

No. 645,585.

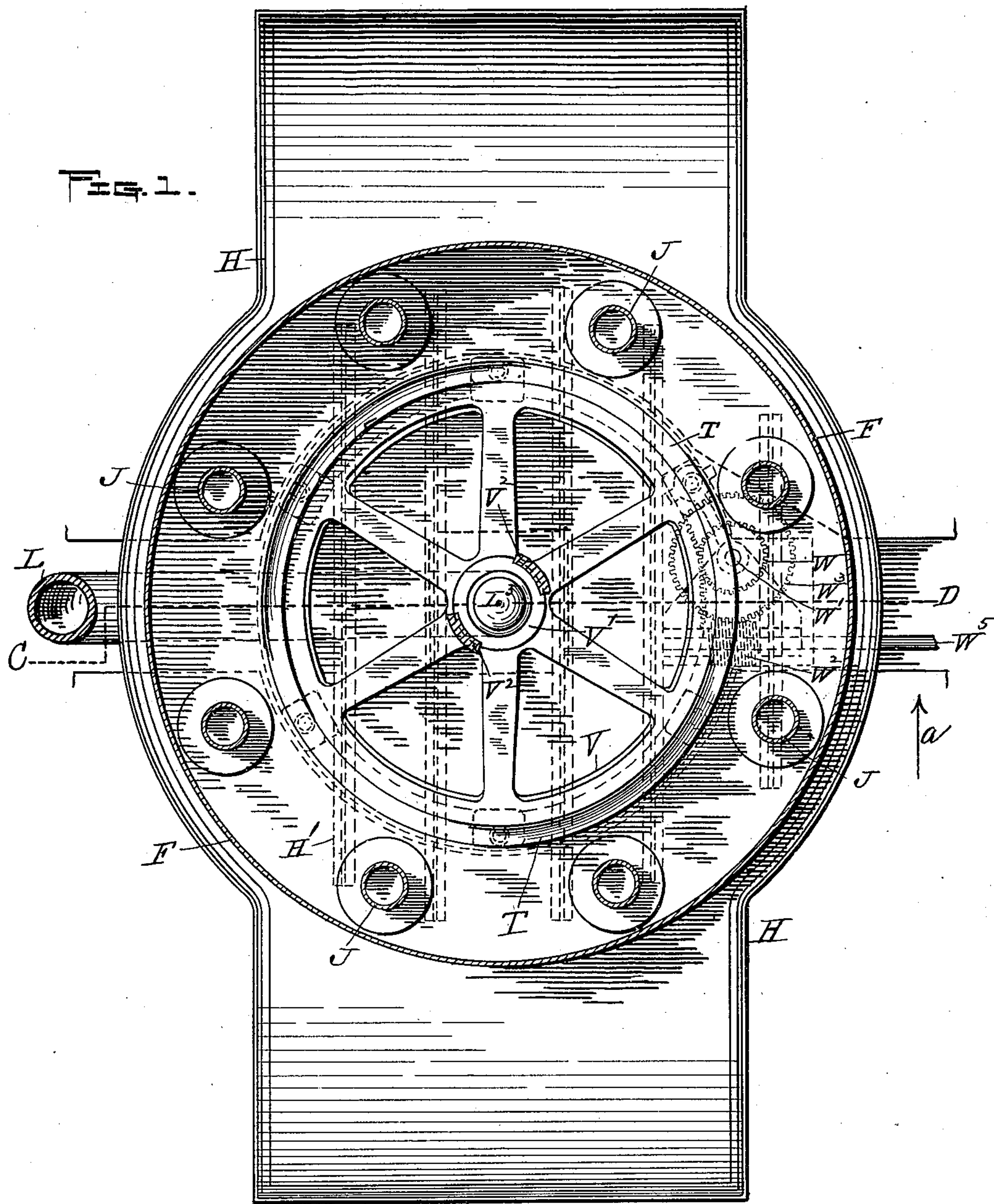
Patented Mar. 20, 1900.

C. W. BILDT.  
AUTOMATIC GAS PRODUCER.

(Application filed July 31, 1899.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses;  
W. B. Nourse.  
A. A. Gilbert.

Inventor;  
Carl Wilhelm Bildt  
By A. A. Barker. Atty.



