

(No Model.)

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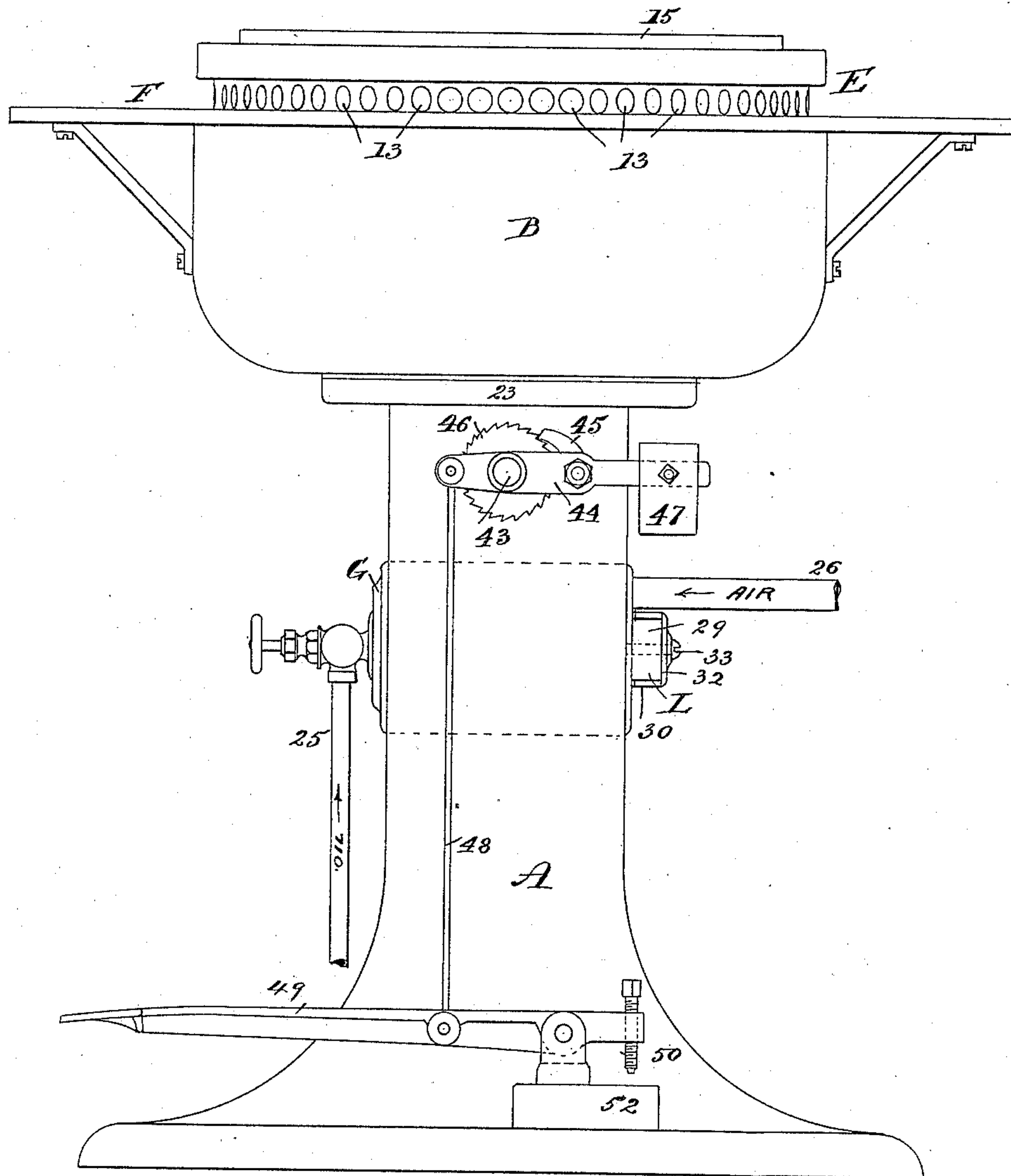
J. H. BULLARD.

ROTARY FURNACE FOR HEATING BLANKS.

No. 426,556.

