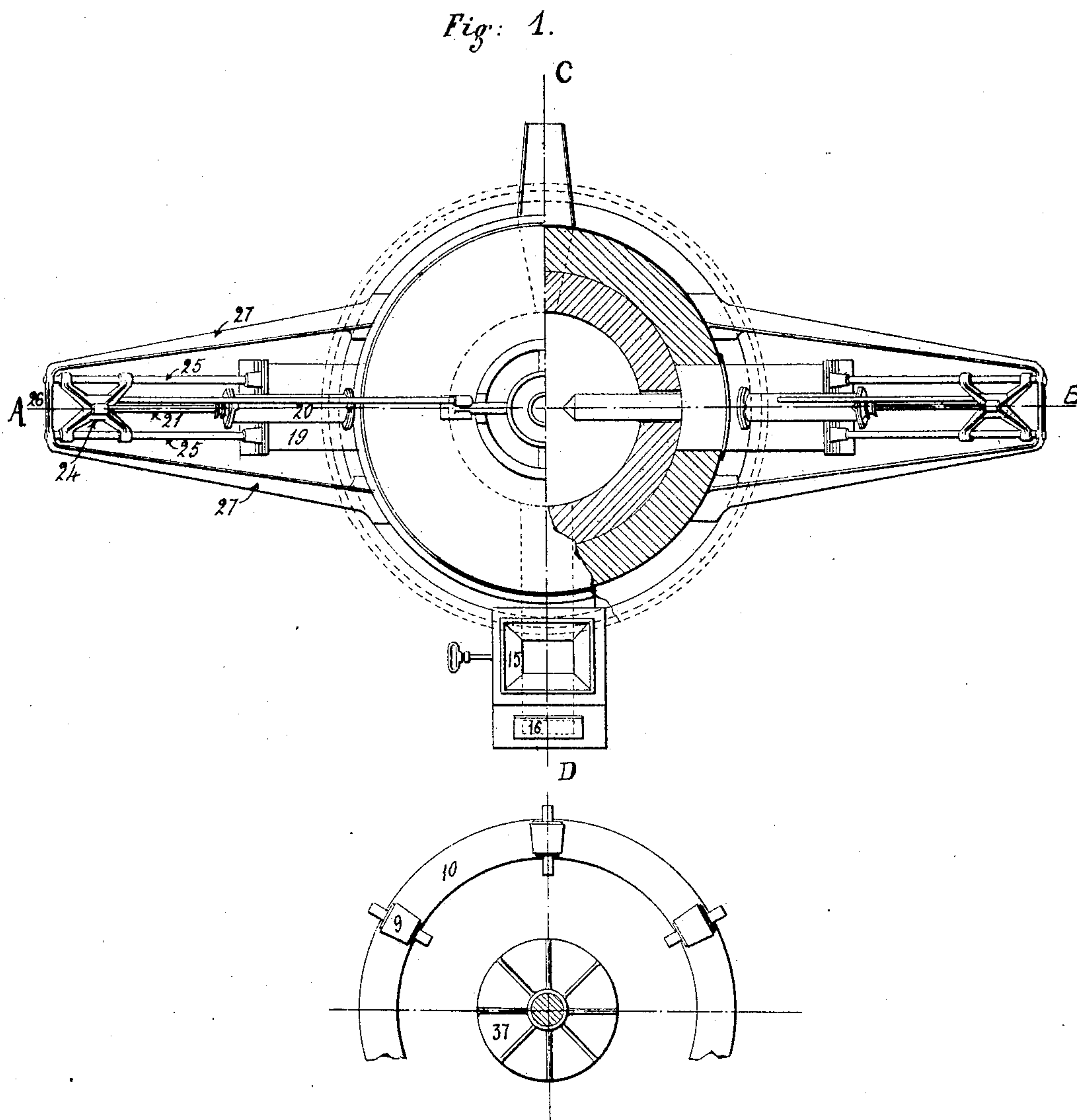


E. STASSANO.
REVOLVING ELECTRIC FURNACE.

APPLICATION FILED APR. 9, 1902.

4 SHEETS--SHEET 1.



Witnesses:
J. C. Hebert.
A. Witt.

