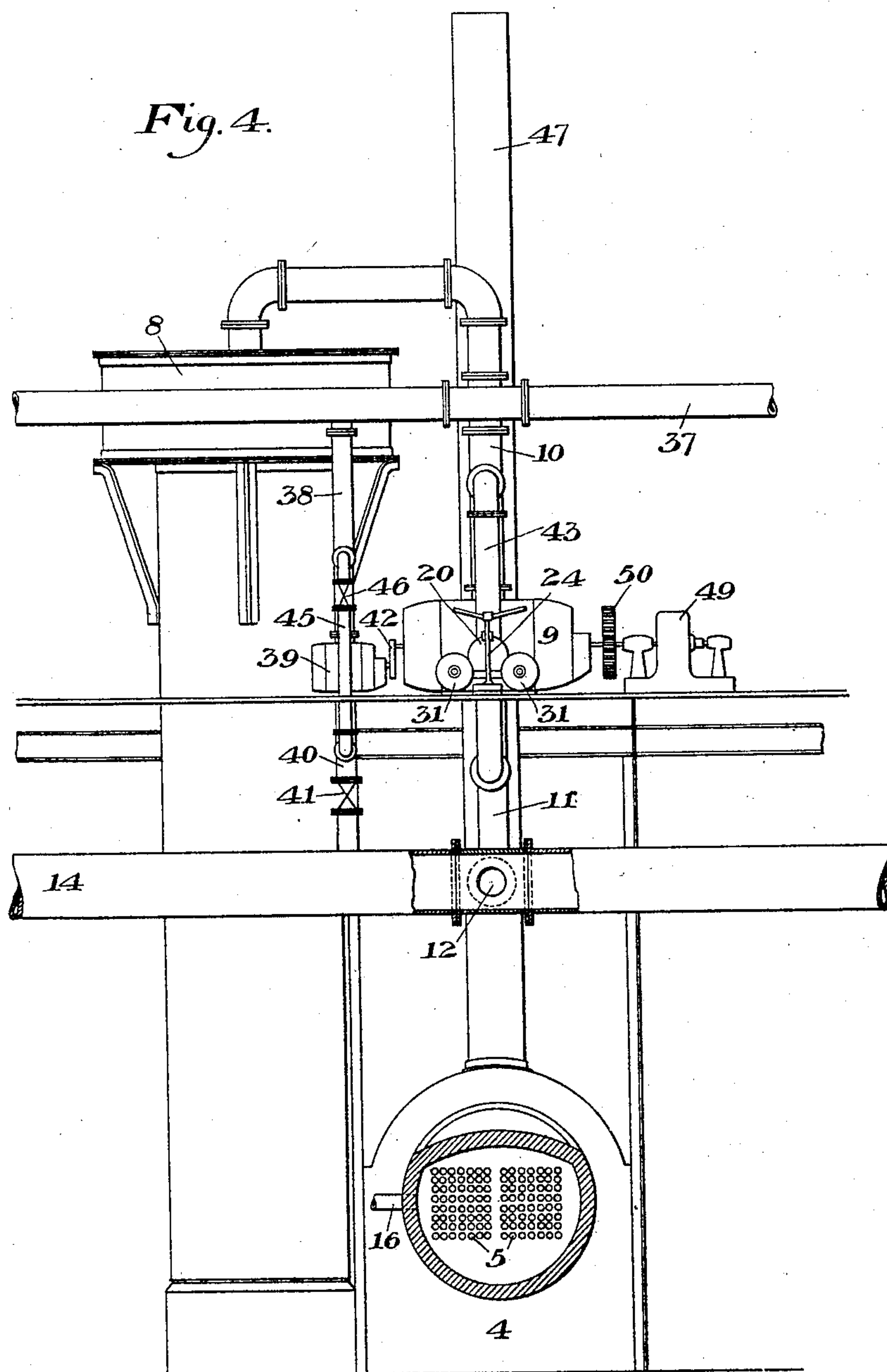
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6 SHEETS—SHEET 4.