Patented Apr. 29, 1890.

Fig. 1.



Witnesses

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" "

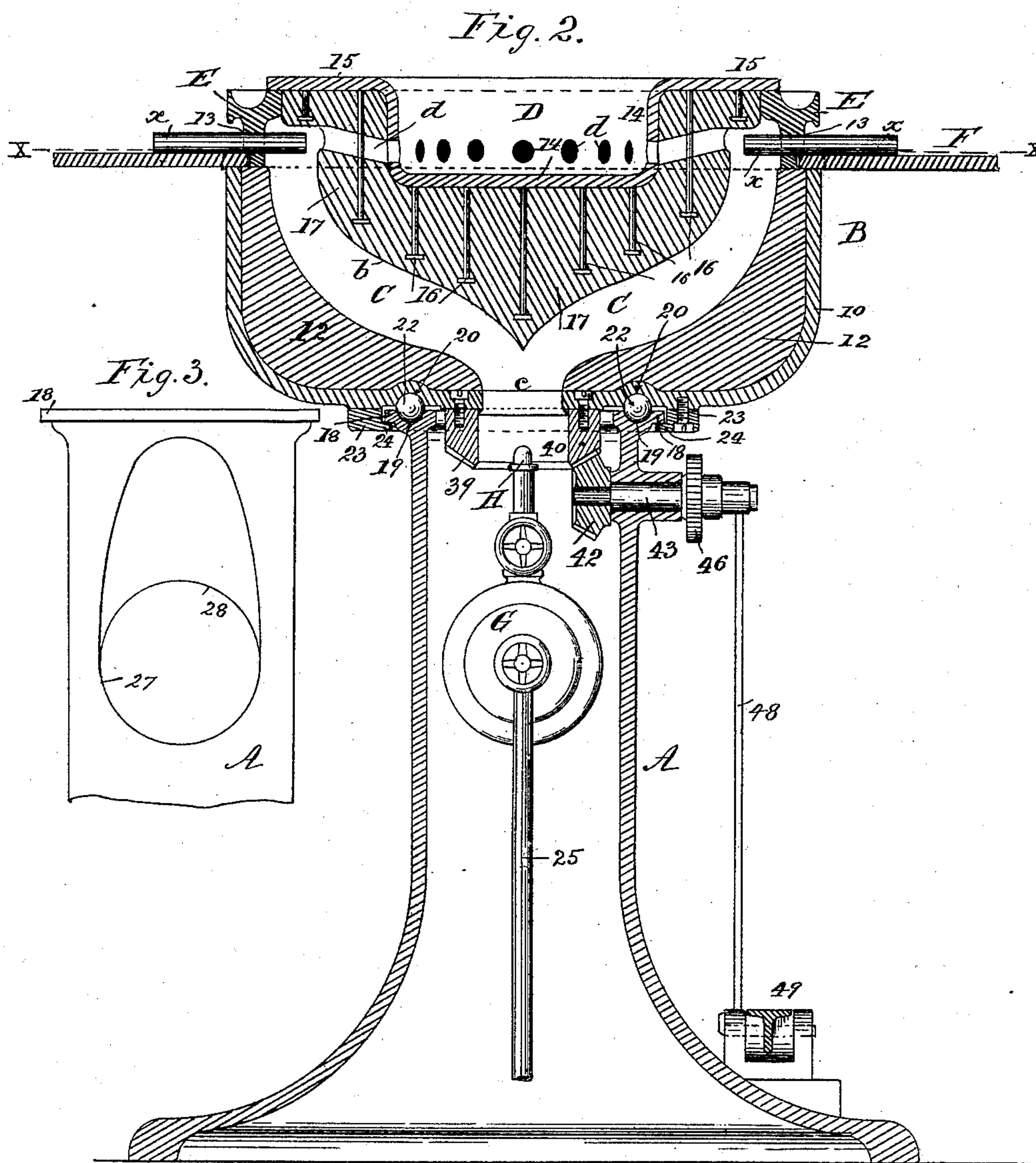
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3 Sheets—Sheet 3.