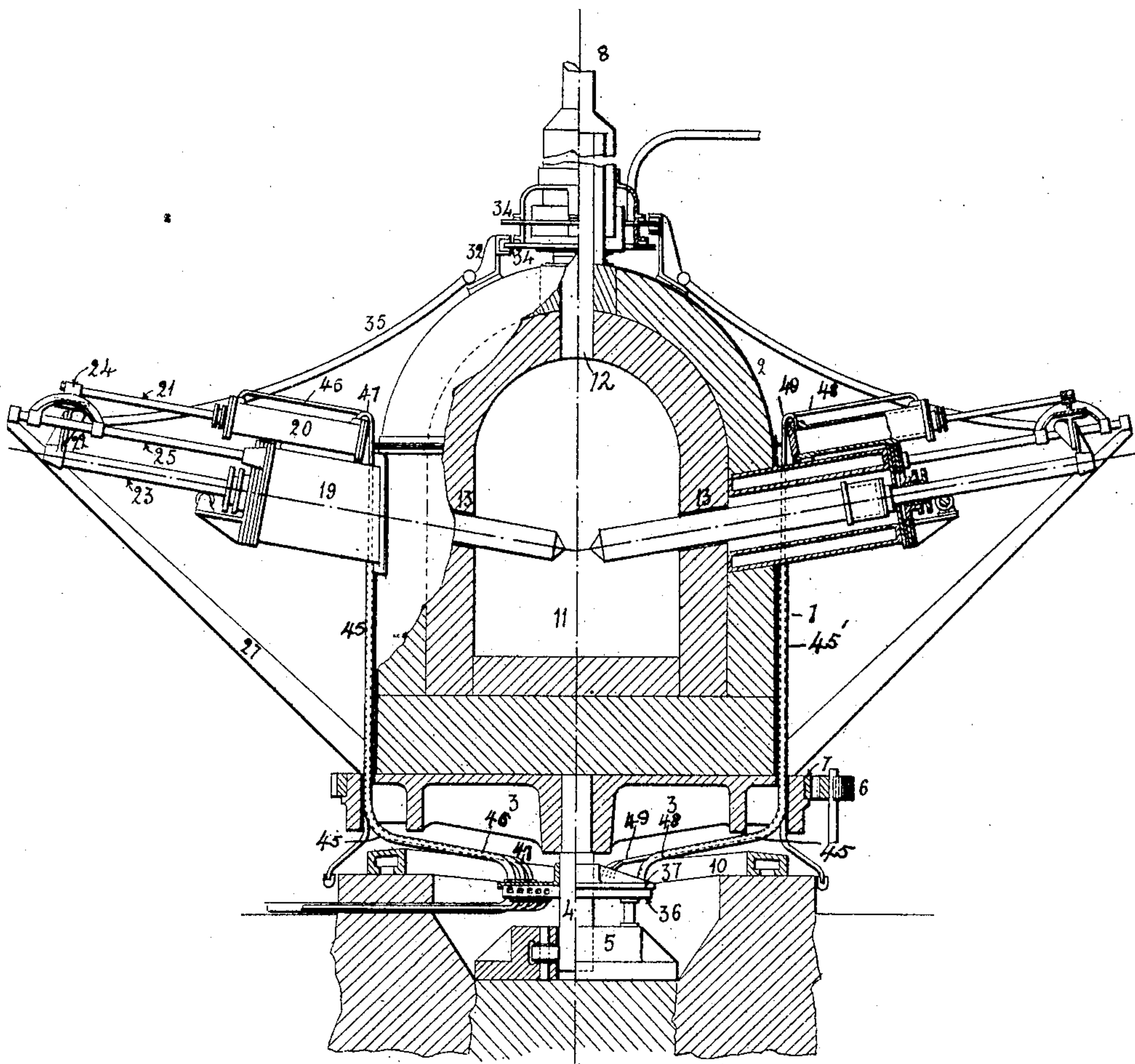
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4 SHEETS—SHEET 2.

Fig. 2.



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No. 799,105.