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6 SHEETS—SHEET 6.

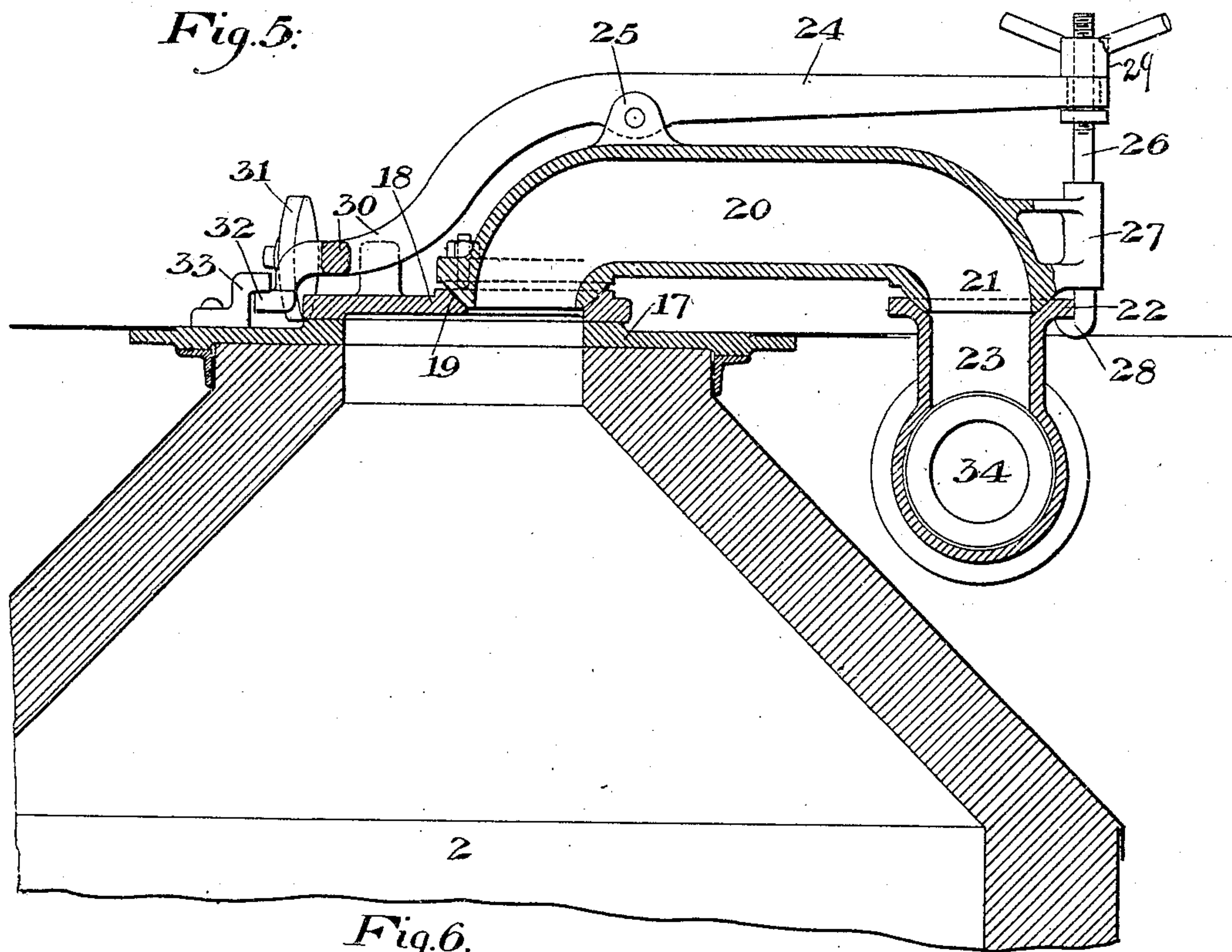
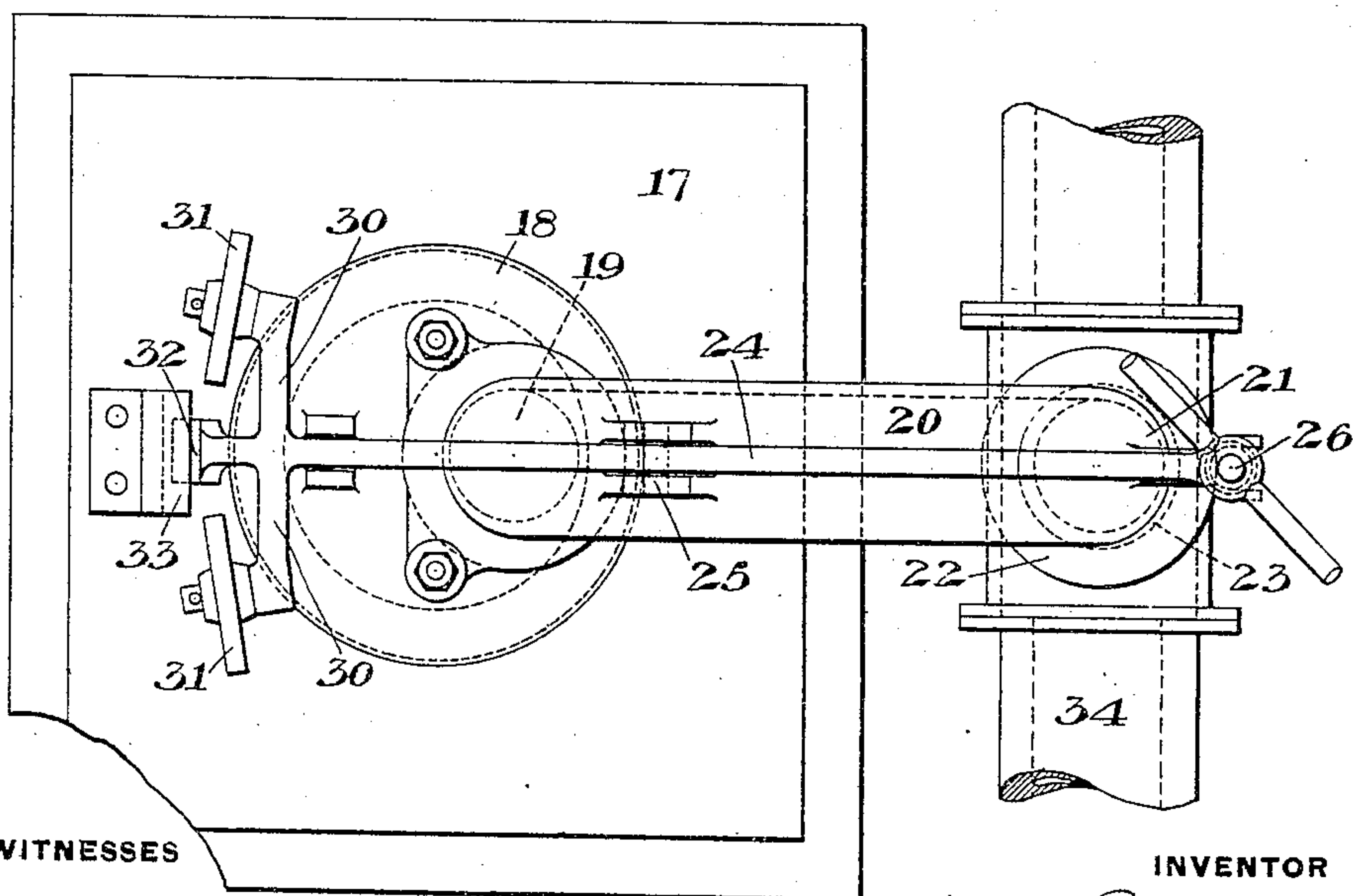


