

(No Model.)

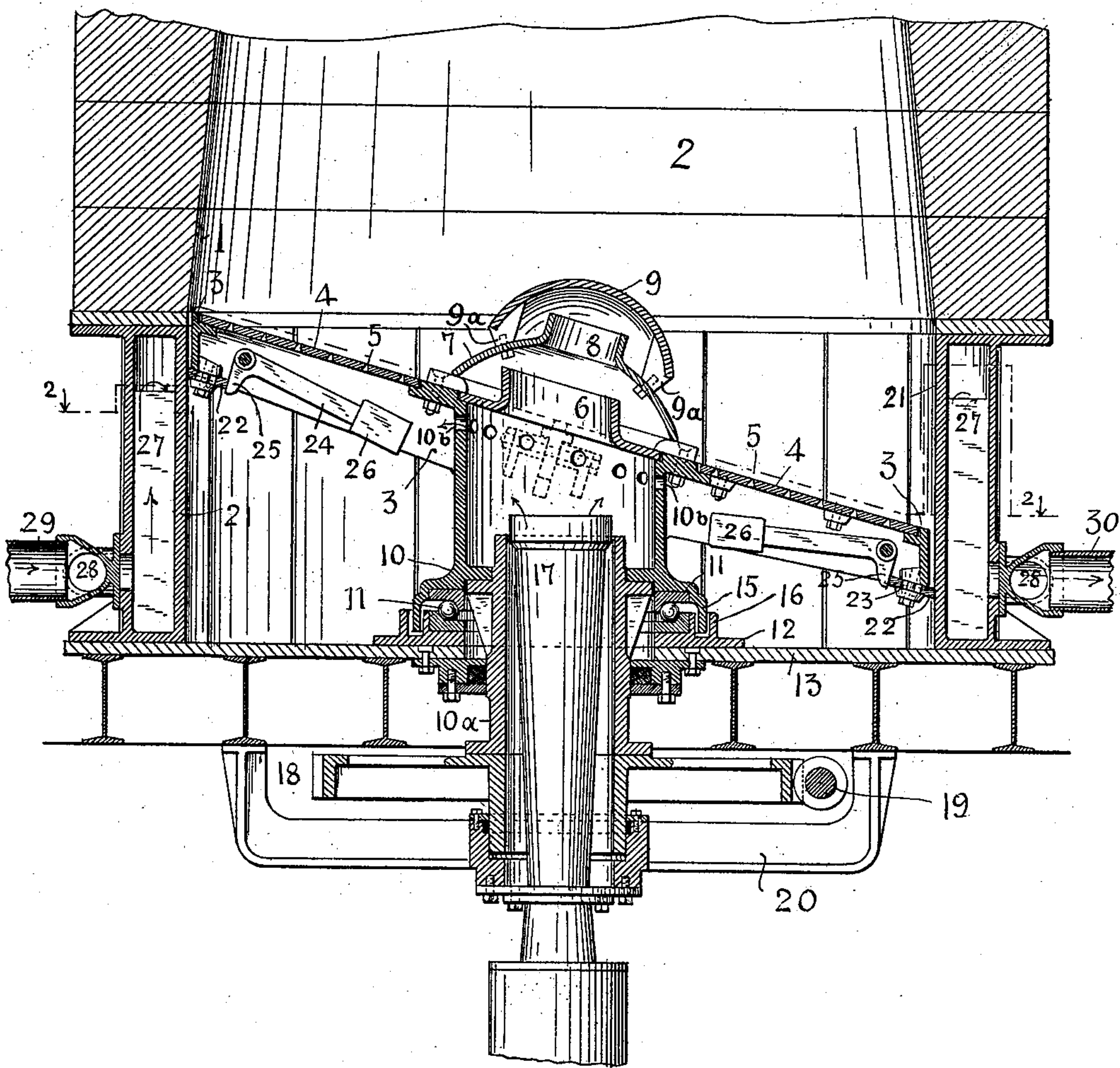
3 Sheets—Sheet 1.

A. KITSON.
GAS PRODUCER.

No. 594,539.

Patented Nov. 30, 1897.