J. H. BULLARD.

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Fig. 4.

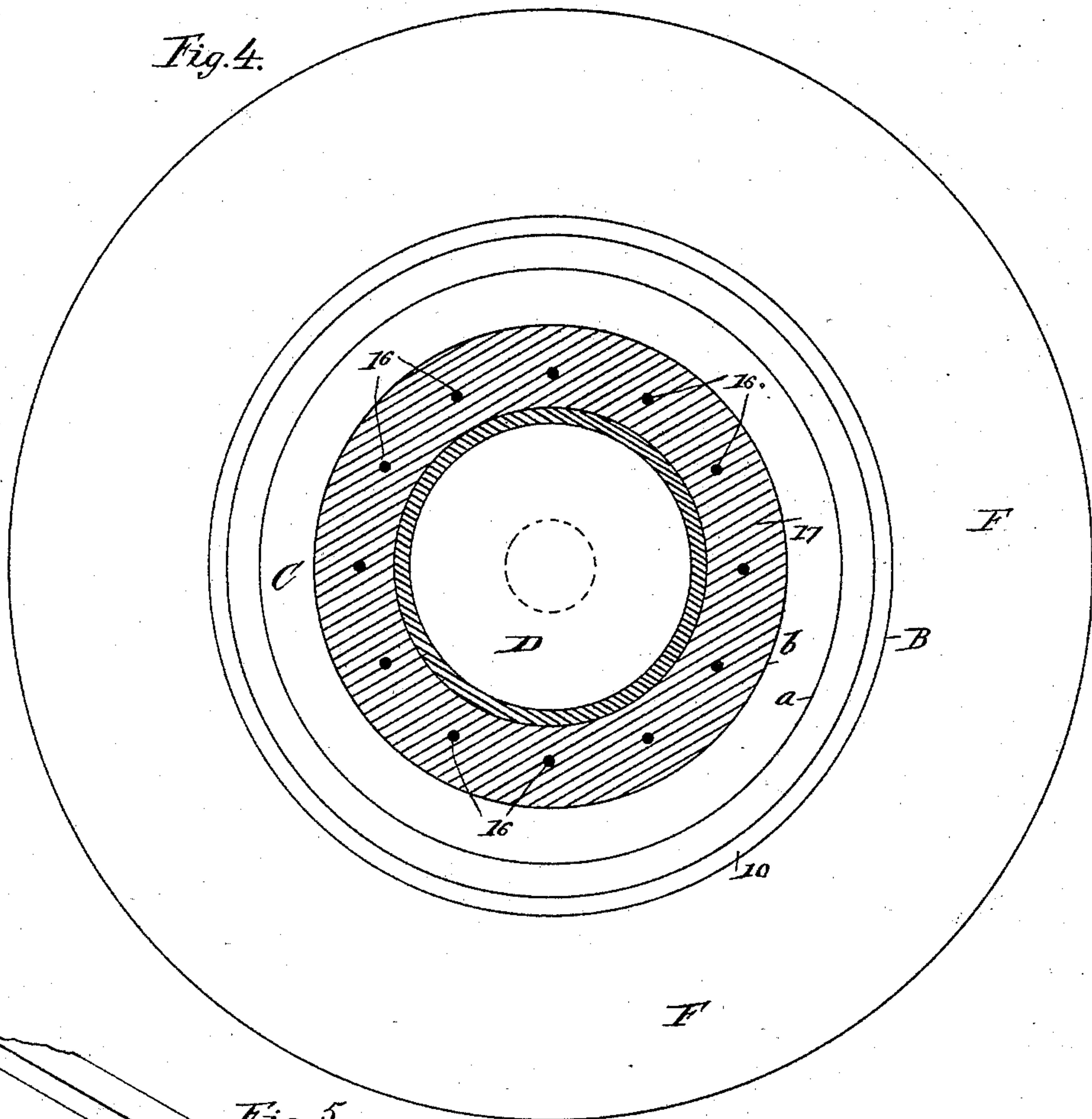


Fig. 5.