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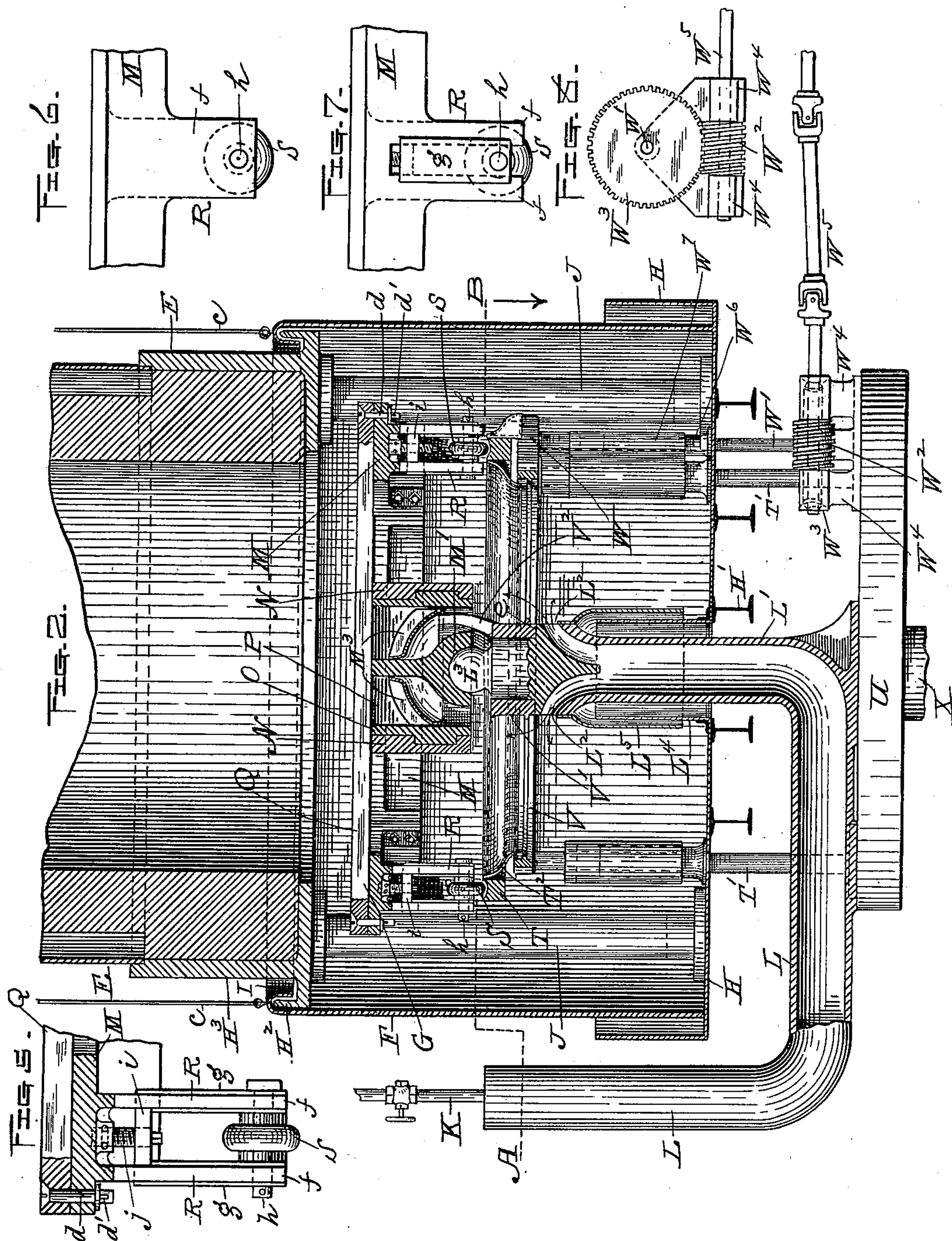
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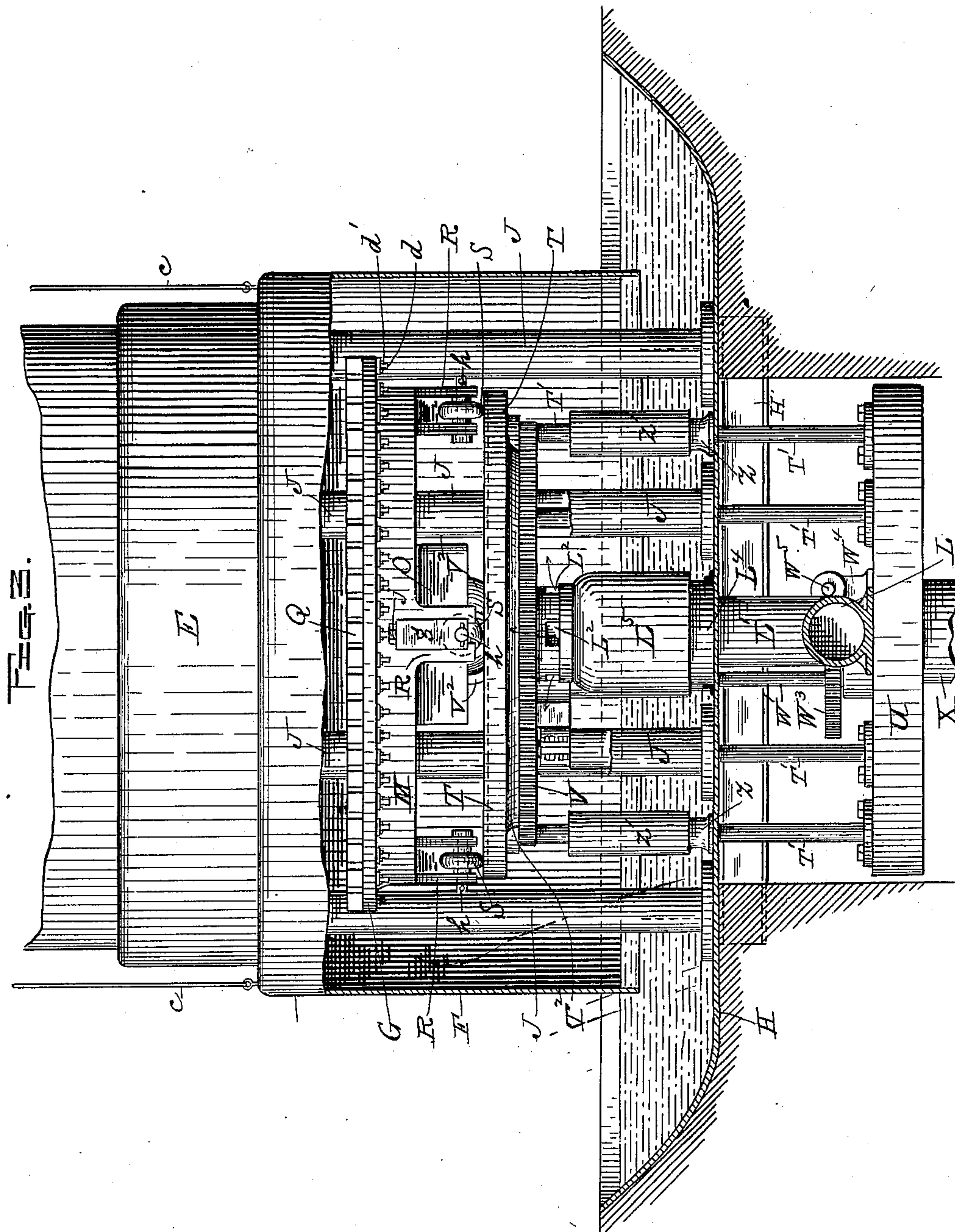
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4 Sheets—Sheet 4.