Fig. 1.



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(No Model.)

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Fig. 2.

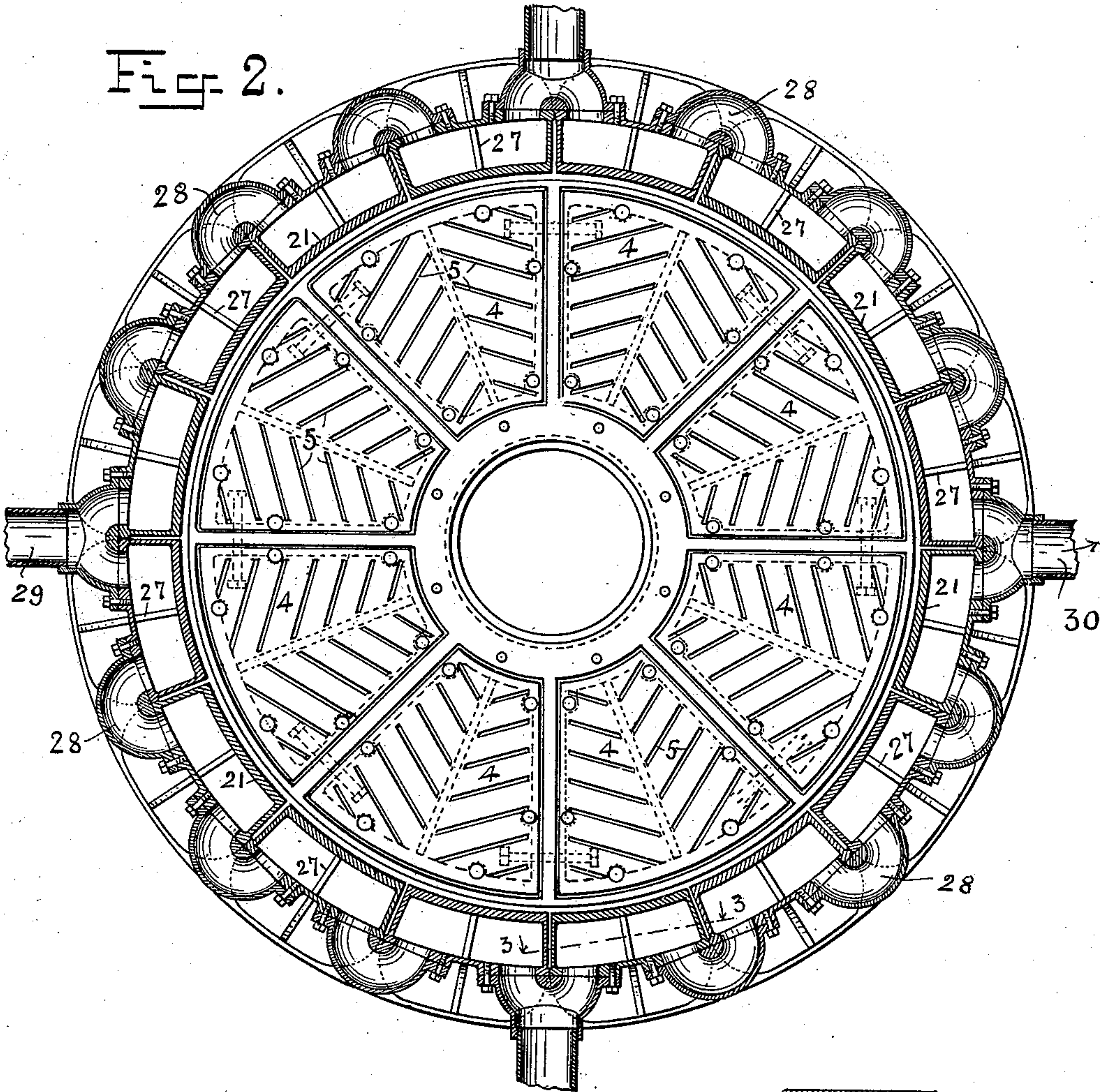
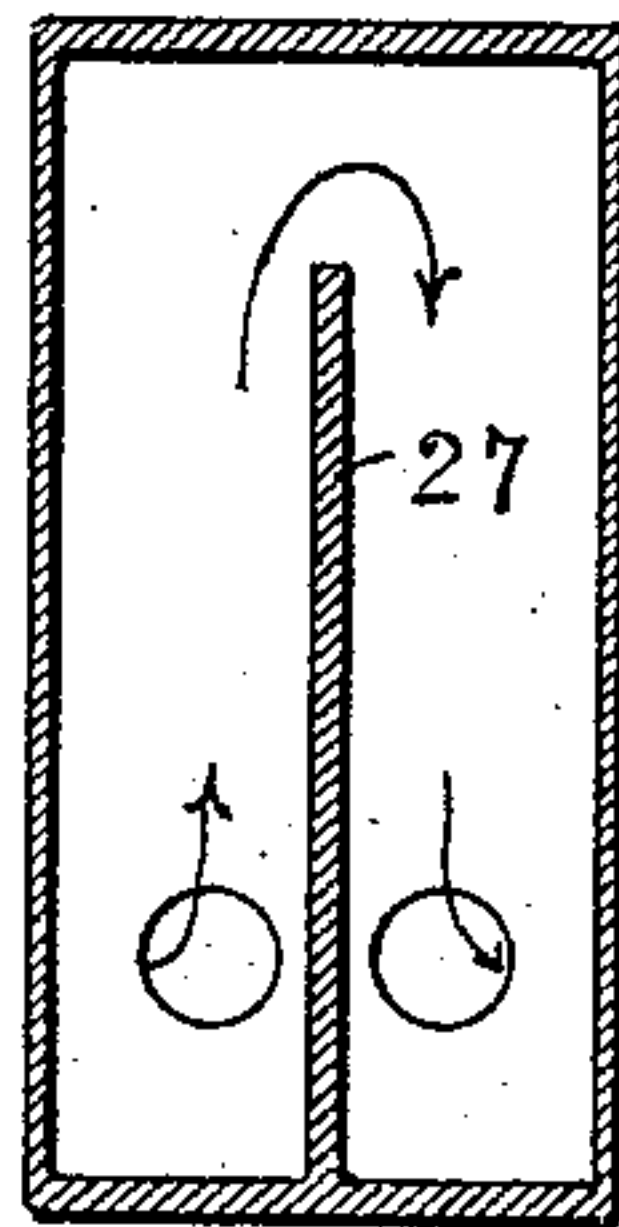