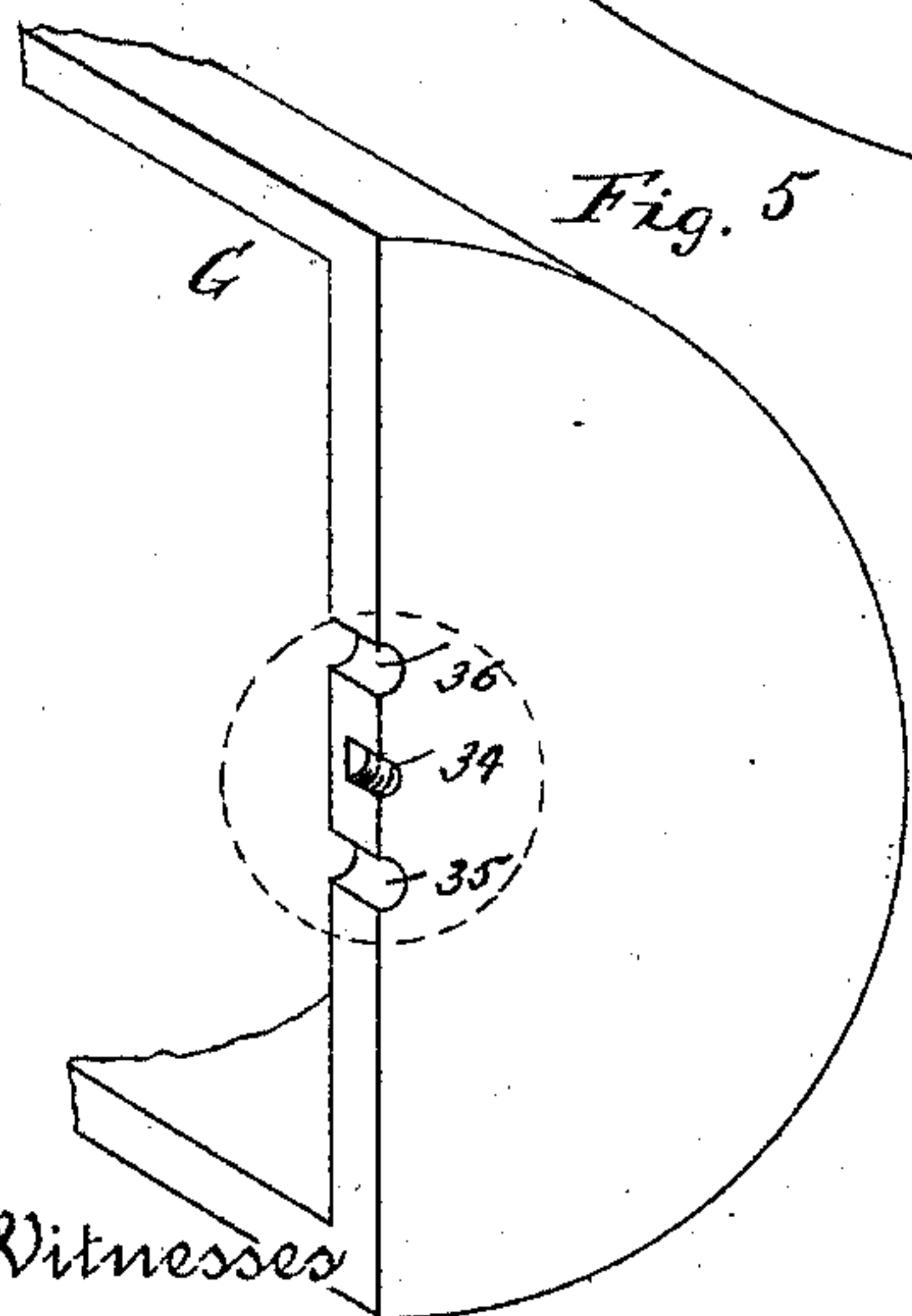
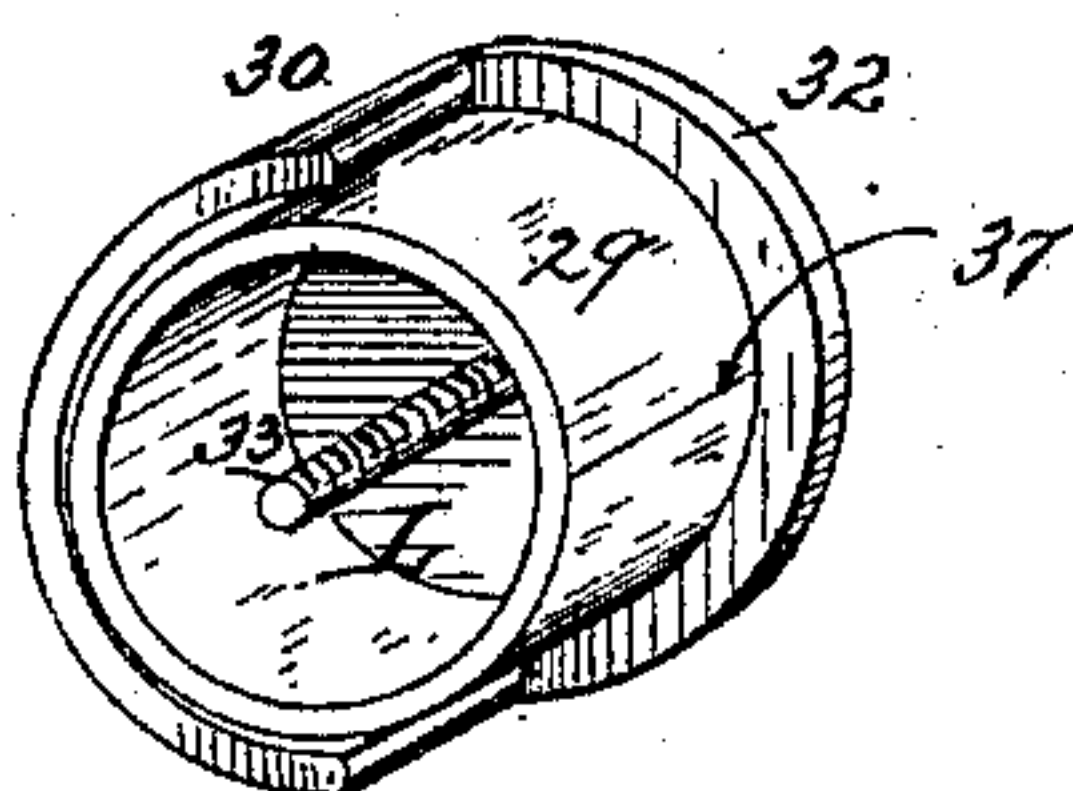


