V. ROYLE.

ELECTRIC TEMPERING FURNACE.

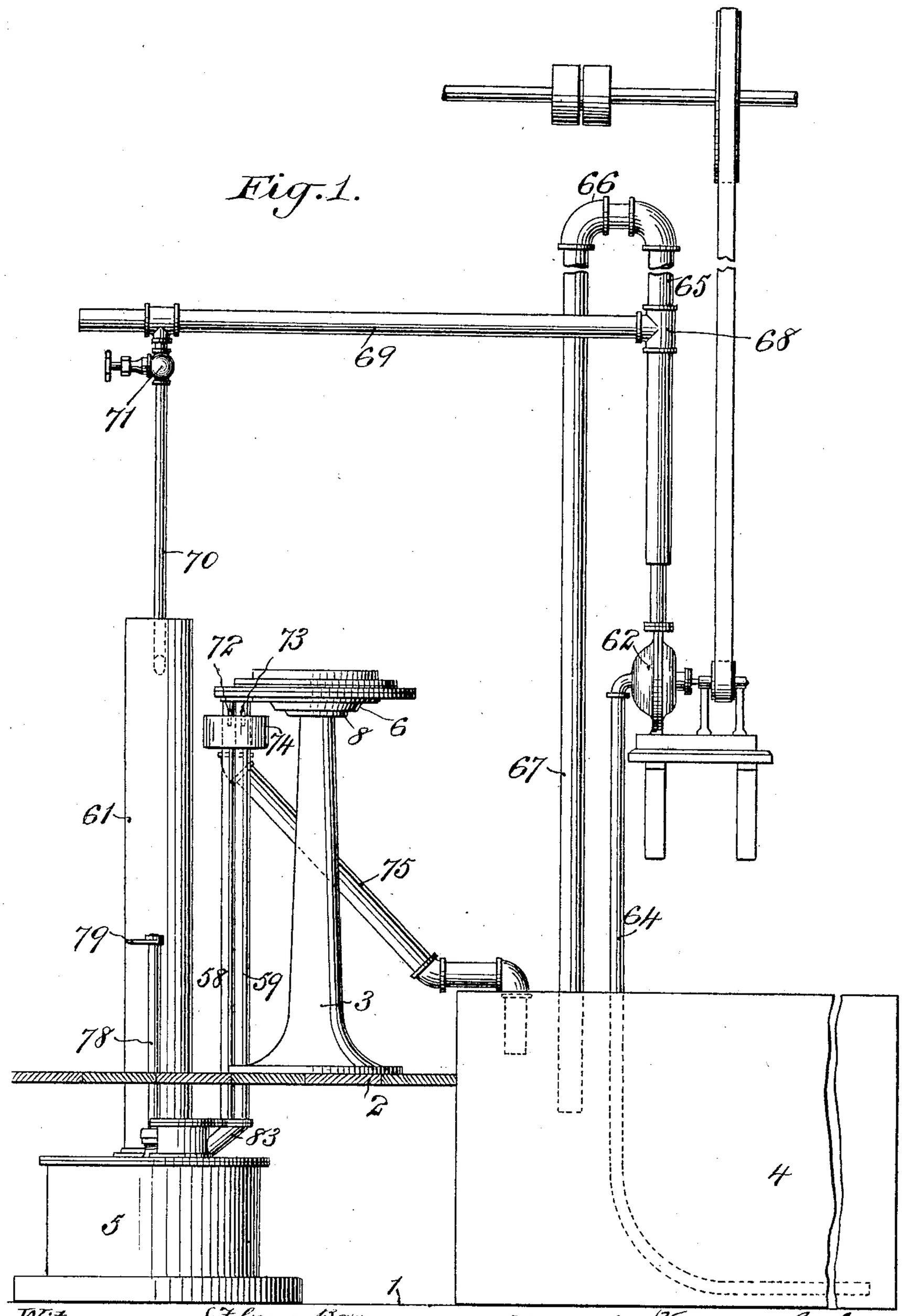
APPLICATION FILED AUG. 24, 1906.

924,109.

Patented June 8, 1909.

4 SHEETS—SHEET 1.

Fig. 1.



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Inventor: { Vernon Royle By Brown Sewall his attorneys

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4 SHEETS—SHEET 2.

Fig. 2.

