

(No Model.)

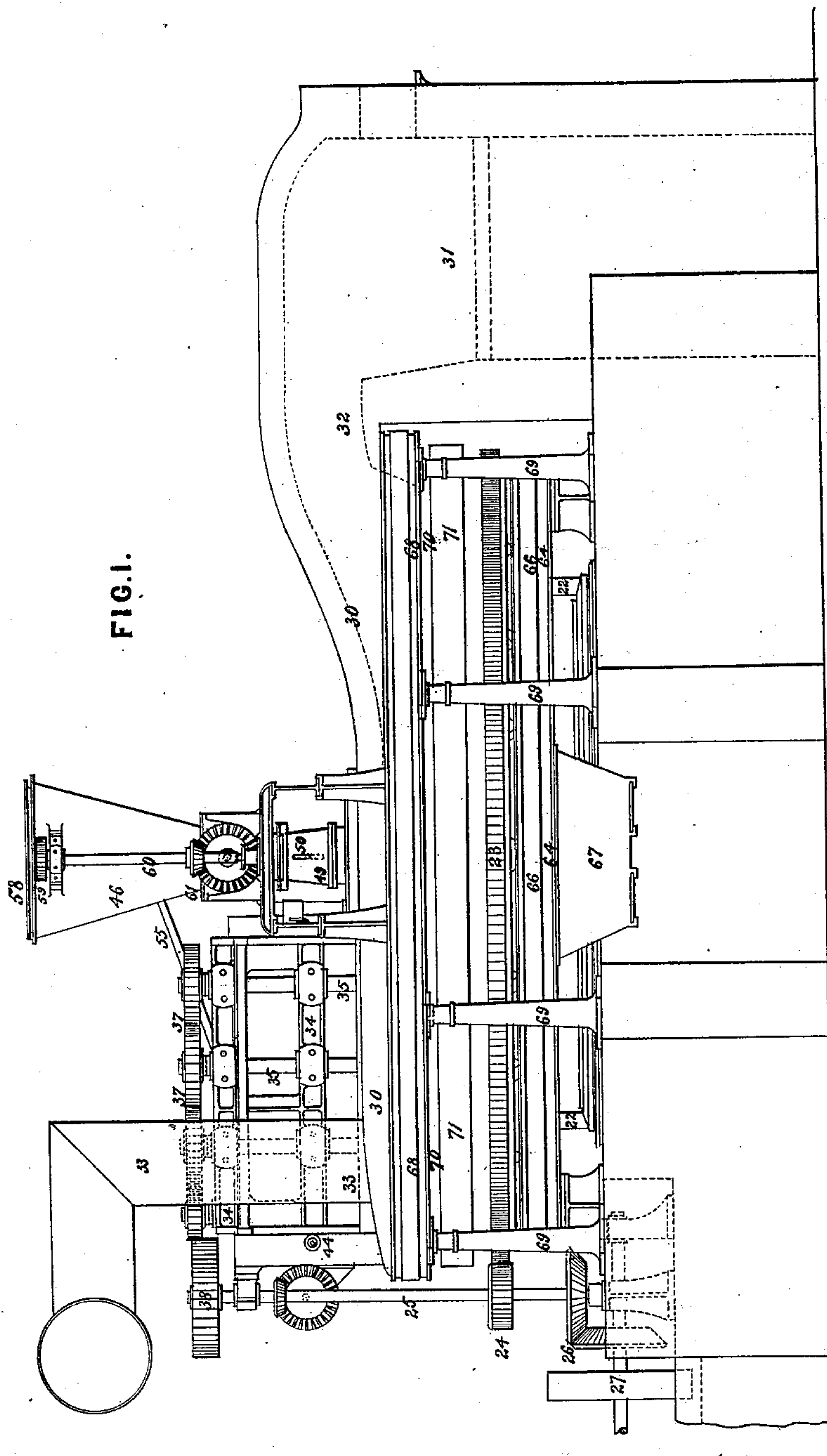
4 Sheets—Sheet 1.

J. MACTEAR.

FURNACE FOR CHEMICAL PROCESSES.

No. 253,734.