Fig. 6.



WITNESSES

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UNITED STATES PATENT OFFICE.

FRANCIS H. TREAT, OF PITTSBURG, PENNSYLVANIA.

GAS-GENERATING SYSTEM.

No. 835,293.

Specification of Letters Patent.

Patented Nov. 6, 1906.

Application filed December 14, 1904. Serial No. 236,823.

To all whom it may concern:

Be it known that I, FRANCIS H. TREAT, of Pittsburgh, Allegheny county, Pennsylvania, have invented a new and useful Gas-Generating System, 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 plan view, partly in section, of a gas-making system constructed in accordance with my invention. Fig. 2 is an end elevation of the same, partly broken away. Fig. 3 is a sectional front elevation. Fig. 4 is a rear elevation of one of the units, and Figs. 5 and 6 are respectively a sectional side elevation and top plan view of the swinging connection for the top of a producer.

My invention relates to that class of gas-producers wherein the generators are operated intermittently on the downdraft principle.

Heretofore where producer-gas is made by a downdraft and where water-gas is produced by forcing steam upwardly through one producer and then passing it down through another producer to fix the tarry matters carried therein such producers have been set in units, each unit containing two producers, a boiler, a scrubber, an exhaustor, a water-gas holder, and a producer-gas holder. In some cases the producer-gas holder of such a unit has been used as a mixed-gas holder, the water-gas and producer-gas being mixed by means of hand-regulated valves. In such systems during the periods when producer-gas is being made there is no provision for regulating each producer—that is, if one fire is more open than the other it will take an excessive share of the air passing through and the gas will not be of the proper quality. My invention overcomes this difficulty; and it consists in providing independent generators any one of which may be connected with any other during the water-gas periods, while in the producer period each generator works as an independent unit and can be regulated independently of the other generators. In the preferred form of my system where boilers are used I provide for each unit a single producer, a boiler, an exhaustor, and a scrubber. These units are so arranged that any one of

the producers may be connected to any other, so that during the water-gas period any two producers may be combined whose fires are of the proper character for coöperating during this period. I thus obtain independent control and regulation of each generator and at the same time may be enabled to combine two generators whose fires are more correctly related to each other than where the same two generators are always combined during this water-gas period.

My invention further consists in certain arrangements of the generators and the combinations hereinafter described and claimed.

In the drawings I show a series of generators 2, which may be of any desirable type, their lower ends being connected in the form shown through a port 3 to a steam-generator 4, through the tubes 5 of which the producer-gas passes to a box 6 and through pipe 7 to the bottom of the scrubber 8. The exhaustor 9, which is shown as being a blower of the Root type, is connected to a pipe 10, leading from the top of the scrubber, and sucks the gas through the boiler and scrubber and forces it through pipe 11 into pipe 12, containing a control-valve 13, by which the flow into the main 14 is controlled. I have shown the boiler as provided with a combustion-chamber 15, to which fuel may be applied in starting the plant or in furnishing an auxiliary source of heat.

The steam-inlet pipe 16, leading from the boiler 4 or from any source of steam under pressure, may lead into the channel between the lower end of the producer and the boiler, as shown, or into any suitable connection from which the steam will flow into the lower end of the producer below the grate.

The upper end of each producer is preferably of inverted-cone shape and is provided with a top casting or plate 17, having a large hole or opening at the center corresponding to the top opening of the producer-body. On the flat upper face of this plate 17 slides plate 18, having an eccentric hole 19, arranged to register with the hole and plate 17 in one position, the plate 18 having a concave seat around its hole, which is engaged by the curved end portion of a horizontally-swinging pipe 20, whose other end 21 revolves within the enlarged mouth 22 of the branch

pipe 23. The socket connection between the pipe 20 and the plate 18 is to allow self-adjustment of these parts during their motions.

5 The pipe is swung to open or closed position by the operator, and to clamp the pipe in adjusted position I provide the lever 24, which is pivotally connected to lugs 25 on the pipe and carries at one end a screw 26,
10 extending through a guide 27 on the pipe and having a lower end 28 arranged to clamp against the flange of the mouth 22. The hand-nut 29 engages the upper portion of the screw.