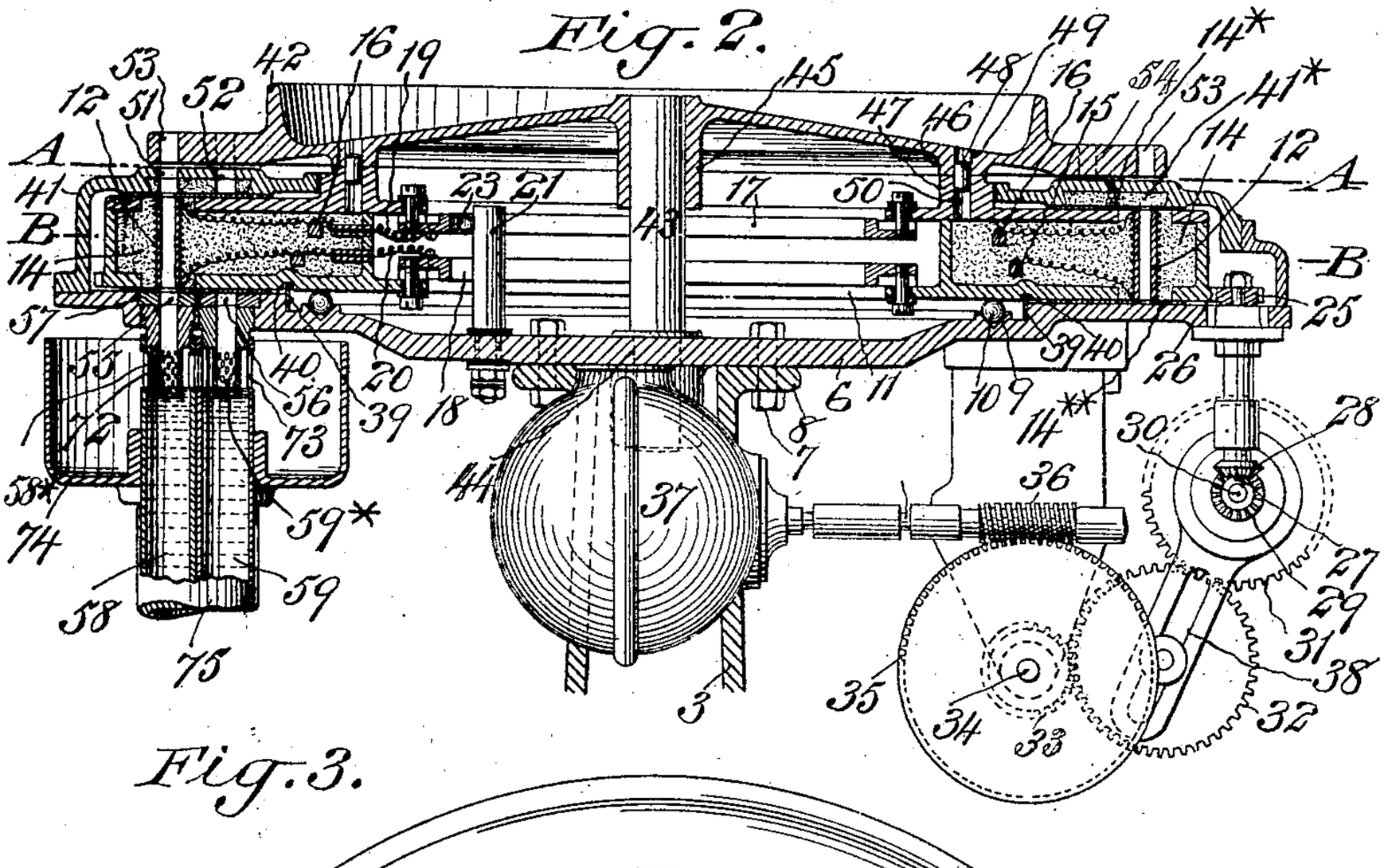