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES H. BULLARD, OF SPRINGFIELD, MASSACHUSETTS.

ROTARY FURNACE FOR HEATING BLANKS.

SPECIFICATION forming part of Letters Patent No. 426,556, dated April 29, 1890.

Application filed November 15, 1888. Serial No. 290,936. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. BULLARD, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Rotary Forges, of which the following is a specification.

This invention relates to rotary forge-furnaces for heating spindle-shaped blanks from which bolts and similar small articles are to be forged, the object of which is to so improve the construction of furnaces of this character as to enable an easier, more rapid, and uniform heating of the blanks, and in the present invention the heating is performed from the combustion of hydrocarbon in conjunction with air, although, as will be apparent, without departing from certain features of the invention, the heating may, in a more or less satisfactory degree, be effected from the burning of fuel of other description; and the invention consists in the constructions and combinations of parts, all substantially as will hereinafter appear, and be set forth in the claims.

In the drawings accompanying, Figure 1 is a side elevation of the rotary forge-furnace; and Fig. 2 is a central vertical section of the same, taken on a plane at right angles to the face of said Fig. 1. Fig. 3 is a detail view of a portion of the supporting-standard. Fig. 4 is a horizontal section on the line *xx*, Fig. 2. Figs. 5 and 6 are perspective views of details to be hereinafter referred to.