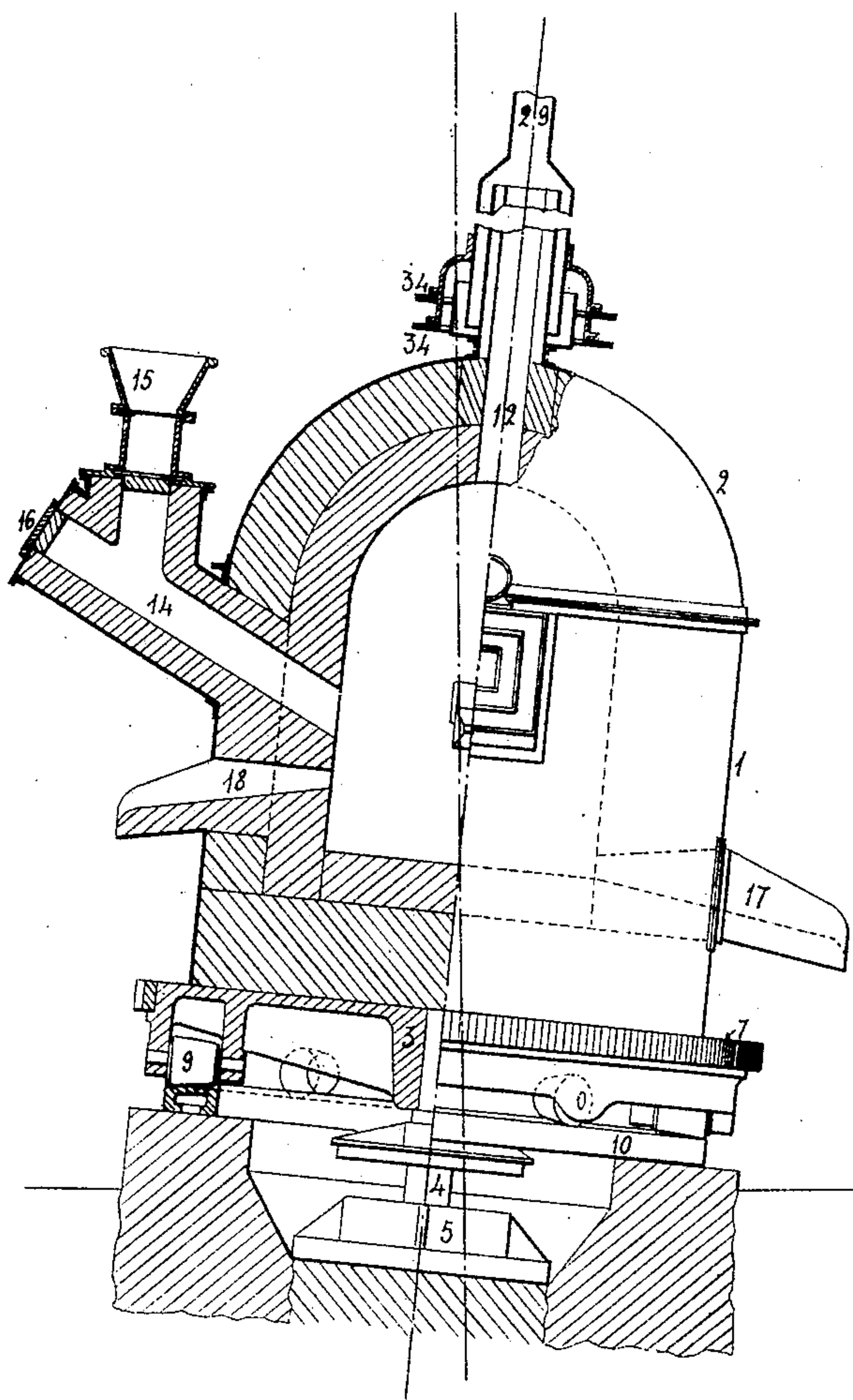
PATENTED SEPT. 12, 1905.

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4 SHEETS—SHEET 3.

Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 5.