15 The other end of the lever 24 is forked or provided with side arms 30, having supporting-wheels 31 mounted thereon, these wheels traveling on the top plate of the producer. The end portion 32 of the lever is arranged to
20 slide under a bracket or lug 33 on the producer, and when in the position shown in Fig. 5 a turning of the hand-nut will force down the plate 18 and close the joint connecting to the producer.

25 The pipe 23 from each producer leads to a connecting-pipe 34, which leads along each producer and has closed ends. The function of this pipe 34 is simply to connect any two of the producers which may be desired.

30 When two of the producers are connected through their pipes 20 and the pipe 34, the steam flows up through one producer and is converted into water-gas and carrying with it part of the tarry or volatile matters flows up
35 into pipe 20 of this producer, then through the pipe 34, and down through pipe 20 into the top of the other producer, to which it is coupled. It passes down through this producer under the driving force of the steam,
40 and being fixed the gas flows out through the boiler and thence through the scrubber.

From the pipe 10, leading from the top of each scrubber, a branch 35, having a valve 36, leads to a pipe 37, which connects to the
45 water-gas holder 37^a. (Indicated in Fig. 1.)

From this pipe 37 each producer has a pipe 38 leading down to a small Root exhaustor 39, from which the pipe 40, containing valve 41, conducts the water-gas into the main 14.

50 The exhaustors 39 and 9 are preferably driven at fixed relative speeds—for example, by pulleys on their shafts connected by the belt 42, as shown. The exhaustor 39 is preferably smaller than the exhaustor 9, so that by

55 regulating the size and speed of these two exhaustors the proportion of water-gas which is fed into the main may be predetermined. The water-gas passing into the main is drawn from one of the producers which at such time
60 is making water-gas. This water-gas is delivered into the holder as it is made and will be gradually drawn from the holder for mixing with the producer-gas.

In order to allow each exhaustor to work continuously independent of the connections 65 at any particular time, I preferably provide a by-pass around each exhaustor, so that it may be pumped in a closed circuit. Thus I show the by-pass 43, having valve 44, leading around the exhaustor 9 and the corresponding
70 by-pass 45, containing valve 46, leading around the exhaustor 39. When the valves in these by-pass pipes are opened, the exhaustors will simply pump the gas around and back through the exhaustors again. 75

In order to provide for passing the producer-gas directly to the open air, I provide the stack 47, which is connected by valve-pipe 48 with the pipe 12, leading to the main.

In order to drive the exhaustors, I have 80 shown electric motors 49, having slow-motion connection 50 with the exhaustor 9, the small exhaustor being driven from the large one.

In this plant or system it will be noted 85 that each unit consists of a producer, a boiler, a scrubber, and an exhaustor and that the generators are so arranged that any one may be connected with any other during the period of making water-gas in two generators 90 so coupled together.

In operating the system continuously with a plant of four generators, as shown, one of the generators would ordinarily be cut off for cleaning purposes. This is done by closing 95 the valves 13 and 41. One of the other generators would be working on the producer period, while the two remaining would be connected and producing water-gas. Any two generators opened to the connecting-
100 pipe are coupled to each other and will produce water-gas, which is partially generated in one, passes up therefrom, and then down through the other, which is coupled thereto. At the same time the third generator is cut
105 off from these two and may be making producer-gas. In such case the one generator which is operating on the producer period would have its top open, the pipe connection being swung to one side and its mouth closed
110 by resting on the flat blank surface of the top producer-plate. The air entering this producer would be sucked down through the bed of fire, and the producer-gas thus formed would flow through the boiler and the scrub-
115 ber and be forced into the main. At the same time steam will be forced in through one of the pair of coupled generators and being forced up through one generator will form water-gas. The closed tops of these two
120 producers are connected at this time to the common connecting-pipe, so that the water-gas will flow from the top of the one through the connecting-pipe into the top of the other and thence down through it to fix the volatile
125 matters carried by the water-gas. The wa-

ter-gas passing from the bottom of the second coupled generator will flow through the boiler and the scrubber and pass to the water-gas holder, with the exception of the measured quantity, which is drawn down through the small exhaustor and forced into the main. Thus the main is receiving producer-gas, and at the same time a predetermined proportion of water-gas, which proportion may be varied as desired. As the gas passes through the boiler or other heater the greater proportion of its heat is absorbed by the water or air surrounding the pipes through which the gas passes, and the temperature of the gas is so reduced that it can be controlled by a common form of valve, the heater thus serving as a cooler for the gas. The scrubber also serves to further cool the gas.