FIG. 4.

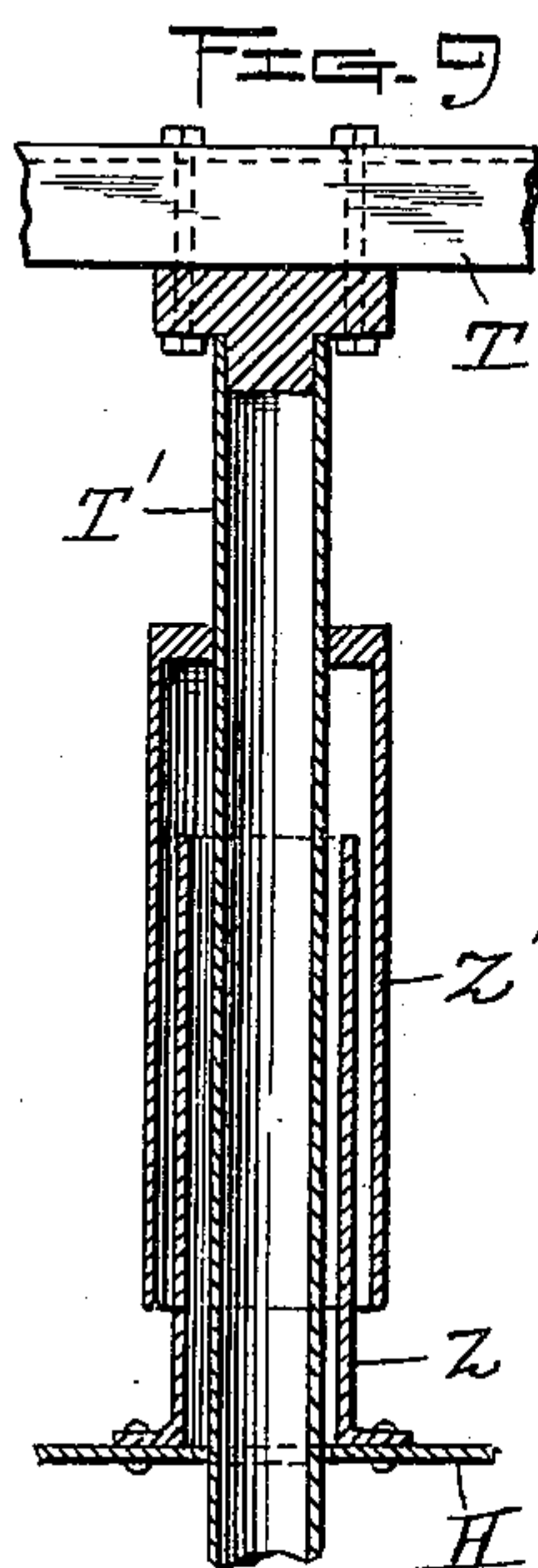
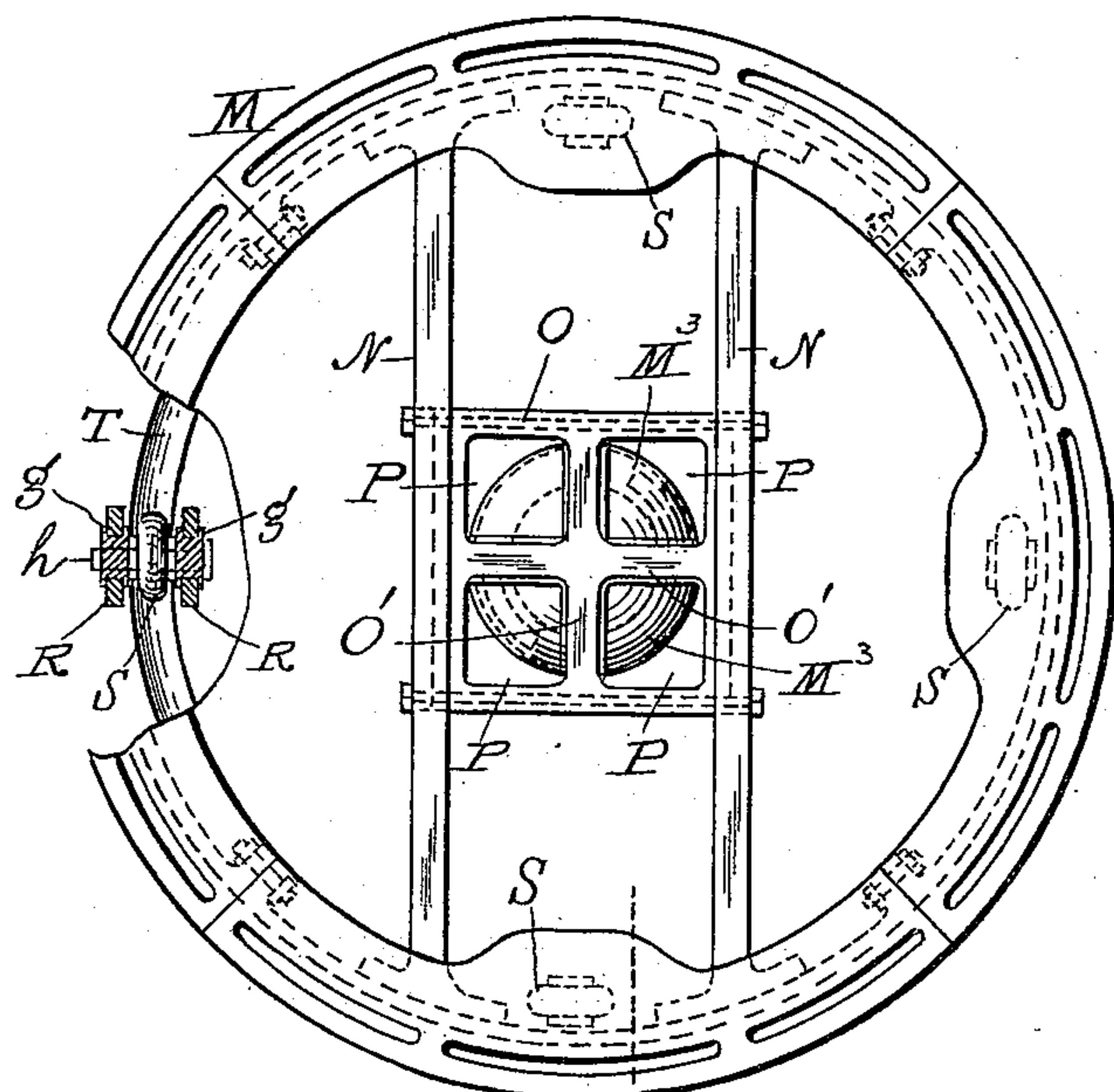