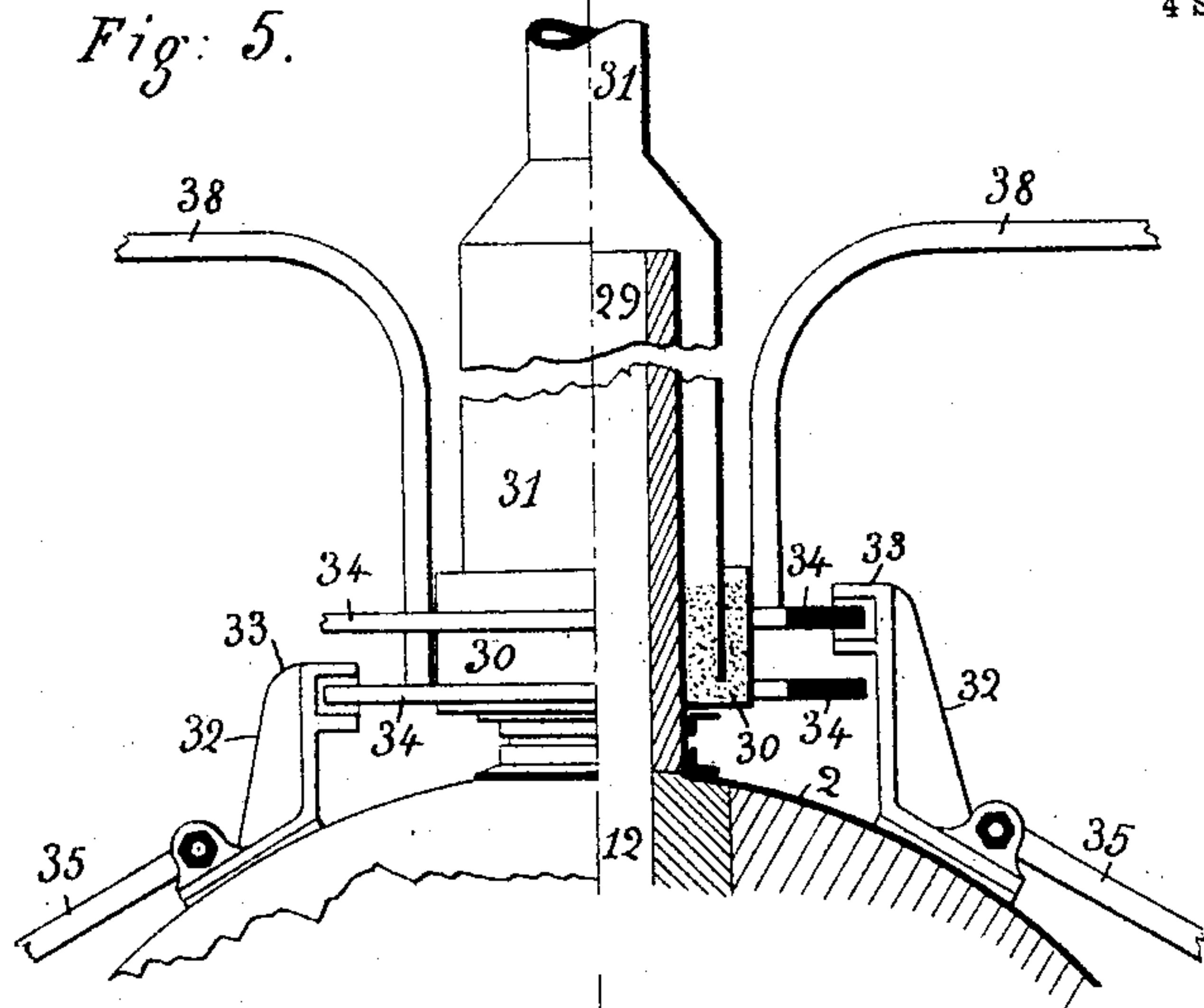


Fig. 6.