The present furnace comprises a supporting-standard A and a furnace chamber-head B, supported thereby and rotatable thereon. The chamber-head comprises an outer basin-shaped body *a* and an inner body *b* of inverted conoidal shape, said bodies being separated from each other, forming an upwardly flaring or funnel-shaped annular combustion-chamber or wide passage C, said chamber being closed at its top; but entrance for the fuel vapors or gas or for products of combustion is had at the bottom of said chamber through the axial opening *c* in the bottom of the outer basin-body portion *a*. In the upper and wider portion of the inner conoidal body is a basin or chamber D, open at the top and more or less horizontal, and radial passages *d* lead to the said basin from the

upper portion of said annular upwardly-flaring chamber. The said bodies are to be essentially formed of fire-brick or other suitable refractory material strengthened and supported by any suitable metal or material, and in practice and under the conditions shown the outer basin-body is formed by an outer iron shell 10, having a central aperture, and the fire-brick 12 molded therein, also having a central aperture. An annular cast-iron frame E, radially perforated, as at 13, and to be designated the "blank-receiving ring," rests on the upper edge of the lower body, and the upper body comprises a basin-shaped casting 14, having a broad flange 15 resting on the blank-receiving ring and provided with downwardly-extending and shouldered metal rods 16, formed thereon or secured thereto, and the fire-brick 17, molded upon the under side of said flanged basin-casting and around and upon the said shouldered rods, the latter serving to more securely insure the retention of the fire-brick in its pending support from the casting above. A ring-shaped table F rests on the upper edge of the body B and surrounds the blank-receiving ring.

The standard A at its upper portion is provided with an outwardly-projecting flange 18, and in its top has an annular channel 19, that is semicircular in cross-section, the bottom of the basin-casting 10 being provided with an annular channel 20, also of semicircular cross-section, the said two channels accommodating and forming a case for the balls 22, and constituting with the latter a ball-bearing for easy rotation of the furnace-head on the standard. A ring 23, having an internally-projecting flange 24, is secured on the bottom of the lower body, bearing by its said flange under the outwardly-extending flange of the standard, such interlocking of the rotatable and stationary parts preventing any accidental displacement of the former from its rest and bearing on the latter.

Means for producing and introducing heat to the annular chamber C from below or through the aperture *c* are to be provided, and, without departing from certain features of the invention particularly relating to the chambered head, may be of any approved class or description; but the said chambered head has been particularly designed for the

use in connection therewith of the products of combustion of hydrocarbon fuel; and G represents a cylindrical burner-tank supported with its axis horizontal by and within the walls of the standard A, somewhat below the opening *c* to the furnace-chamber.

An oil-supply pipe 25 leads to the lower portion of the burner-tank, the oil being supplied thereto under any suitable pressure, as by a pump; or the pipe may be similarly connected to the burner tank, passing thereto from an oil-supply tank located above the burner-tank, the oil passing from the said supply to the burner-tank under gravity; and a pipe 25, for conducting air under suitable pressure, also communicates with the chamber of the burner-tank above the desired oil-line, the air being supplied thereto under a regulated pressure by an air-pump, and all as has heretofore been made manifest by and in Letters Patent of the United States granted to me July 5, 1887, No. 365,790, to which reference may be had. A burner or atomizer H, in substance and operation the same as illustrated in the above-referred-to patent, forms a part of said burner-tank and is located below and in the axis of the circular furnace-head. The said burner-tank resting in the borders of the apertures 27 28, Fig. 3, formed in the standard, has at one end a supplemental chamber L, formed of an inner tubular glass body 29, and an outer semi-cylindrical metallic shield or casing 30, having a head 32, overlying the outer end of the transparent body, and a headed screw-rod 33, passing centrally through said head and by its inner end engaging the screw-threaded socket 34 in the end of the burner-tank proper, holds the said transparent body and shield therefor in place on the end of the burner-tank.

The lower and upper apertures 35 and 36 in the end of the burner-tank afford means of entrance, respectively, for oil and air into the supplemental chamber, whereby a uniform oil-level may be maintained in both the main and supplemental tank-chambers. A gage-line 37 is to be drawn horizontally on the uncovered portion of the glass casing to correspond with the oil-level desired.