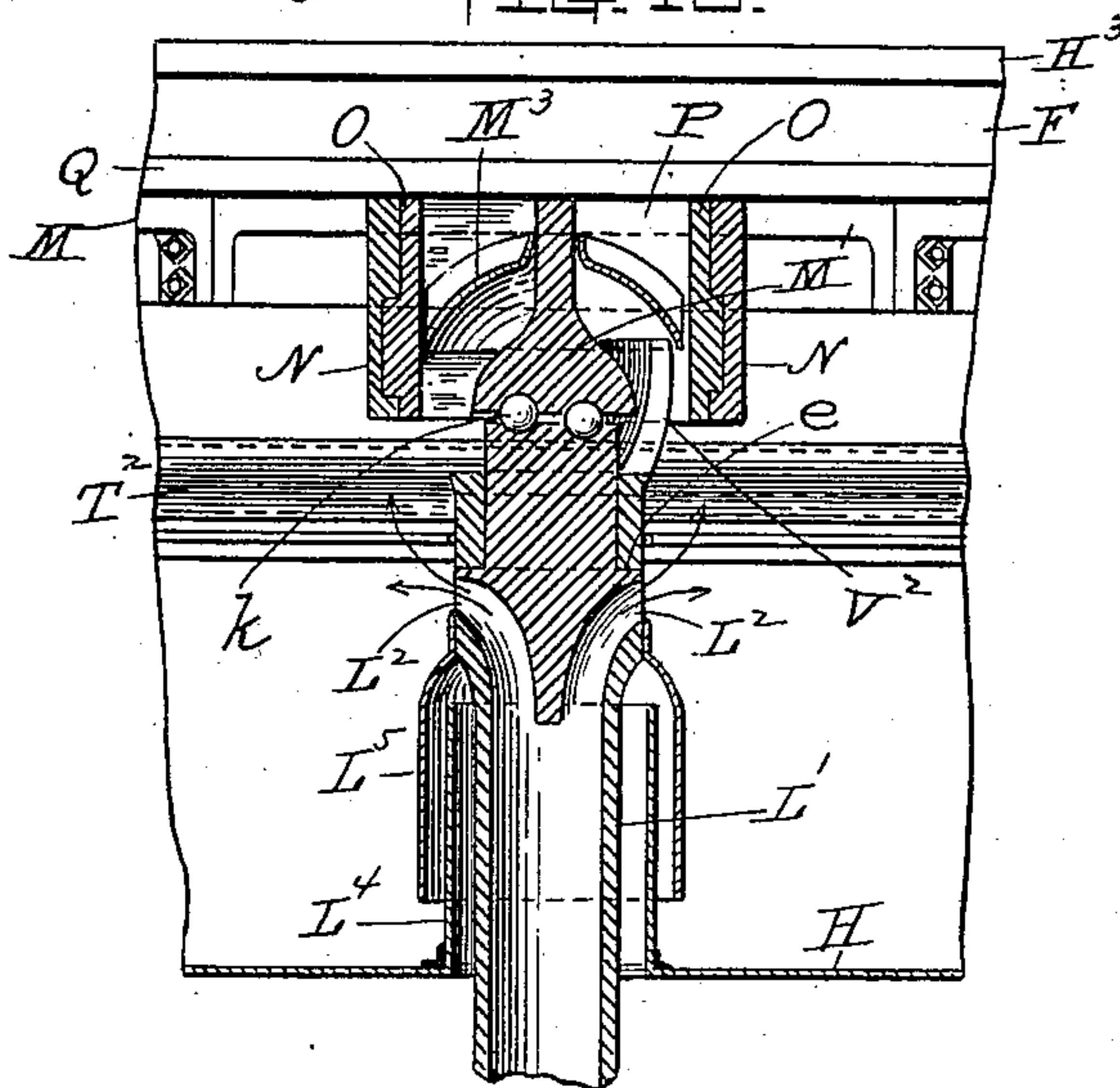


FIG. 10.