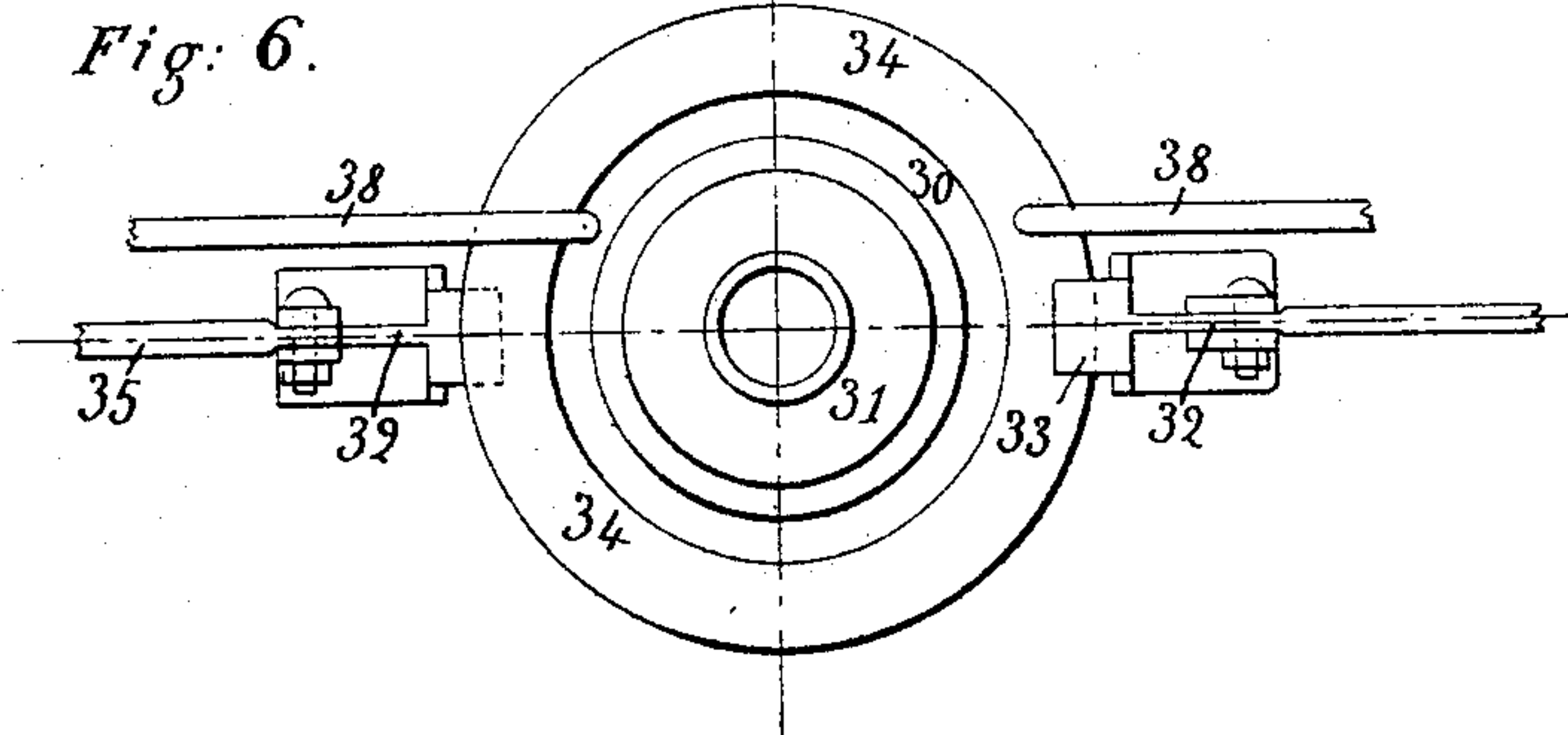


Fig. 7.