The advantages of my invention will be apparent to those skilled in the art. Inasmuch as each generator works independently of all others at the time when it is operating on the producer period it may be easily and effectively regulated to give the character of gas desired. At the same time two other generators may be coupled together to produce water-gas, and owing to the number of independent units which may be coupled together I am enabled to select two of the generators which are in proper condition to couple for water-gas making. The proportion of water-gas which is mixed with the producer-gas can be predetermined and will remain in this fixed proportion until it is desired to vary such proportion. The system enables a producer of large diameter to be used for making producer-gas for a given-sized unit, and this is of especial advantage where wood is employed in the generator or any material which is bulky as compared to its gas-producing capacity. The connections are easily made and changed. By making each generator a separate unit I am enabled to do away with a number of controlling-valves, which are subject to rapid deterioration under the action of the hot gases.

The number of generators employed in my system may be of course varied widely, as may also the character of the generator and its connections. The boilers may or may not be used, and the make-up of each unit may be changed. During the water-gas period one generator may be used by itself, the water-gas being taken directly from this one producer instead of passing it through a second one with less perfect results than where two are coupled together, as in my preferred form. The combustible may be wood, coal, coke, or any other desirable material, and many other changes may be made without departing from my invention.

I claim—

1. A gas-producer system having gener-

ators arranged to alternately produce water-gas and producer-gas by the intermittent system, means for supplying steam, a connecting gas-conduit extending adjacent to said producers, a gas-pipe leading from each producer to said common pipe, whereby water-gas may be passed from any one of the producers to any other of said producers in the system, and means for cutting off each of said gas-connecting pipes separately; substantially as described.

2. A gas-producer system having generators arranged to alternately produce water-gas and producer-gas by the intermittent system, a gas-conduit common to all of said producers in the series, separate gas-pipes connecting the common pipe to each generator, and means for simultaneously admitting air to any generator and closing its connecting-pipe; substantially as described.

3. In a gas-producer system, a series of independent units, each unit containing a generator and an exhaustor, and means for connecting any one of said generators to any other unit; substantially as described.

4. A gas-producer system having generators arranged to alternately produce water-gas and producer-gas by the intermittent system, a conduit common to all of the generators in the series, and a swinging pipe connection between each generator and said common pipe arranged to open the generator to the air when said connection is swung to cut the generator off from the common pipe; substantially as described.

5. In a gas-generator system, a series of independent units, each having a generator, a scrubber and an exhaustor, and means for connecting any one of said units to any other of said units in the battery; substantially as described.

6. A gas-producer system having generators arranged to alternately produce water-gas and producer-gas by the intermittent system, a main arranged to receive producer-gas, and means for forcing into said main a proportionate quantity of water-gas; substantially as described.

7. A gas-producer system having generators arranged to alternately produce water-gas and producer-gas by the intermittent system, a main arranged to receive producer-gas from the system, a water-gas holder arranged to receive water-gas from the generators, and means for diverting a proportionate quantity of water-gas and positively forcing it into the main receiving producer-gas; substantially as described.

8. In a gas-producer system, a series of independent units, each unit containing a generator and a scrubber, and means for connecting any one of said generators to any other unit; substantially as described.

9. In a gas-producer system, a series of independent units, each unit containing a generator and a cooler, and means for connecting any one of said generators to any other unit;
5 substantially as described.

10. In a gas-producer system, a series of independent units, each unit containing a generator and means for producing a draft, and means for connecting any one of said

generators to any other unit; substantially as described.

In testimony whereof I have hereunto set my hand.

FRANCIS H. TREAT.

Witnesses:

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SEWARD BABBITT.