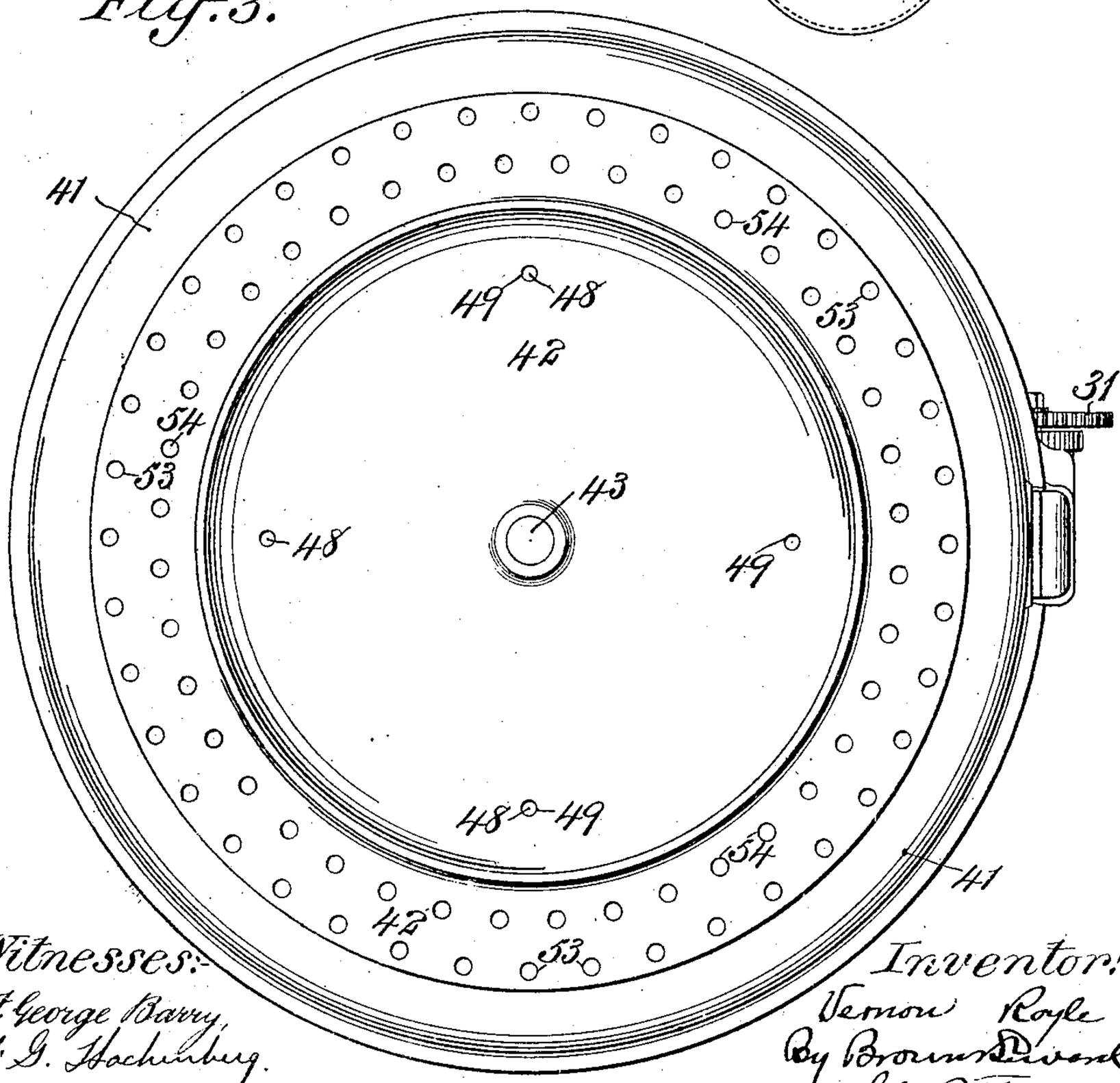


Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 4.

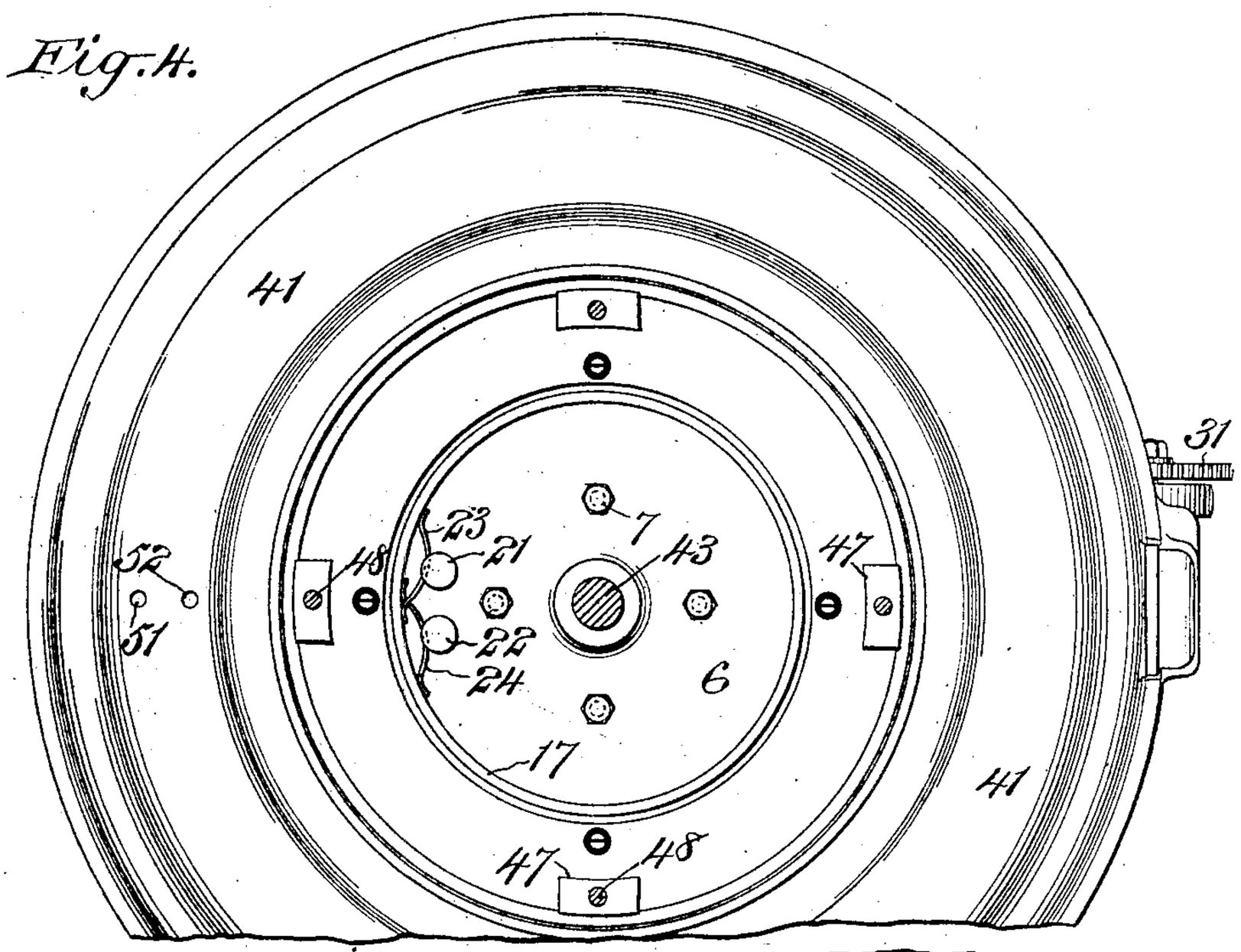
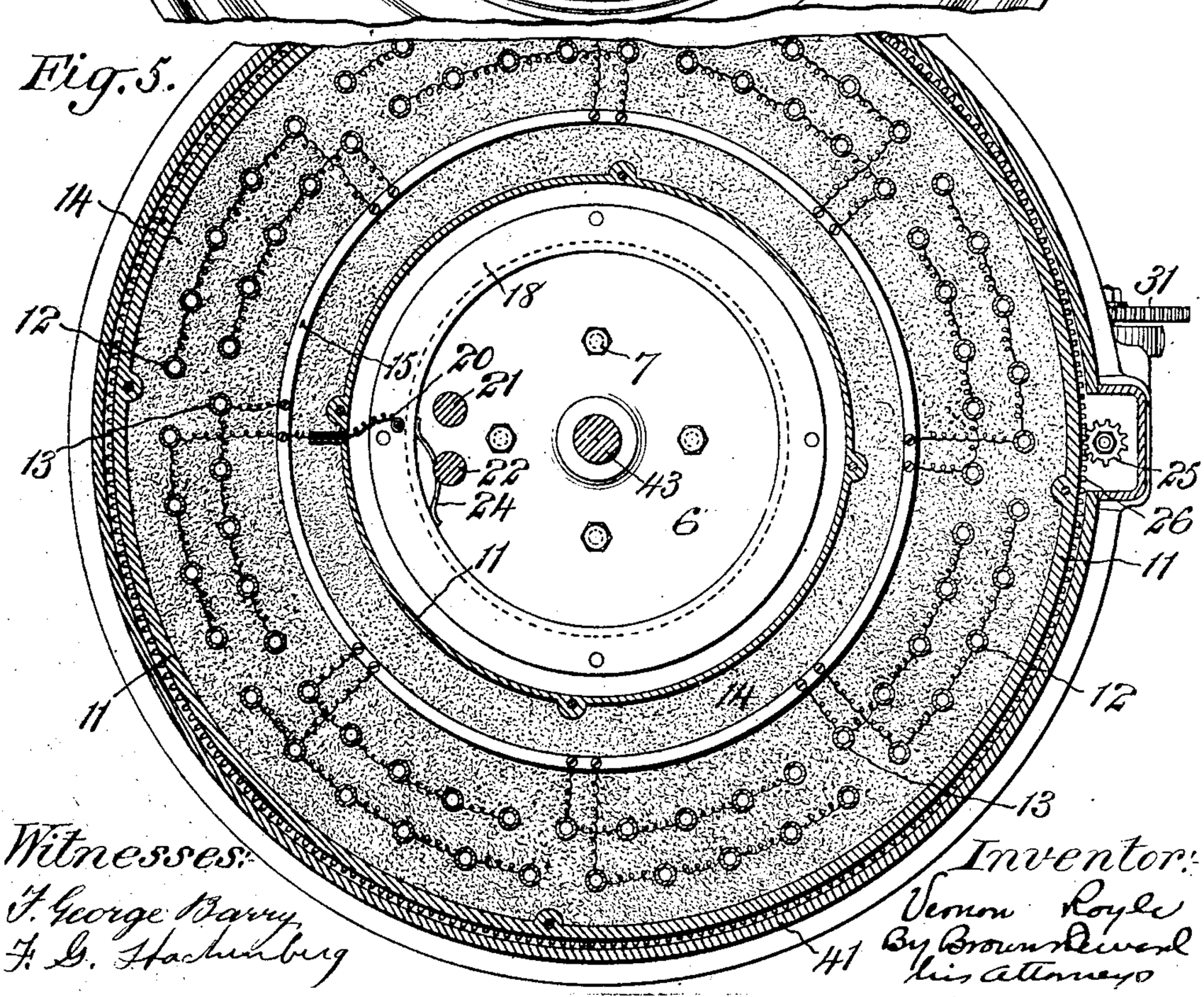


Fig. 5.