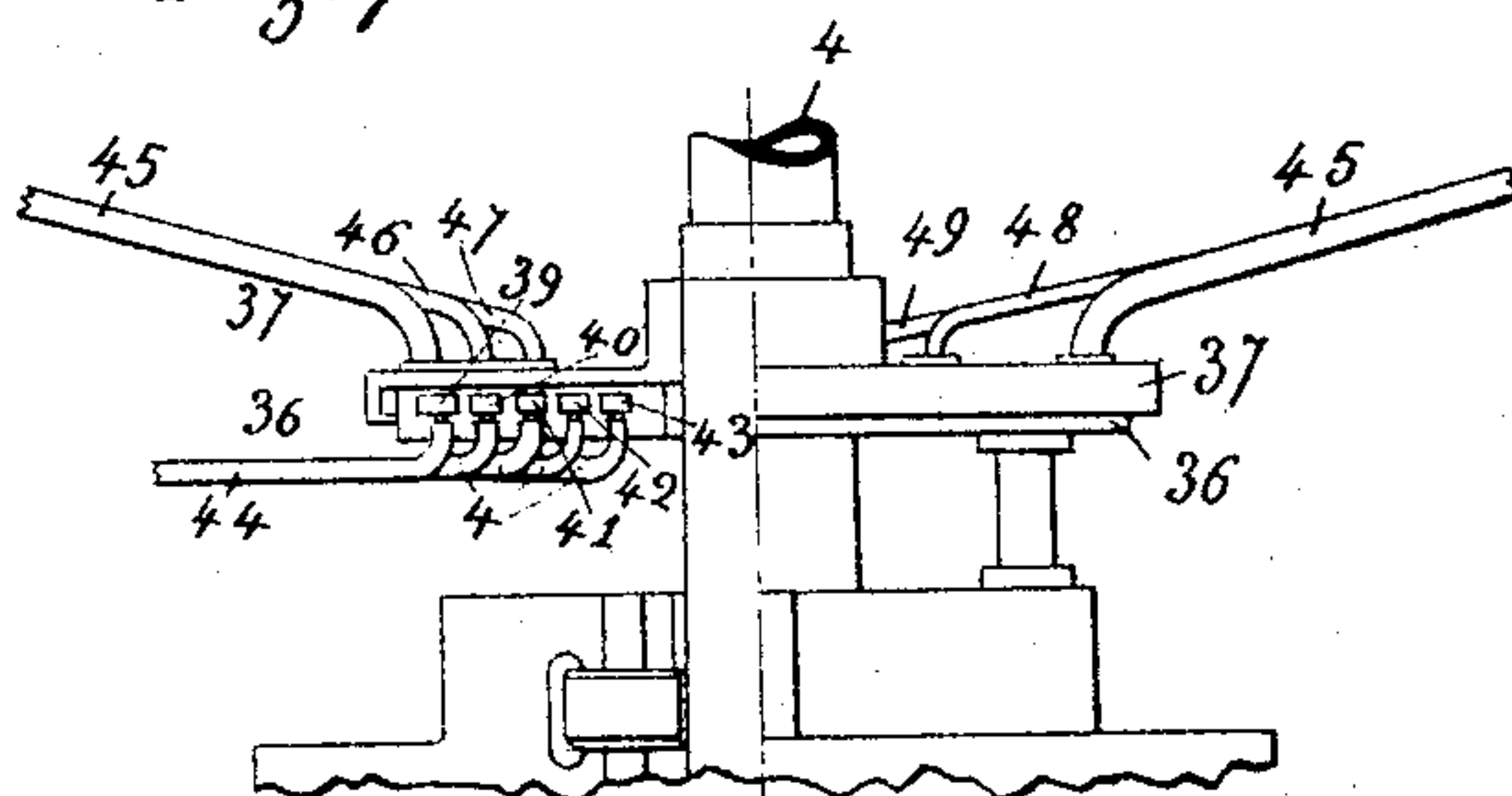
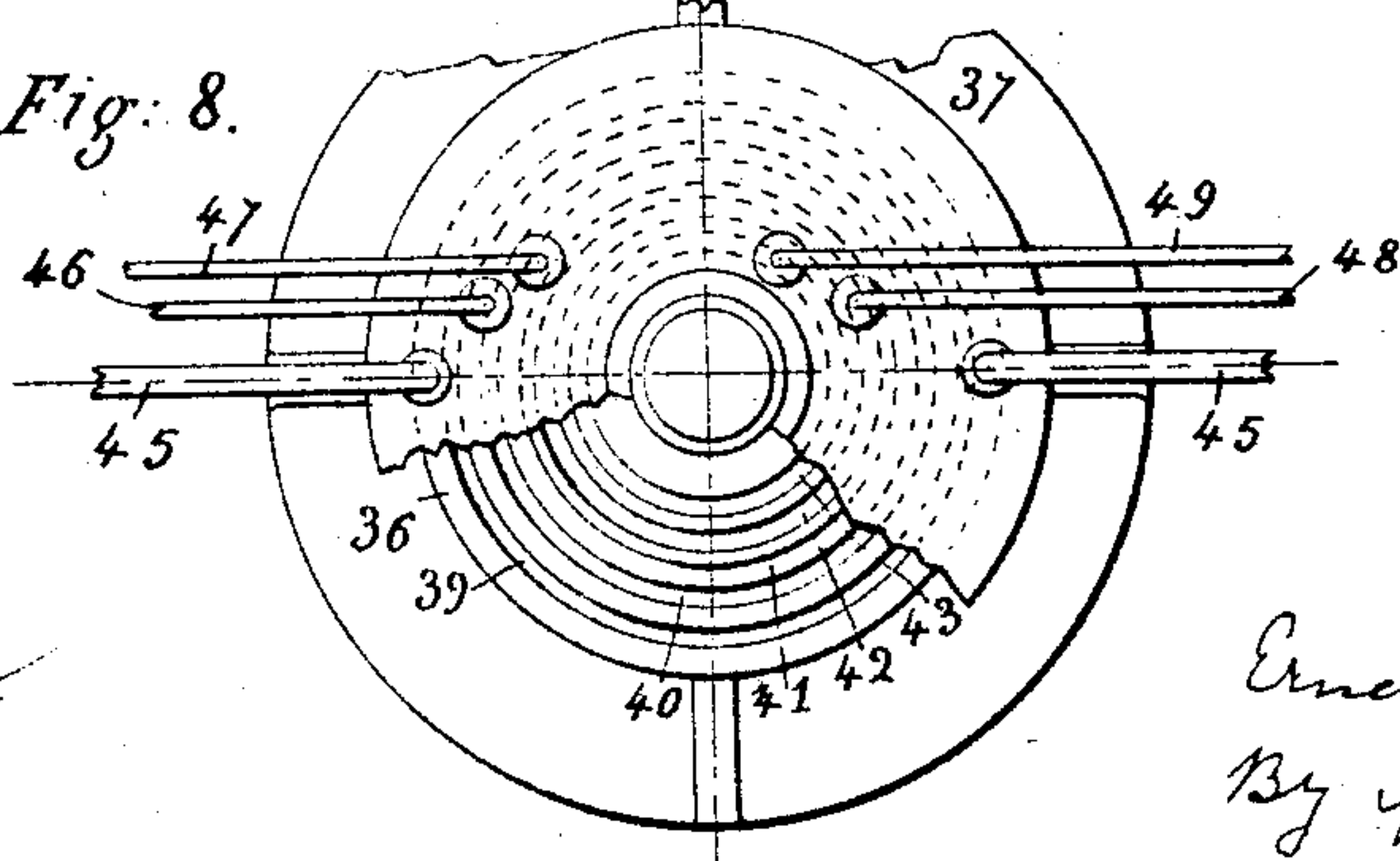


Fig. 8.



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UNITED STATES PATENT OFFICE.

ERNESTO STASSANO, OF ROME, ITALY.

REVOLVING ELECTRIC FURNACE.

No. 799,105.

Specification of Letters Patent.

Patented Sept. 12, 1905.

Application filed April 9, 1902. Serial No. 101,996.

To all whom it may concern:

Be it known that I, ERNESTO STASSANO, a subject of the King of Italy, residing at Rome, in the Kingdom of Italy, have invented certain new and useful Improvements in Apparatus for Reducing and Refining Metals, of which the following is a specification.