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# UNITED STATES PATENT OFFICE.

CARL WILHELM BILDT, OF WORCESTER, MASSACHUSETTS.

## AUTOMATIC GAS-PRODUCER.

SPECIFICATION forming part of Letters Patent No. 645,585, dated March 20, 1900:

Application filed July 31, 1899. Serial No. 725,583. (No model.)

*To all whom it may concern:*

Be it known that I, CARL WILHELM BILDT, of the city and county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Automatic Gas-  
5 Producers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this  
10 specification, and in which—

Figure 1 represents a horizontal section through the lower part of a gas-producer, taken at the point indicated by line A B in Fig. 2, showing a plan of the supporting central axis and track upon which the rotary grate of the producer rests and turns, as will be hereinafter described. Fig. 2 is a central vertical section through the lower part of the producer, its movable grate, and means for  
15 supporting and operating said grate, said section being taken at the point indicated by line C D in Fig. 1 looking in the direction of arrow *a*. Fig. 3 is an elevation of the lower part of the producer with the lower portion thereof broken away and showing an elevation of the movable grate and its supporting and operating mechanism. Fig. 4 is a plan of the  
20 movable grate-frame with the grate-bars left off and one side of said frame broken away to show one of the wheels, the bearings thereof, and part of the circular track upon which said wheels travel. Fig. 5 is a vertical section taken on line *b*, Fig. 4, through one side of the movable grate and one of the bars, also a side or edge view of one of the wheels  
25 and its bearings above referred to. Figs. 6 and 7 are side views of the aforesaid wheels and bearings, Fig. 6 showing the wheel in a fixed bearing and Fig. 7 in an adjustable bearing, as and for the purpose hereinafter described. Fig. 8 shows a plan of a worm wheel and gear constituting part of the mechanism for rotating the grate. Fig. 9 is a vertical section showing one of the upright supporting-posts of the circular track and the  
30 tubing or jackets and hoods surrounding the same to form a water seal, as and for the purpose hereinafter described; and Fig. 10 is a vertical section through part of the grate-frame and its central support, showing a

modification in the construction of said central support.

The object of my invention is to provide a grate for gas-producers which may have horizontal, rotary, vertical, and tilting movements  
35 imparted thereto; and it consists in combining with said grate and the adjacent stationary parts of the producer mechanism whereby said different movements may be independently imparted to the grate, as and for  
40 the purpose hereinafter more fully set forth. Said invention has been designed principally for use in connection with my improved automatic feed device for gas-producers, for which United States Patents Nos. 442,676 and  
45 498,229 were granted to me December 16, 1890, and May 30, 1893, also upon which several foreign patents have been granted, the same being particularly adapted thereto in producing a very complete apparatus. The  
50 mechanism for imparting to the grate said three different movements is constructed and arranged so that any one, two, or all three of said movements may be produced at will independent of each other—as, for example, if a  
55 horizontal rotary motion only is required for the grate then only that part of the mechanism which turns said grate is set in motion and the tilting and lifting parts of the mechanism are not operated, whereas if it is  
60 required to both turn and tilt or rock the grate then the means for tilting said grate is adjusted and the mechanism for rotating the same is set in motion, the lifting part of the mechanism only remaining at rest, or if  
65 all three of the different movements stated are required to be imparted to the grate then all the different parts of the mechanism would be adjusted and set in motion. Each of said  
70 different groups of mechanism is designed, as aforesaid, to be adjusted and operated independently, the means for tilting the grate being adjusted by hand and the means for rotating and for elevating and lowering said grate  
75 being constructed and arranged to operate automatically and to be conveniently shipped and unshipped into and out of action, as circumstances may require in the operation of the producer.

To enable others skilled in the art to which 100



my invention appertains to better understand the nature and purpose thereof, I will now proceed to describe it more in detail, with reference to the accompanying drawings, in which—

5 E represents the lower part of an ordinary gas-producer, having a vertically-adjustable bottom casing F for inclosing the grate G and its supporting and operating mechanism previously alluded to. Said casing F is adapted to be elevated and lowered in practice by mechanism (not shown) connected with cords c, whose lower ends are attached to the upper edge of the casing. The bottom of said casing rests in a water-tank H, which is supported on suitable stationary beams H', in turn resting on proper supports. By thus placing the lower end of the casing F in water-tank H it is obvious that a tight water seal is produced at the bottom of the producer around the grate and its operating parts, and to effect a similar seal at the top of the casing, where it connects with the bottom of the producer proper, E, the upper edge of said casing is turned inward over an annular upturned flange H<sup>2</sup> on the bottom supporting-plate H<sup>3</sup> and down into the annular trough I, which is in practice kept filled with water, sand, or other sealing medium.

30 The producer E is supported on posts J, resting on the bottom of tank H, as is shown in the drawings.

In this instance I have represented the producer as being provided with means for supplying a steam-blast to produce the desired combustion, the steam being applied through a steam-pipe K to the blast-pipe L. The outer terminus of the blast-pipe is preferably arranged to come above the level of the water in tank H and from said terminal point extends down vertically, then horizontally, and up and under the center of the grate of the producer, as is shown in Fig. 2. Said central upturned end L' is provided with lateral openings L<sup>2</sup> above the level of the water in tank H to permit the blast to escape around under the grate. It thus serves as a nozzle for the pipe, and also by being extended up above said discharge-openings L<sup>2</sup> forms a pivot or axis L<sup>3</sup> for said grate to turn upon. Said upper end L<sup>3</sup> of the nozzle L' is made round or spherical-shaped, and the bearing M' on the grate-frame M is made concave in shape to fit over said spherical end, as is also shown in Fig. 2, for the purpose hereinafter described.