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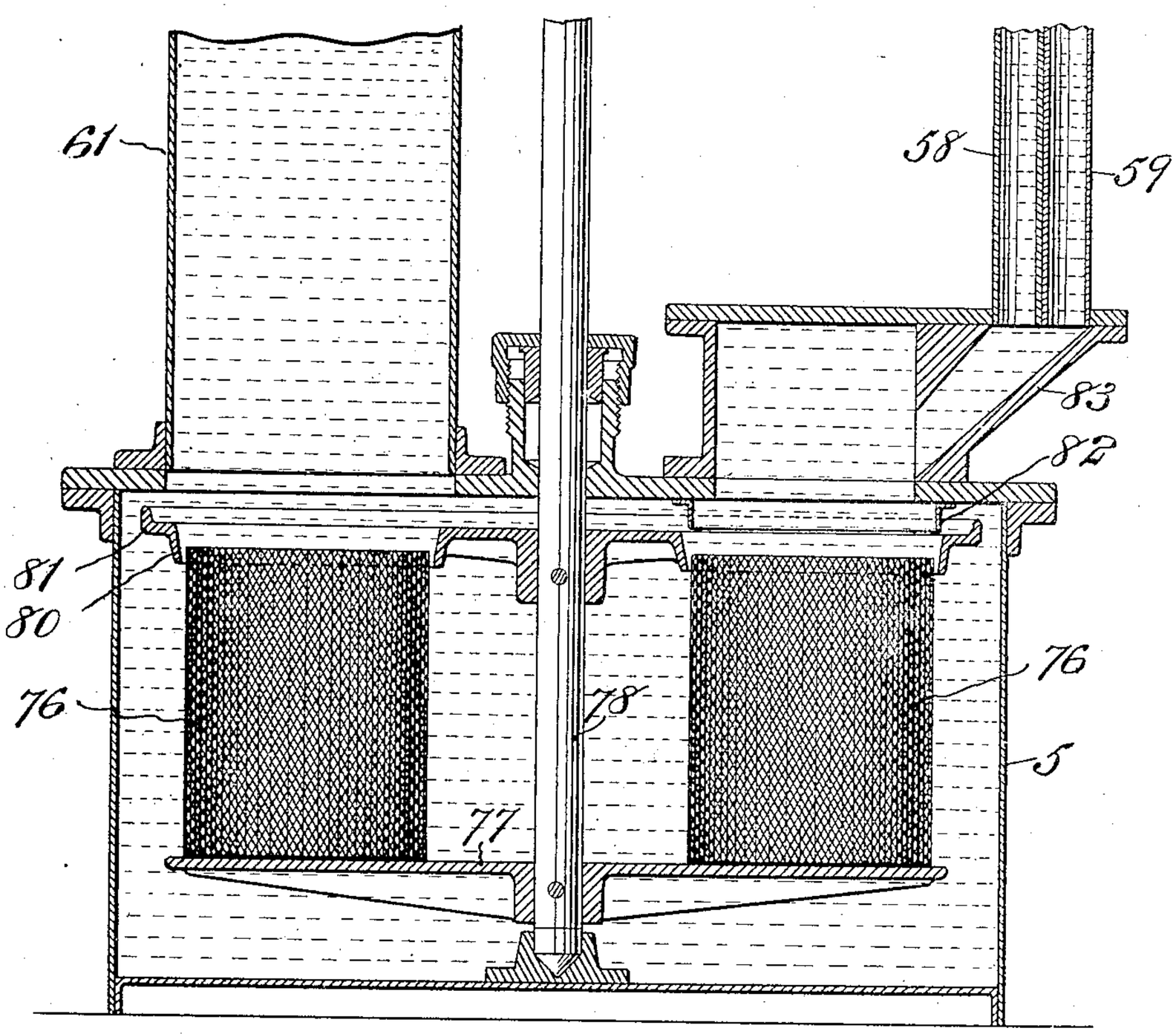
4 SHEETS—SHEET 4.

Fig. 6.



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UNITED STATES PATENT OFFICE.

VERNON ROYLE, OF PATERSON, NEW JERSEY.

ELECTRIC TEMPERING-FURNACE

No. 924,109. Specification of Letters Patent. Patented June 8, 1909.

Application filed August 24, 1906. Serial No. 331,852.

To all whom it may concern:

Be it known that I, VERNON ROYLE, a citizen of the United States, and resident of Paterson, in the county of Passaic and State of New Jersey, have invented a new and useful Electric Tempering-Furnace, of which the following is a specification.

My invention relates to an electric tempering furnace, with the object in view of providing means for automatically tempering tools, insuring a uniform temper without the necessary aid of skilled labor.

The particular form of furnace which I have chosen to illustrate my invention is adapted to tempering what are known as routing cutters where it is important that they shall have a hardness and toughness which will enable them to work effectively in cutting metal.

In the accompanying drawings, Figure 1 is a view of the furnace in side elevation showing the means which coact therewith to furnish a cooling liquid at a substantially uniform temperature and also the means for removing the tempered tools from the furnace, Fig. 2 is an enlarged transverse vertical section taken centrally through the furnace proper, Fig. 3 is a top plan view of the same, Fig. 4 is a horizontal section taken in the plane of the line A—A of Fig. 2, Fig. 5 is a horizontal section taken in the plane of the line B—B of Fig. 2, and Fig. 6 is a transverse section through the receiving box.

As the parts are set up in Fig. 1, the floor on which the tank of cooling liquid is placed is denoted by 1 and on this floor there is a platform 2 on which the pedestal 3 for supporting the furnace is fixed. The tank for containing the cooling liquid, in the present instance brine, is denoted by 4 and the box into which the heated tools are dropped as they pass through the brine is denoted by 5.

The particular arrangement of pipes for conveying the cooling liquid to and from the pipe and the mechanism for removing the tools from the receiving box will be hereinafter more particularly described.

On the pedestal 3 there is mounted a base plate 6 preferably of circular form, here shown as bolted by means of bolts 7 to a flange 8 at the top of the pedestal. On the upper face of the said base plate there is a track 9 supplied with ball bearings 10 on which rests an annular box frame 11 containing the electric retorts. It is found desirable to locate the retorts in two annular series, the outer annular series being denoted by 12 and the inner annular series by 13. These are arranged in staggered order with relation to one another, as clearly shown in Fig. 5. These retorts are preferably packed in asbestos 14 and held in position by thin perforated, metallic plates 14*, 14**, which are secured to the box frame and serve as headers for the opposite ends of the retorts.