Fig. 3.



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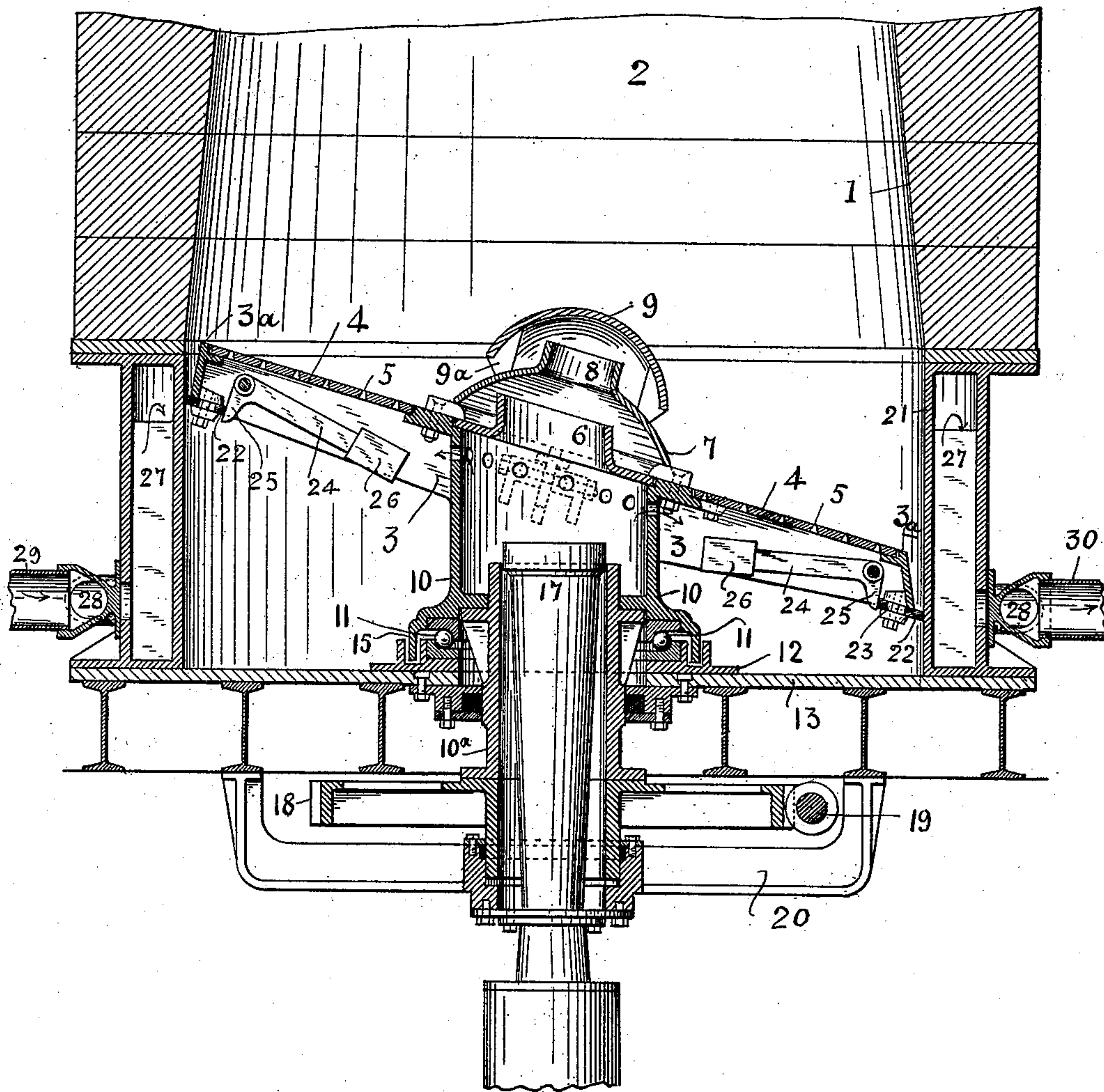
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Fig. 4.



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UNITED STATES PATENT OFFICE.

ARTHUR KITSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
APPLETON L. CLARK.

GAS-PRODUCER.

SPECIFICATION forming part of Letters Patent No. 594,539, dated November 30, 1897.

Application filed May 10, 1897. Serial No. 635,948. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR KITSON, a subject of the Queen of Great Britain, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Gas-Producers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to fuel-gas producers; and it consists of an improved form of rotating hearth for such fuel-gas producer.

More specifically my invention is designed as an improvement on the general type of fuel-gas producers illustrated in the United States Letters Patent granted October 17, 1893, to myself and Thomas Walker, and numbered 507,073.

In the type of the hearth here illustrated the blast is introduced at the center and various other points of distribution, and one of the principal points of novelty in the invention illustrated and described in this application consists in a special arrangement for producing a tight but yielding fit of the rotating hearth to the walls of the combustion-chamber, so that any tendency of the ash to "spill" or grind down between the moving surfaces of hearth and surrounding wall shall be prevented so far as possible and the ash got rid of by forcing the same through openings in the body of the hearth.

In a pending application I have illustrated and claimed an apparatus in which the ashes are all spilled or ground between the surfaces of the hearth and wall, but I find that in certain sizes of furnace or gas-producer it is difficult to regulate the rate of discharge of ashes to the required degree, but that said ashes are discharged so rapidly that the proper economical working of the producer is interfered with.

Experience has shown me that with the large producers of large diameter, where the ash spill is confined to the periphery of the hearth and ground through, as described in the aforesaid pending application, not only do the ashes spill too rapidly, but the fuel up along the lines of the walls of the furnace

rapidly follows the ash in its descent and is frequently spilled into the ash-pit while it is incandescent. The ash over the center of the hearth and in the middle of the fuel-bed is piled up cone-shaped and is not properly ejected into the ash-pit. The present construction is designed to obviate this difficulty.