Although I have described and shown the producer as being supplied with a steam-blast in connection with my improvements, I do not limit myself thereto, as air may also be used in lieu thereof with satisfactory results and embodies one advantage over the use of steam—viz., that if a cold-air blast is employed, the same being discharged around the central bearing or pivot of the rotary frame, said bearing is constantly kept in a cool and perfect-running condition.

The grate-frame M is of circular shape, open at the center and arranged horizontally. It is in this instance made in four sections, bolt- 70 ed together, and is provided with two horizontal cross-bars N N for supporting and holding the central frame O, upon which is formed the concave bearing M', above alluded to. Said frame O is in this instance made in the form of a square, with two cross-bars O' O' extending from the center of each side and uniting at the center to form the aforesaid bearing M', which projects down from said center. Four square vertical openings P are thus 80 formed between the outer part of frame O and its cross-bars O' O', the purpose of which will be hereinafter described. The grate-bars Q are laid on top of frame M and are held in place by means of bolts d, passed vertically 85 through the ends thereof and through the edge of said frame and fastened by passing keys d' through openings in their lower ends under the frame. Upon the under side of frame M are formed or secured suitable bearings R, (four in this instance,) in whose lower ends are mounted wheels S, adapted to travel on a horizontal track T, supported on posts T', footed on the elevator-bed U, which will be later described. The nozzle L' is provided 95 above its discharge-openings L<sup>2</sup> with an annular shoulder e, upon which the bottom of the hub V' of large gear-wheel V rests when said hub is fitted over the top of said nozzle, as is shown in Fig. 2. Said hub V' is provided with upturned flanges or cogs V<sup>2</sup>, (two in this instance,) which pass up into the openings P of frame O, and thus form a clutch or lock connection between the grate-frame M and gear-wheel V, so that they shall turn together when said gear-wheel V is turned, as hereinafter described. It is therefore obvious that by said lock connection the gear-wheel V, the grate-frame M, its top bars Q, bearings R, and wheels S all turn together, the gear-wheel resting upon the shoulder e of nozzle L' and the grate-frame and its attachments normally resting and turning on the central spherical-shaped bearing L<sup>3</sup> with the wheels S normally out of contact with the track T 115 when said grate-frame is adjusted to turn upon a horizontal or level plane only; but when the grate-frame is adjusted to an inclined position one or more of said wheels will of course bear all the time upon said track, as well as said frame upon the central pivot L<sup>3</sup>. To admit of said tilting operations is the main purpose of making said central pivot of round or spherical form, as previously described, and shown in the drawings. The top 125 surface of the track T is also made concave in shape and wheels S with convex peripheries to correspond therewith for the same purpose, so that when the frame is tilted out of a level position said wheels and track will always have a good bearing-contact. In order to thus adjust the grate-frame and its attachments into an inclined position, two of the bearings R upon opposite sides of said frame 130



are made adjustable, (see Figs. 2, 5, and 7,) so that the wheels S thereof may be moved toward and from the frame. The other two bearings on the frame may be either fixed 5 bearings, as shown in Fig. 6, or adjustable, as desired, it not being essential to make them adjustable.

The adjustable bearings are constructed as follows: The two hangers *f f*, forming the 10 sides of each bearing R, are provided with central slots extending from the bottom to nearly the top thereof, and in said slots are fitted slide-blocks *g g*, having bearings at their lower ends to receive the bolts or spindles *h h*, upon which the wheels S turn, and are each connected at their upper ends by the cross-piece *i*, having a central vertical threaded opening to receive a vertical screw *j*, adapted to turn, but held from end movement in 20 its bearing in grate-frame M. By this construction it will be seen that by turning screw *j* the slide-blocks *g g* and wheel S may be elevated or lowered, according to which direction the screw is turned.

25 In practice the wheel S upon one side of the grate-frame is adjusted by its screw *j* toward said frame, so as to lower that side of the frame toward its supporting-track, and upon the opposite side the wheel is adjusted from 30 the frame so as to elevate said frame above the level of the other side, and thus hold the grate in an inclined position to the track T during its rotation thereon. The purpose of thus tilting the grate is to cause what may be 35 termed a "wabbling" or irregular motion to be imparted to said grate in its horizontal rotations, and thereby cause the bed of coal upon the grate to be more or less stirred or moved about, so as to facilitate an even com- 40 bustion thereof, and thus admit of dispensing with the usual frequent poking operations.

It will be understood that it is not intended to impart sufficient irregular motion to the grate to move or shift the bed of coal bodily 45 thereon from one position to another, (as it is essential to maintain a bed of even thickness,) but to simply, as above stated, stir up the body of coal, so as to permit the blast to pass up through it more readily and evenly, 50 and thereby produce a uniform and perfect combustion over the whole surface of the grate.

In some instances it is preferable to simply rotate the grate horizontally without imparting the aforesaid wabbling motion thereto, 55 and I therefore reserve the right to use said tilting mechanism or not, as desired.