The rotation of the head on the standard is secured by the following means: A bevel-gear 39 is secured on the under side of the basin-casting 10, said gear being formed with a central aperture 40 in continuation of the passage-opening *c* to the funnel-shaped chamber C. A bevel-gear 42, carried by a short shaft 43, rotatable in bearings of the standard, meshes with the first-named gear 39. A lever 44, carrying a pawl 45, is loosely hung for a tilt on the said shaft, its pawl engaging the teeth of a ratchet-wheel 46, fixed on the shaft. To the rear end of the tilting pawl-carrying lever a weight 47 is hung, and to the forward end of said lever one end of a connecting-rod 48 is fastened, which by its lower end is attached to an intermediate portion of a treadle

49, said treadle having an extension beyond its fulcrum carrying an adjusting stop-screw 50. On a depression of the treadle-lever the pawl-carrying arm is swung by its rear end upwardly, forcing by its pawl the ratchet around the distance of one or more teeth. The action of the weight is to then tilt the outer end of the lever 44 upwardly, the rear end of the treadle moving downwardly until its rear stop-screw strikes the abutment 52 therefor. By raising the screw the parts may be moved for the pawl to retrace over a greater number of ratchet-teeth, while on a lowering thereof the pawl will retrace a less number of teeth, and consequently under the adjustment of the stop-screw each operation of the treadle will insure a more or less extent of rotary motion of the basin-head, as desired.

While the treadle and pawl devices for rotating through the gear-shaft 43 the furnace-head by foot-power, substantially as shown, are of great efficiency, the rotation of the said gear-shaft may be secured in various other ways well known for securing the rotation of shafts, as by a crank-arm or belt and pulley.

In the use of the furnace, as above described, for heating blanks of spindle form, with a number of such blanks inserted by their ends to be heated through several or all of the apertures of the blank-receiving ring E to project over the combustion-chamber C, (two of such blanks *x* being so shown in place in the sectional view, Fig. 2,) the supply of hydrocarbon and air is turned on, which is entered into said combustion-chamber and ignited and burned therein, being evenly distributed throughout the chamber, producing a most intense incandescent and smokeless heat, which, by the cock provided on the burner H, may be regulated in its intensity, as desired or necessary. After a heated blank has been removed from a ring-aperture by the operator for its being formed into shape by drop-forging or compressors in the usual manner, not necessary to herein specify, it is replaced by another, and so on, the head being intermittently rotated to successively bring the blanks to within easy reach of the operator. In practice at the first introduction of the blanks in and through the ring-apertures they are placed to project but slightly; but before being brought around to the place of the workman again for their removal they are forced to project farther within the furnace-chamber.

The table F, which need not necessarily be circular, affords convenient support for the blanks before heating, and in some cases after heating, but of course may be dispensed with.

The basin-shaped chamber D in the upper part of the furnace-head, to which the heat may pass from the chamber C with more or less freedom, serves as a heating-receptacle into which the blanks may be entered to be partially heated before being placed through the ring-apertures.

By the use of a hydrocarbon fuel and the

employment of the burner-tank apparatus therefor, in conjunction with the peculiarly-formed furnace-head, a minimum amount of space below the combustion-chamber is required, enabling a machine for the purpose described to be complete and compact within itself, while the peculiar effect upon the blanks to be forged of the heat produced and employed as described, as extended experience has demonstrated, is a most desirable and advantageous one, for no scale is formed on the surface of the completed forgings, as is the case under a heat produced by coal, and the so-produced heat has the effect of annealing or softening unduly hard iron or that which is easily fractured, rendering it and its product more valuable.

What I claim as my invention is—

1. In a forge-furnace, a head having formed therein an annular flaring or funnel-shaped combustion-chamber C, with a central lower opening leading thereto, and a basin-shaped chamber D thereabove, the bottom and side walls thereof forming a partition between said two chambers, openings *d*, leading inwardly from the upper portion of said chamber C to the chamber D through the walls thereof, and a series of blank-entering apertures leading to said combustion-chamber C through the upper portion of its outer wall, substantially as described.