My present application is intended to illustrate an apparatus which will avoid the above-described difficulty, and the preferred form of that apparatus is illustrated in the accompanying three sheets of drawings, in which—

Figure 1 is a vertical axial section of a lower portion of a fuel-gas producer with the top broken away. Fig. 2 is a section on line 22 of Fig. 1. Fig. 3 is a detail of the air-passages in the shell surrounding the ash-pit, and Fig. 4 is a modification.

Throughout the drawings like reference-figures refer to like parts.

1 represents the lower portion of the cylindrical walls of the combustion-chamber 2 of a fuel-gas producer or other furnace.

3 represents the main frame of the hearth, which is inclined to the horizontal plane, but rotates on a vertical axis, as set out in the patent to Kitson and Walker, above referred to. On the main frame of said hearth are ranged the sectional plates 4 4, &c., the drawings showing eight of said plates. These plates are bolted or otherwise fastened to the frame or spider 3 and are removable in case of breakage. These plates have any number of suitably-arranged openings 5 5, &c., which are preferably made in the form shown, narrower at the top than at the bottom. Through these openings the ashes pass downward and a certain amount of blast passes upward. At the center of the hearth is an opening 6, through which the main portion of the blast passes, and over that is arranged the head 7, which has an opening 8, and over this latter opening is placed the cap 9. Variations may be made in the form of these parts of my invention, but they should be so arranged as to permit escape of the air-blast and prevent the passing down of any quantity of ash through the opening 6. The hearth may be mounted in any suitable way to enable it to revolve, but I prefer to construct it, as shown, with

the central supporting-pillar 10 resting on the ball-bearings 11, which run on the stationary bearing 12 on the foundation 13 of the furnace and have the overhanging flanges 15 and 16 to prevent dirt getting into said bearings. Depending from the center of the supporting-pillar 10 is the portion 10^a of smaller diameter, which has a bearing in the frame 20 at its lower end. Supported on this frame 20 and projecting up into the cylindrical part 10^a is the blast-pipe 17. On this cylinder 10^a is mounted the worm-wheel 18, which is driven by the worm 19, which also has bearings in the frame 20.

The sides of the rotating spider 3 have a slight clearance from the walls 21 of the ash-pit and also of a portion of the combustion-chamber to permit of the expansion and contraction of the parts under varying temperatures without their binding one against the other. To prevent the ash from spilling down through the space left by this clearance, a series of arc-shaped plates 22 22 are mounted on the under side of the spider by means of bolts passing through the slotted openings 23 in said plates. Bell-crank levers 24 are pivoted to the spider, each having its toe 25 pressing against the rear of one of these plates 22 by reason of the downward pull of the weight 26 on the other arm of the bell-crank lever.

In operation the walls 21 of the ash-pit and the lower portion of the combustion-chamber become quite hot, and to utilize this heat I would form said walls of hollow castings having partitions 27 formed therein and the pipes 28 28 connecting adjacent sections.

29 represents the inlet to one portion of the series of passage-ways formed in this wall surrounding the ash-pit, and 30 represents the outlet. If the air-blast is drawn or forced through this series of passage-ways thus formed, it will evidently be heated thereby and the heat so taken up be returned to the furnace. A further important function of these passage-ways consists in serving, by means of the constant flow of cold air through them, to preserve the depending walls at a more nearly constant temperature under the great variations of heat to which they are subjected by being alternately exposed to the full heat of the charge when the lower side of the hearth is toward them and relieved entirely from said heat when the upper side of the hearth is toward them. Unless something is done to preserve said depending walls at approximately the same temperature the expansion and contraction under the varying conditions above outlined become destructive to the furnace and to its successful action.

In the modification shown in Fig. 4 the hearth is shown having its surface 3^a adjacent to the walls of the ash-pit chamber inclined away therefrom instead of being parallel thereto, as in Fig. 1.