The object of my invention is to provide a smelting or reducing apparatus or furnace of a simple and cheap form which may be manipulated easily and in which there is little heat wasted; and to such ends my new and improved apparatus consists of a closed chamber so mounted as to be capable of rotation on an axis inclined to the vertical and provided with a carbon anode and a carbon cathode held in reciprocating holders, means for cooling the carbons, and means for reciprocating the same, although it is not to be understood that this invention is limited to an apparatus comprising at once all the aforesaid elements, as the same consists of the construction of certain devices and parts and the construction, combination, and arrangement of certain devices and parts, all as hereinafter more particularly set forth in the specification and pointed out in the claims.

The invention is fully described and shown in the following specification, of which the accompanying drawings form a part, wherein similar numerals of reference designate like or equivalent parts wherever found throughout the several views, and in which—

Figure 1 is a top view, with a portion of one side shown in a horizontal section, taken on the line *a a* of Fig. 2. Fig. 2 is a view in elevation, a portion thereof being shown in section, taken on the line *A B* of Fig. 1; and Fig. 3 is a view similar to Fig. 2, taken in section on the line *C D* of Fig. 1. Fig. 4 is a top view in detail of the annular ring or rail which supports the furnace as the same is rotated. Fig. 5 is a detail view, half in vertical section of the top portion of the furnace, showing the connection thereof with the stationary chimney and the seal-joint between them and the electric connections. Fig. 6 is a top plan view of that portion of the device shown in Fig. 5, the top of the furnace itself being omitted; and Figs. 7 and 8 are side and bottom views, respectively, of the bottom portion of the device, showing the manner of supplying the water for cooling the carbons and actuating the same.

Referring to the drawings, the furnace consists of a large upright cylinder 1, of iron

plate, covered by a spherical cap 2 and supported on the bottom by a strong cast-iron plate or table 3, fitted with a central pivot 4, revolving in a step-bearing 5. The cast-iron plate or table 3 is provided on its periphery with a toothed ring 7, forming a gear-wheel around the base of the furnace which gears into a pinion 6, which is put in motion by any suitable contrivances or means of rotation, (not shown,) so as to bring about a constant rotation of the furnace.

The spindle 8 of the furnace instead of being vertical is inclined to the perpendicular, and the furnace rotates on the pivot 4, being supported by means of rollers 9, Fig. 4, on an annular rail 10, Fig. 3, which annular rail also has its upper surface inclined at the same angle, the interior bottom of the furnace being also so inclined, whereby two melted charges of material will be kept in continual agitation and the various particles thereof thoroughly intermixed and mingled during the rotation of the furnace.

The furnace or reduction-chamber 11 is lined with fireproof material and is provided at the top with an upwardly-extending cylindrical portion 29, the central line of which is an extension of the inclined rotative axis of the furnace, and through this is formed the passage 12, forming the escape-orifice for the gases produced in the furnace by the action of the electric arc upon the charge. A charging hole or orifice 14 is also formed in and through the wall of the furnace and is provided with an exterior receiving-funnel 15, and this opening is normally closed by a plug 16. Two outlet tapping-holes 17 and 18 of the usual form, adapted to be plugged in the well-known way with balls of wet clay, are also formed in such wall, usually at diametrically opposite points, the one marked 17 being for the withdrawal of the heavier reduced metal and the one marked 18 being for the withdrawal of the lighter silicious slag.

The carbon electrodes, between which plays the arc performing the reduction, pass at 13 through the peripheral walls downwardly and inwardly, and the outer end portions of the same, as well as the inner ends of the carbon-holding rods, are inclosed in a water-walled casing 19, between the walls of which a current of water is kept in constant circulation in order to keep the outer ends of such carbons and such rods constantly cool. On these cooling-cases are mounted the hydraulic carbon-electrode-actuating cylinders 20, each of

which is provided with a reciprocating piston-rod 21, provided at the outer end with a guide-head 24, which slides on the guide-rods 25 and is connected with the adjacent metallic carbon or electrode rod 23 by an arm 22, and each pair of the rods 25 are connected together by means of a bar 26, supported rigidly in position by the inclined supporting-rods 27, the lower ends of which are firmly secured to the exterior of the revolving portion of the furnace. From the arrangement it will be seen that a reciprocation of the piston-rods 21 of the hydraulic cylinders will cause a similar reciprocation of the carbon electrodes through the intervening mechanism. The electrode-rods slide on the rollers 28.

The cylindrical portion 29, Figs. 5 and 6, through which passes the escape-orifice 12, is provided on the exterior adjacent to the bottom with an upwardly-extending annular box or cup open at the top, and down into this annular cup 30 projects the lower end of an annular metallic hood or chimney 31, which is rigidly secured in position in the wall or roof of the building, so that its central axis is coincident with the axis of the escape-orifice 12 in such manner that such chimney or hood will remain stationary while the furnace is rotated upon such axis, the box 30 being filled with fine sand or other suitable refractory material in such manner as to form a seal at the joint thus formed, so as to prevent the escape of the furnace-gases therethrough into the furnace-room.