Any suitable mechanism may be employed for turning the gear-wheel V, and through it 60 the grate and other operating parts connected therewith. In this instance I have adopted the following construction: A pinion W, mounted on the upper end of a vertical shaft W', is adapted to engage with the teeth on 65 said gear-wheel, said shaft W' being fitted to turn in suitable fixed bearings at the top and bottom and turned by a worm-gear W<sup>2</sup>

through the horizontal gear W<sup>3</sup>, secured to the bottom of the shaft. Said worm-gear W<sup>2</sup> is fitted to turn in suitable bearings W<sup>4</sup> W<sup>4</sup> 70 and is operated by a jointed shaft W<sup>5</sup>, which may be connected with any suitable driving mechanism. The purpose of using a jointed drive-shaft W<sup>5</sup> is to admit of operating the worm-gear W<sup>2</sup> and other parts while moving 75 up and down, the grate and all the parts employed for supporting and operating the same as hereinbefore described being arranged to be elevated and lowered while in operation, as previously stated. Said vertical move- 80 ments are imparted thereto by mounting said parts on the elevator-platform U, in turn mounted on the upper end of a vertical shaft X, which may be operated up and down by connection with any suitable lifting mechan- 85 ism. As said lifting mechanism does not constitute a part of my invention, it is deemed unnecessary to illustrate or describe the same.

The grate and other parts are supported upon the elevator by means of posts T', ex- 90 tending between the under side of track T and the top of said elevator-platform U. The blast-pipe L is also supported on said elevator-platform, as is shown in Figs. 2 and 3.

It is obvious that since the blast-pipe L, 95 supporting-posts T', and vertical shaft W' pass up through the bottom of tank H some means must be provided to prevent the escape or leakage of water where said parts pass up through said bottom. To accomplish 100 this result, I arrange a jacket Z around each post T', made water-tight at the bottom around the opening in the bottom of the tank, through which the post passes up through the top of said jacket, coming about on a level with the 105 top of the tank, and over said jacket is arranged a hood Z', attached with a close joint to the post at a short distance above the top of the jacket, thereby, as will be seen, forming a water seal or trap to prevent the escape 110 of gases from the producer around the space between each post T' and its jacket. A similar jacket L<sup>4</sup> and hood L<sup>5</sup> are also arranged over the blast-pipe nozzle L', and a jacket W<sup>6</sup> and hood W<sup>7</sup> over the vertical shaft W' for a 115 like purpose.

In order that the central pivot of the grate may be protected from ashes dropping down around and clogging the same, I provide hoods 120 M<sup>3</sup>, which fit in the openings P of frame O over said pivot, and thus protect the same, while at the same time not materially impeding the discharge of the ashes down through said openings. An annular hood T<sup>2</sup> is also 125 extended from the inner top edge of track T over the rim of gear-wheel V for a like purpose. (See Fig. 2 of the drawings.)

By the foregoing-described construction and arrangement of supporting the grate and its operating parts upon an elevator-plat- 130 form the same may be elevated or lowered at will, either with reciprocating or intermittent movements, the advantage of which will at once be apparent to those skilled in the



art to which my invention appertains. By this provision I am enabled to vary the height of the coal-bed for a short or long period, either to a higher or lower level, or, if desired, reciprocating vertical movements may be imparted to said coal-bed, by which, in connection with the irregular horizontal motion thereof previously described, the coal is caused to be thoroughly shaken and stirred up over the whole grate-surface, thereby insuring a most perfect combustion, and in consequence a superior quality of gas is produced at less cost in the production and less danger to the attendants, since poking is entirely dispensed with, than by the old style of producers.

In Fig. 10 I have shown an antifriction ball-bearing for the central support of the rotary frame M, the bottom of bearing M' and the top end of the nozzle L' being provided with corresponding annular grooves to receive a series of friction-balls  $k$  between them. This construction is intended to be used only when the frame is rotated horizontally without the irregular or "wabbling" motion being imparted thereto, as when adjusted into an inclined position. As this construction embodies the same principle as that covered by the use of a single fixed ball-bearing—viz., of providing the rotary frame with a central support and pivot—I reserve the right to use either or any equivalent thereof, as circumstances may require in practice.

By the use of my improved movable open grate, which when rotated is designed to be turned at a very low rate of speed continuously, (although it may be turned intermittently,) the ashes are continuously worked or sifted through slowly over the entire surface of the grate, and as said ashes and the coal are constantly kept in motion over the whole surface of said grate the depth or thickness thereof is consequently also kept uniform. This is especially the case when the coal is evenly distributed over the whole grate-surface, as by the use of my improved automatic feed device hereinbefore referred to. The ashes being sifted through evenly and an even thickness of ashes and coal being thus maintained over the grate-surface, the steam or air-blast has a uniform distance to pass through, and, meeting the same resistance over the entire area, gas of a uniform grade or quality low in carbonic acid is produced, practically no clinkers are formed, and, as before stated, no poking is required. The ashes which sift through and accumulate under the grate are removed through the water in tank H and prevent any exterior air entering the producer at this point.

It will at once be apparent to those skilled in the art to which my invention appertains that by combining my improved apparatus hereinbefore described, having the water-sealed bottom, with my patented feed device previously referred to a very complete gas-producer is provided, whereby gas of a uniform grade and superior quality and at a

minimum cost is produced. A large saving of labor is also effected over the use of gas-producers of ordinary make, and the danger to the attendants is reduced to a minimum.

Having now described my invention, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The combination of a rotatory grate-frame carrying suitable grate-bars, a centrally-located pivot on which the grate-frame rests and turns, means for rotating said grate-frame and means for limiting the tilting motion thereof, said means being normally out of contact therewith, substantially as and for the purpose set forth.

2. The combination of a rotary grate-frame carrying suitable grate-bars, a centrally-located pivot on which the grate-frame rests and turns, means for rotating said grate-frame, a track for limiting the tilting motion thereof, said track being normally out of contact therewith, substantially as and for the purpose set forth.

3. The combination of a rotary grate-frame carrying suitable grate-bars, a centrally-located pivot on which the grate-frame rests and turns, means for rotating said grate-frame, a track carrying wheels mounted on the grate-frame for limiting the tilting motion of said grate-frame, said track being normally out of contact with said wheels, substantially as and for the purpose set forth.