Wires lead from the opposite poles of the coils of each retort to electric contact rings 15, 16, those from one pole leading to the ring 15 and those from the opposite pole leading from the ring 16. These rings 15, 16, are embedded in the asbestos 14 and insulated from each other and from the surrounding walls of the box frame and from them cables lead through the interior wall of the box frame to binding posts connected with electric conductor rings preferably of brass denoted by 17, 18. The cable leading to the binding post on the ring 17 is denoted by 19 and the cable leading to the binding post on the ring 18 is denoted by 20.

Two conducting posts, denoted by 21, 22, are set in the base plate 6 and extend upwardly spaced apart and spaced from the inner face of the rings 17, 18, and each is provided with a brush for engaging one of the rings 17, 18. The brush on the post 21 for engaging the ring 17 is denoted by 23 and the brush on the post 22 for engaging the ring 18 is denoted by 24. The rings 17, 18, are insulated from one another and so are the posts 21, 22.

Contact is made with the lower ends of the posts 21, 22, by suitable electric conductors leading from a source of supply not shown.

The box frame 11 is caused to rotate on the ball bearings 10 by means of a pinion 25 engaged with a rack 26 on the exterior of the box frame, the said pinion being fixed on a shaft 27 provided with a bevel gear 28 which meshes with a bevel gear 29 on the shaft 30 of a wheel 31 which, in turn, meshes with an intermediate wheel 32, the latter meshing with a pinion 33 on the shaft 34 of a worm wheel 35 which engages a worm 36 on the shaft of an electric motor 37.

For convenience in determining the speed at which the box frame carrying the electric retorts shall travel, the wheel 32 is mounted in an elongated slot 38, so that the wheel 31 may be interchanged with a wheel larger or

smaller than the wheel 31 to vary the speed of the drive pinion 25.

The rotary box frame carrying the electric retorts which may be hereinafter referred to as the retort frame, is conveniently held centrally in position by means of its connection with the tool feeding disk to be hereinafter described. An annular guard flange 39 fixed to the base plate enters a slot 40 in the retort frame to protect the ball bearings from foreign matter.

Fixed to the base plate 6 along its outer edge is an overhanging annular frame 41 which extends upwardly from the plate 6 exterior to the retort frame and then extends inwardly over the part of the box frame occupied by the retorts and serves to separate the retort frame from the tool feeding disk 42. The latter is in the form of a circular cover crowned at the center and held centrally in position by a spindle 43 set in a socket 44 in the base plate and passing through a central hub 45 in the tool disk.

The tool disk 42 rests by means of an annular downward projection 46 on an upward projection 47 on the retort frame and is keyed to rotate with the retort frame in the present instance by means of one or more pins 48 passing through a socket or sockets 49 in the tool disk into a socket or sockets 50 in the retort frame.

The stationary separating frame 41 is provided with two holes 51, 52, with which the retorts in each of the two series are brought consecutively into alinement as the retort frame rotates. The tool disk 42 is provided with two series of holes or bottomless pockets 53, 54, corresponding to and in alinement with the electric retorts in the retort frame and consequently in position to be brought consecutively into alinement with the holes 51, 52, in the stationary frame which is interposed between the tool disk and retort frame. Throughout the rest of its extent, the stationary frame 41 is imperforate or in any event is not provided with holes which will permit the tools to drop from their pockets in the tool disk and hence serves as a bottom to the pockets 53, 54, in the tool disk and also as a top or cover to the retorts, save only where the holes 51 and 52 are located. The plate 41 may have a ring of asbestos 41* located therein along over the retorts.

At one point throughout its extent, the base plate 6 is provided with passageways 55, 56, in position to aline with the retorts in the two series, respectively. These passageways are preferably formed in a steel plate or plates 57 set into a recess in the upper face of the base plate where the tool cooling tubes are attached. Throughout the rest of its extent, the base plate serves as a bottom to the electric retorts and these passageways 55, 56, serve as openings to the bottoms of the retorts as they one after another come over the passageways to permit the tools to be discharged into the cooling liquid.

From the passageways 55, 56, pipes 58, 59, extend downwardly from the base plate to a receiving box 5 and their connection with the receiving box is a water-tight one. From the said receiving box a large tool delivery tube 61 extends upwardly to within convenient reach of the operator and the cooling liquid is pumped by any suitable means, as, for example, by an electric pump 62, from the bottom of a supply tank 4 along a pipe 64 into an upwardly extending pipe 65, the latter being provided with a return bend 66 and a downwardly extending return pipe 67 extending into the upper part of the tank 4 at a distance from the intake end of the pipe 64.

From a point 68 in the upwardly extending pipe 65 below the return bend 66, a pipe 69 extends to a point where it is coupled with the feed pipe 70 leading into the upper part of the delivery tube 61. This feed pipe 70 is provided with a valve 71 for controlling the flow of liquid into the tube 61.

The top of the tube 61 is above the tops of the tubes 58 and 59 which receive the heated tools so that the water is forced to rise from the receiving box 5 up through the tubes 58, 59, to a point near their upper ends where they are provided with perforations 72, 73, forming an overflow which is received in a basin 74 surrounding the upper portions of the tubes and from the bottom of which a return pipe 75 leads to the upper part of the supply tank 4.