2. In a forge-furnace, a head comprising a lower basin-shaped body with a central lower opening therein and a body of substantially an inverted conical form supported above and separated from said lower body, whereby an annular funnel-shaped chamber is formed, and openings leading from the exterior of said head to said funnel-shaped chamber, combined with a burner located at said central lower opening for injecting liquid fuel into said furnace and toward the apex of said conical body, for the purpose set forth.

3. A head for a forge-furnace, consisting of a basin-shaped body *a*, having a central lower opening *c*, a ring E, having a series of apertures therethrough and supported on the upper edge of said body *a*, and the body *b*, of substantially an inverted conical form, having an overlying flange 15, by which it is supported from said ring E within and separated from the lower body, substantially as and for the purpose described.

4. A head for a forge-furnace, consisting of a lower basin-shaped fire-brick body 12, having a cast-iron outer shell, an apertured ring E, resting on the upper edge of said body, and the upper body formed of the upper flange-casting 15, provided with the inverted conoidal-shaped fire-brick molded on and about said casting and its rods, and having outlet-openings *d* therein, said body being by its flange supported from said ring E within and separated from said lower body, substantially as and for the purpose described.

5. The combination, with a standard and a furnace-head supported thereon, said head

having formed therein an annular upwardly-flaring or funnel-shaped combustion-chamber with a central contracted lower opening leading thereto, and having one or more outlet-openings leading from its upper portion, and also provided at its upper portion of its outer wall with a series of directly-entering blank-entering apertures, of a fuel-burner located in said support below the central lower opening in said head, substantially as set forth.

6. The combination, with a standard and a furnace-head supported for rotation thereon, said head having formed therein an annular flaring or funnel-shaped combustion-chamber with a central lower opening leading thereto, and having one or more outlet-openings leading from its upper portion, and provided at the upper portion of its outer wall with a series of blank-entering apertures leading to said annular funnel-shaped combustion-chamber, of a fuel-burner located in said support below the central lower opening in said head, substantially as described.

7. The combination, with a standard and the shaft 43, having a bearing therein and provided with the gear 42 and means for rotating said shaft, of the furnace-head supported for rotation on said standard, provided with the apertured gear 39, and having formed therein an annular flaring or funnel-shaped combustion-chamber with a central lower opening leading thereto, and having one or more outlet-openings leading from its upper portion, and provided at the upper portion of its outer wall with a series of blank-entering apertures leading to said annular funnel-shaped combustion-chamber, and a fuel-burner supported in said standard below the said central lower opening, substantially as and for the purpose described.

8. The combination, with a standard having the circular channel 19 in its upper end, the shaft 43, having a bearing in said standard and provided with the gear 42 and means for rotating said shaft, and the balls 22, resting in said channel, of the furnace-head provided in its bottom with the circular groove 20, overlying said balls, and the apertured gear 39, and having formed therein an annular flaring combustion-chamber with a central lower opening leading thereto, and having one or more outlet-openings leading from its upper portion, and provided at the upper portion of its outer wall with a series of blank-entering apertures leading to said annular funnel-shaped combustion-chamber, and a fuel-burner supported in said standard below the said central lower opening, substantially as and for the purpose described.

9. The combination, with a standard having the circular channel 19 in its upper end and provided thereat with the outwardly-extending flange 18, the shaft 43, having a bearing in said standard and provided with the gear 42 and means for rotating said shaft, and the balls 22, resting in said channel, of the furnace-head provided in its bot-

tom with the circular groove 20, overlying
said balls, the inwardly-flanged holding-ring
interlocking with said standard-flange 18 and
the apertured gear 39, and having formed
5 therein a combustion-chamber with a central
lower opening leading thereto, and having one
or more outlet-openings leading from its up-
per portion, and provided at the upper portion
of its outer wall with a series of blank-enter-

ing apertures, and a fuel-burner supported in
said standard below the said central lower
opening, substantially as and for the purpose
described.

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Witnesses:

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H. A. CHAPIN.