The furnace-top is usually of the spherical form shown, and to such top are rigidly secured the metallic arms or brackets 32, electrically insulated in any desired manner therefrom, each of which arms or brackets is provided with a brush 33, which will slide, respectively, upon a metallic disk or ring 34, electrically insulated from but rigidly secured to the hood or chimney 31, thus forming a sliding electrical connection between the brackets or arms 32 and such rings or disks, which latter are in connection with the plus and minus conductors 38 of the device or devices supplying the electric energy to the reducing-electrodes, which are in electric communication with the arms or brackets 32 through the electrode-holding rods 23 and conductors 35, and from this description it will be seen that during the rotation of the furnace continuity of the electric current will be constantly maintained through the sliding contacts so formed.

Underneath the table 3 is located the apparatus for supplying the cooling-water to the water-casing 19 around the electrode-poles and also for supplying the water to the hydraulic cylinders 20. Such apparatus is shown in detail in Figs. 7 and 8 and consists in substance of an annular disk 36, fixed to the central stationary supporting journal, bushing, or base 5, and in the top surface of this

disk 36 are formed five annular grooves or channels numbered, respectively, 39, 40, 41, 42, and 43. This grooved plate or disk 36 is covered at the top by a plate or disk 37, secured to and revolving with the furnace, the joint between such parts 36 and 37 being so made that water-tight joints are formed between the grooves, so that although the plate 37 is in rotation there will be no communication between such grooves or between them and the atmosphere. Secured on plate 37 in such manner as to be in communication therethrough with each of such grooves, respectively, are pipes 45, 46, 47, 48, 49, and 45', the pipes 45 being in communication at their upper end with the water-chamber of the electrode-casing 19 on one side and the pipes 45' being in communication in like manner with the like chamber of the other electrode on the other side, the pipes 46 and 47 being in communication with the front and rear end, respectively, of one of the cylinders 20 and the pipes 48 and 49 being in communication in like manner with the other cylinder 20, and the various grooves in plate 36 being supplied with water under pressure fed thereto through pipes 44 in communication with a suitable water-pressure supply (not shown) and the flow of the water through the various pipes being controlled by suitable valves. (Not shown.)

What I claim is—

1. In an electric furnace, the combination with a circular closed chamber having its axis inclined at an angle to the vertical, of means for rotating such chamber, means for feeding an anode and a cathode toward one another within the chamber, and means for cooling the outer ends of the anode and cathode, substantially as shown and described.

2. In an electric furnace, the combination with a circular closed chamber having its axis inclined at an angle to the vertical, of means for rotating such chamber, means for feeding an anode and a cathode toward one another within the chamber, a stationary chimney in communication with the waste-gas passage of the chamber, and means for sealing the joint between the chimney and the chamber, substantially as shown and described.

3. In an electric furnace, the combination with a circular closed chamber having its axis inclined at an angle to the vertical, of means for rotating such chamber, means for feeding an anode and a cathode toward one another within the chamber, a stationary chimney in communication with the waste-gas passage of the chamber, and means for sealing the joint between the chimney and the chamber, consisting of an annular cup surrounding an extension of the chamber through which the gas-passage passes in which lies the lower end of the chimney, the cup being filled with a finely-pulverized heat-resisting substance to form a seal at such joint.

4. In a rotating electric furnace a revolving body or receptacle, provided with conductors in connection with the electrodes, such conductors ending in brushes sliding on two disks fixed to a stationary pipe forming the chimney which disks communicate with the source of electricity, such pipe being dipped into an annular cup and filled with sand fixed to the rotating body or receptacle, substantially as shown and described.

5. In a rotating electric furnace two electrodes inclosed within double-walled carbon-holder casings, in which cold water is allowed to circulate continuously, such casings rotating together with the electrodes and the furnace and being in communication with a disk rotating in its turn on a stationary disk, the latter being fitted with grooves in communication with pipes in communication with a

water-pressure supply, substantially as shown and described. 20

6. In a rotating electric furnace two electrodes connected with the piston of two hydraulic cylinders having their ends connected by means of water-pipes, a disk rotating in unison with the furnace which communicates with a grooved disk below the first disk the grooves of which are in connection with a water-pressure supply, substantially as shown and described. 25

In testimony whereof I have affixed my signature, at Rome, this 25th day of March, 1902, in presence of two witnesses. 30

ERNESTO STASSANO.

Witnesses:

T. T. MEREDITH,
A. ROZZI.