For the purpose of guiding the cutters as they leave the retort past the openings in the pipes through which the cooling liquid is forced and directing the cutters on their passage down the pipes, I may introduce short perforated tubes 58*, 59*, depending from the base plate into the mouths of the tubes through which the cooling liquid passes. The tools as they leave the retort will pass through these short tubes into the cooling liquid pipes.

By placing the return bend 66 above the point where the cooling liquid is taken to the feed pipe 70 and receiving box, the cooling liquid is kept under a constant head so that when the valve 71 is once set, the supply of liquid to the receiving box will be constant and uniform. Furthermore, by drawing the liquid from the bottom of the tank and returning it to the top at a distance from the point where it is drawn at the bottom, the temperature of the liquid will be kept substantially constant for a considerable length of time, long enough for practical purposes.

As the tools pass down through the tubes 58, 59, into the receiving box, they are received in a removable vessel 76 of such size

as may be drawn upwardly through the delivery tube 61.

For convenience, I locate a turn table 77 in the bottom of the receiving box and operate it by means of a spindle 78 which extends up through a suitable stuffing box in the top of the receiving box where it is provided with a crank 79. This turn table is conveniently so arranged that it will support two receiving vessels 76 and when it is turned to carry one of the receiving vessels from underneath the tool discharging tubes into position to be lifted up through the delivery tube 61, an empty vessel will be at the same time placed in position to receive the tools from the tubes 58, 59. These vessels which receive the tools are perforate, conveniently made of open mesh wire fabric, and they may be lifted up through the large tube 61 by means of any suitable hooked rod or other device of sufficient length to be passed down through the tube and engage them.

The vessels 76 pass down through openings 80 in a circular shelf 81 attached to the spindle 78 and a guard flange 82 depending from the top of the receiver 5 serves to retain any tools, which may have fallen during the swinging of the table, in position to be pushed by the flange into the vessel as it moves into receiving position.

A bend 83 at the lower ends of the tubes 58, 59, serves to gradually retard the speed of the falling tool to prevent injury.

In operation, the current of electricity having been turned on and the retorts raised to the desired heat, tools may be placed in the pockets in the tool disk just after they have passed over the holes in the intermediate disk thus requiring them to travel along with the tool disk a complete circuit and in so doing undergo a preliminary heating before they are finally discharged into the electric retorts. As they reach the limit of their circuit, they will pass through the holes in the intermediate plate and into the retorts, the discharge openings in the base plate being so located with respect to the openings, passageways or holes in the intermediate plate that the retort will have passed over the discharge opening in the base plate just before it receives the tool from the disk plate. In this position and subject to the heat of the electric retorts, the tools will be carried by the retort frame around on the base plate until they finally reach the discharge openings through the plate when they will be discharged into the tubes leading to the receiving box and will pass through the cooling liquid as they travel along down the said tubes. The retorts having been heated to a predetermined heat and the retort frame having been set to rotate at a speed which will assure the raising of the tool to that heat before it is discharged, the only attention required of the operator is to feed the tools into the disk plate and remove the vessels from the receiving box as they are filled.

What I claim is:—

1. A tempering furnace comprising a vertical retort, means for heating the retort, and means for passing a tool into and out of the retort by gravity.

2. A tempering furnace compri ing a vertical tube, means for heating the tube by electricity and means for passing a tool into and out of the tube by gravity.

3. A tempering furnace comprising a series of vertical tubes, means for heating tools by electricity and means for passing tools into and out of said tubes by gravity.

4. A tempering furnace comprising a revolving frame containing a series of electrically heated tubes and means for passing tools into and out of the tubes.

5. A tempering furnac comprising a revolving frame containing a plurality of series of electrically heated tubes and means for passing tools into and out of the tubes.

6. A tempering furnace comprising a series of electrically heated tubes and means for automatically introducing and discharging the articles to be tempered.

7. A tempering furnace comprising a horizontal frame supported upon ball bearings, retorts carried by the frame, means for heating the retorts, means for revolving the frame and means for introducing the articles to be tempered into and removing them from the retorts.

8. A tempering furnace comprising a retort frame provided with retorts, means for heating the retorts and a feed disk removably secured in position above the retorts for feeding the articles to be tempered to the retorts and means for removing the articles from the retorts.

9. A tempering furnace comprising a revolving retort frame provided with retorts, means for heating the retorts, a feed disk mounted to revolve with the retort frame and provided with perforations for the reception of the articles to be tempered and means for permitting the articles to fall from the feed disk into the retorts at predetermined intervals.

10. A tempering furnace comprising a revolving retort frame provided with retorts, means for heating the retorts, a perforated feed disk provided with perforations corresponding to the retorts and an intermediate plate forming a bottom to the perforations in the feed disk and a top to the retorts, the said feed plate being perforated at a suitable interval or suitable intervals to permit the articles to pass from the feed plate into the retorts and means for discharging the tools from the retorts.