4. In a gas-producer, the combination of a horizontal, rotary frame, provided with suitable grate-bars and having means for turning it, also having supporting-hangers, provided with adjustable bearings in which are mounted wheels, adapted to travel upon a supporting-track, said rotary frame being adapted to turn upon a central pivot; said track, means for supporting it upon an elevator, the central pivot, also supported upon said elevator, and said elevator, adapted to be elevated and lowered, substantially as and for the purpose set forth.

5. In a gas-producer, the combination of a horizontal, rotary frame, provided with suitable grate-bars and having means for turning it, also having bearings in which are mounted antifriction-wheels, adapted to travel upon a supporting-track, said rotary frame being adapted to normally rest and turn upon a central pivot, with its wheels normally out of contact with the aforesaid supporting-track; said track, means for supporting it upon an elevator, the central pivot, also supported upon said elevator, and said elevator, adapted to be elevated and lowered, substantially as and for the purpose set forth.

6. In a gas-producer, the combination of a horizontal, rotary frame, provided with suitable grate-bars, and having bearings in which are mounted wheels adapted to travel upon a supporting-track, also having mounted thereon a central frame or hub adapted to be clutched to the hub of a horizontal gear-wheel, provided with a central bearing adapted to



rest and turn upon a central pivot, with the aforesaid wheels normally out of contact with the supporting-track; said track, means for supporting it, the central pivot, means for supporting it, the horizontal gear-wheel, having means whereby it may be clutched to the central frame or hub of the rotary frame, and means for turning said gear-wheel, substantially as and for the purpose set forth.

7. In a gas-producer, the combination of a horizontal, rotary frame, provided with suitable grate-bars, and having supporting-hangers, provided with adjustable bearings in which are mounted wheels adapted to travel upon a supporting-track, said rotary frame also having mounted thereon a central frame or hub adapted to be clutched to the hub of a horizontal gear-wheel, provided with a central bearing adapted to rest and turn upon a central pivot; said track, means for supporting it, the central pivot, means for supporting it, the horizontal gear-wheel, having means whereby it may be clutched to the central frame or hub of the rotary frame, and means for supporting and turning said gear-wheel, substantially as and for the purpose set forth.

8. In a gas-producer, the combination of a horizontal, rotary frame, provided with suitable grate-bars and having supporting-hangers, provided with adjustable bearings in which are mounted wheels adapted to travel upon a supporting-track, said rotary frame also having mounted thereon a central frame or hub adapted to be clutched to the hub of a horizontal gear-wheel, provided with a central bearing adapted to rest and turn upon a central pivot; said horizontal gear-wheel, having means for supporting it and whereby it may be clutched to the central frame or hub of the rotary frame, means for turning said gear-wheel; the track, means for supporting it upon an elevator; the central pivot, also supported upon said elevator, and the elevator, adapted to be elevated and lowered, substantially as and for the purpose set forth.

9. In a gas-producer, the combination of a horizontal, rotary frame, provided with suitable grate-bars, and having bearings in which are mounted wheels adapted to travel upon a supporting-track, also having mounted thereon a central frame or hub adapted to be clutched to the hub of a horizontal gear-wheel, provided with a central bearing adapted to rest and turn upon a central pivot; said gear-wheel, having means whereby it may be clutched to the frame or hub of the rotary frame, means for turning said gear-wheel; the track, means for supporting it, the blast-pipe having outlets under the grate, also adapted to support the gear-wheel and extended up to form the aforesaid central pivot

for the rotary frame to turn upon, substantially as and for the purpose set forth.

10. In a gas-producer, the combination of a horizontal rotary frame adapted to rest and turn upon a central pivot also carrying suitable grate-bars and having wheels mounted thereon; a horizontal gear-wheel also adapted to rest and turn upon a central pivot and to be locked to the grate-frame; means for turning said grate-frame and gear-wheel; a track mounted on an elevator and carrying the aforesaid grate-frame, wheels for limiting the tilting motion of the grate-frame, said track being normally out of control with said wheels; said elevator, the blast-pipe mounted thereon whose inner terminal serves as the aforesaid central pivot for the grate-frame and gear-wheel, and suitable hoods attached at their upper ends to and surrounding the drive-shaft, track-supports and blast-pipe, said hoods being arranged over jackets which extend up from the bottom of a water-tank around said drive-shaft, track-supports and blast-pipe, substantially as and for the purpose set forth.

11. In a gas-producer, the combination of the horizontal, rotary grate-frame, having means for supporting and turning it, a central frame or hub mounted thereon and provided with a central bearing adapted to rest and turn upon a central pivot, said central frame or hub also being adapted to be clutched to the hub of a horizontal gear-wheel, said gear-wheel, having means whereby it may be clutched to the aforesaid central frame or hub, and the blast-pipe, adapted to support the gear-wheel, and extended up to form the aforesaid central pivot for the rotary frame to turn upon, substantially as and for the purpose set forth.

12. In a gas-producer, the combination of the horizontal, rotary grate-frame, having means for supporting and turning it, a central frame or hub, mounted thereon, and provided with a central bearing adapted to rest and turn upon a central pivot, said central frame or hub also being adapted to be clutched to the hub of a horizontal gear-wheel; said gear-wheel, having means whereby it may be clutched to the aforesaid central frame or hub; the hoods, fitted over the central pivot of the rotary frame, and the blast-pipe, adapted to support the gear-wheel, and extended up to form the aforesaid central pivot for said rotary frame to turn upon, substantially as and for the purpose set forth.

CARL WILHELM BILDT.

Witnesses:

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