The method of operation of my invention is as follows: A rotating motion being given

to the hearth by means of the worm 19, the fuel in the combustion-chamber 2 will be kept in a constant state of agitation. A bed of ashes about ten inches deep rests upon the surface of the hearth and protects it from the burning fuel. As the hearth rotates the ash is gradually forced out through the openings 5 5 in the plates 4 4 at the same rate that it is produced by the burning out of the fuel above. As the hearth rotates the weighted levers 24 hold the plates 22 in yielding contact with the walls 21 of the combustion-chamber and ash-pit and prevent any of the ash spilling down between the hearth and the walls. The blast enters through the pipe 17 and the greater portion of it passes up through the openings 6, 8, and 9^a, and a small portion passes out through the openings 10^b, under the plates 4, and up through the openings 5. The ash-pit of course is entirely inclosed, as shown. The air for the blast is drawn in through one of the connections, as 29, passed through the passage-ways in the hollow wall surrounding the ash-pit formed by the partitions 27 and pipes 28, and is heated in consequence.

Various changes in the details of construction of the hollow surrounding walls of the ash-pit and of the rotating hearth and connections could be made without departing from the spirit of my invention, so long as the openings 5 5 are left for the passage of the ashes and the yielding plates 22 22 are retained in contact with the walls of the ash-pit.

Another feature of my invention consists in the auxiliary agitating action of the cap 9, which projects a considerable distance above the surface of the hearth at its central point and which is formed symmetrically to an axis perpendicular to the plane of said hearth instead of coincident with the axis of rotation. It is evident that as the hearth rotates this cap will point in different directions and will produce a rotary as well as an up-and-down disturbance in the central portion of the charge of fuel. To this result the inwardly-inclined walls of the combustion-chamber 2 also contribute by allowing the fuel to break away from the wall as it sinks lower and lower in the combustion-chamber and so preventing "bridging" or "scaffolding" in the furnace. This, with the agitating action of the rotating inclined hearth, the cap 9, and the ash-spilling action of the grate increasing toward the circumference by reason of the fact that the rate of travel increases as the radius increases, combines to produce an equable agitation of all parts of the charge, preventing clinkering and choking of the furnace.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. The combination of the cylindrical depending walls of the combustion-chamber, the rotating hearth within the same, the adjustable plates attached to said hearth, and con-

forming to the curvature of said walls and means for forcing said plates against said walls with yielding pressure, substantially as described.

5 2. The combination of the cylindrical depending walls of the combustion-chamber, the rotating hearth within the same, the adjustable plates attached to said hearth by bolt-and-slot connection, conforming to the curvature of the walls, and weighted levers, which
10 press said plates outwardly, substantially as described.

15 3. The combination of the closed ash-pit walls and bottom, the rotating hearth having openings therethrough and the adjustable plates at the circumference of the hearth, with means for holding said plates against the ash-pit walls with yielding pressure, substantially as described.

20 4. In a furnace the hearth inclined to the horizontal plane but rotating on a vertical axis, the depending inclosing walls which surround said hearth, and air-conduits extending along said walls for heating the air forced
25 through said conduits, substantially as described.

30 5. In a furnace the combination of the hearth inclined to the horizontal plane but rotating on a vertical axis, the central main blast-opening through said hearth, and the raised cap for said blast-opening, which is formed symmetrically to an axis perpendicu-

lar to the plane of the hearth, substantially as described.

6. In a furnace the combination of the inclined walls of the combustion-chamber, the
35 perforated hearth, inclined to the horizontal plane but rotating on a vertical axis, the depending perpendicular walls which surround said hearth, and adjustable means for making
40 a tight joint between the hearth and the walls, substantially as described.

7. In a furnace the combination of the rotating perforated hearth, the surrounding depending walls, the adjustable plates on the
45 under side of the hearth at the circumference thereof, which conform to the curvature of the walls and means for pressing said plates against said walls with yielding pressure, substantially as described. 50

8. In a furnace the combination of the hearth inclined to the horizontal plane but rotating on a vertical axis, the central main blast-opening through said hearth, and the raised cap over said blast-opening, which cap
55 is formed eccentrically to the vertical axis of the hearth, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR KITSON.

Witnesses:

GEO. OAT SUDDARDS,
ARCHIBALD R. DEWEY.