11. An electric furnace comprising a revolving retort frame, a suitable support for the retort frame, an overhanging plate forming a peripheral closure for the retort frame and extending over the retorts within the frame, retorts, means for heating the retorts, a feed disk mounted to rotate with the retort frame and located above the said overhanging plate, the said feed disk being provided with perforations for holding the articles to be tempered in alinement with the retorts, the said overhanging plate being provided with perforations for permitting the articles to drop into the retorts at a predetermined point and means for removing the articles from the retorts.

12. A tempering furnace comprising a revolving retort frame provided with retorts, means for heating the retorts, a feed disk provided with perforations in alinement with the retorts, a plate interposed between the feed disk and the retort frame to form a bottom to the feed disk, perforations and a top to the retorts and a support for the revolving retort frame arranged to form a closure for the bottoms of the retorts and perforated at a predetermined point for permitting the discharge of the articles from the retorts.

13. A tempering furnace comprising electrically heated retorts, means for moving the retorts one after another along a prescribed path, means for holding the articles to be tempered in position to enter the retorts, means for automatically introducing the articles to be tempered into the retorts and means for automatically discharging the articles to be tempered from the retorts.

14. A tempering furnace comprising a retort frame, retorts located in the frame, means for heating the retorts, a non-heat-conducting means in which the retorts are embedded, means for introducing articles to be tempered into the retorts and means for permitting the discharge of articles from the retorts, the said retort frame and means for permitting the discharge of the articles from the retorts being movable relative to one another.

15. A tempering furnace comprising a revolving retort frame provided with retorts, electric coils for heating the retorts, electric conducting rings connected with the coils, stationary binding posts for receiving the electricity from a suitable source and brushes connecting the posts with the rings for transmitting current to the rings and hence to the coils around the retorts, means for introducing articles to be tempered into the retorts and means for discharging the articles from the retorts.

16. A tempering furnace comprising a series of individual heated retorts, means for heating the retorts, means for introducing the articles to be tempered into the retorts at predetermined intervals and means for positively regulating the time each article remains in the retort.

17. A tempering furnace comprising a series of retorts mounted to rotate as a series, means for heating the retorts, a feed disk for holding the articles to be tempered over the retorts preliminary to being discharged into the retorts, gears for rotating the series of retorts and feed disk and means for interchanging the gears to vary the speed of rotation of the series of retorts and feed disk.

18. In a tempering furnace, the combination with a series of retorts, means for heating the retorts, means for feeding the articles to be tempered and discharging them from the retorts, means for supplying cooling liquid, and a receptacle into which the tools are discharged, of a tube leading upwardly from the receptacle to a point where the articles are discharged from the retorts an overflow cup at the upper portion of said tube and an overflow conduit leading from said cup to the supply of cooling liquid.

19. In a tempering furnace, the combination with a series of retorts, means for heating the retorts, means for feeding articles to be tempered to and discharging them from the retorts and a supply of cooling liquid, of a receptacle for the cooling liquid located below the retorts and a tube leading upwardly from the receptacle to the retorts for receiving the heated article from the retort and the said tube being provided with a bend near its lower end for retarding the fall of the article as it enters the receptacle.

20. In a tempering furnace, the combination with a retort, means for heating the retort and means for feeding the article to be tempered to and discharging it from the retort, of a receptacle for the cooling liquid located below the retort, a discharge tube leading from the retort to the receptacle and a delivery pipe leading upwardly from the receptacle for removing the article from the cooling liquid in the receptacle.

21. In a tempering furnace, the combination with a retort, means for heating the retort and means for feeding the article to be tempered to and discharging it from the retort, of a receptacle for the cooling liquid located under the retort, a tube for directing the article from the retort into the receptacle, a turn table located in the receptacle, receiving vessels removably seated on the turn table, a delivery tube uprising from the receptacle and means for operating the turn table to bring the receiving vessels alternately underneath the discharge tube and delivery to tube.

22. In a tempering furnace, the combination with a retort, means for heating the retort and means for feeding the article to be tempered to and discharging it from the re-

tort, of a receptacle for cooling liquid located below the retort, a discharge tube connecting the retort with the receptacle, a delivery tube uprising from the receptacle, a turn table mounted in the receptacle, receiving vessels removably seated on the turn table, a guard plate located over the turn table and provided with openings through which the receiving vessels are passed onto the table and a guard flange depending from the top of the receptacle for retaining the articles on the guard plate and forcing them through the openings into the vessels when the turn table is turned.

23. In a tempering furnace, two rotating frames or disks and an intermediate stationary frame or disk, one of said frames or disks being provided with retorts and another of said frames or disks with passageways separated by intervening spaces for opening and closing communication with the retorts and means for heating the retorts.

24. The combination with a retort for heating the article to be tempered, of a tube into which the article to be tempered is discharged, means for connecting the interior of said tubes with the interior of said retort and means for maintaining an upward flow of cooling liquid through said tube, the said tube being provided at its upper portion with vertically elongated openings for the outflow of the cooling liquid.

25. The combination with means for heating the article to be tempered, of a pipe into which the article is discharged from the retort, means for passing the cooling liquid through said pipe, the said pipe being perforated at its upper portion for the discharge of the liquid therefrom and a perforated tube depending into the mouth of the said cooling liquid tube for directing the article to be tempered as it leaves the retort.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this 22d day of Aug. 1906.

VERNON ROYLE.

Witnesses:
VERNON E. ROYLE,
HEBER ROYLE.