Patented Feb. 14, 1882.



Witnesses
Harry Drury
James F. Jobin

Inventor:
James Mactear
by his Attorneys,
Howson and Sons

(No Model.)

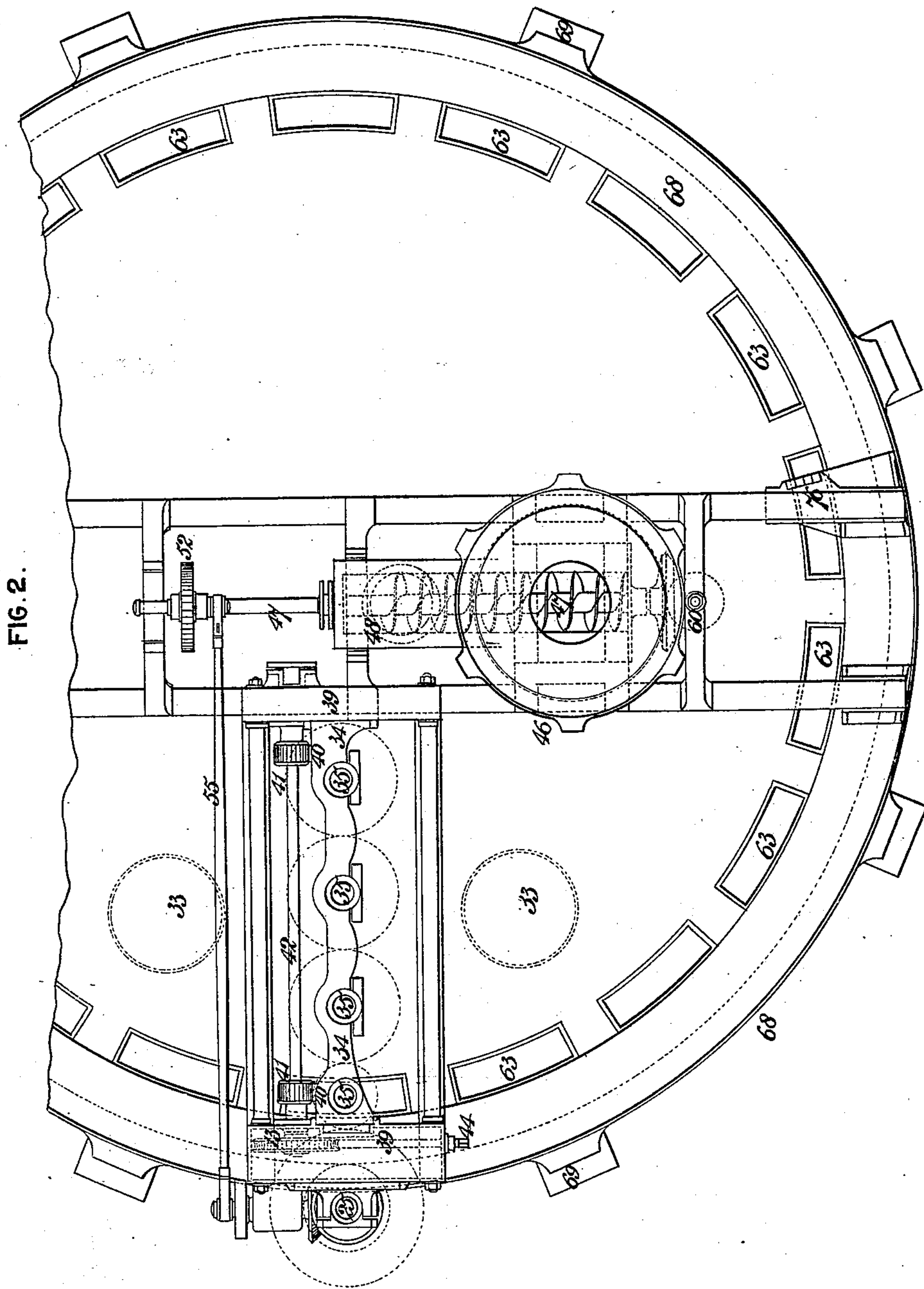
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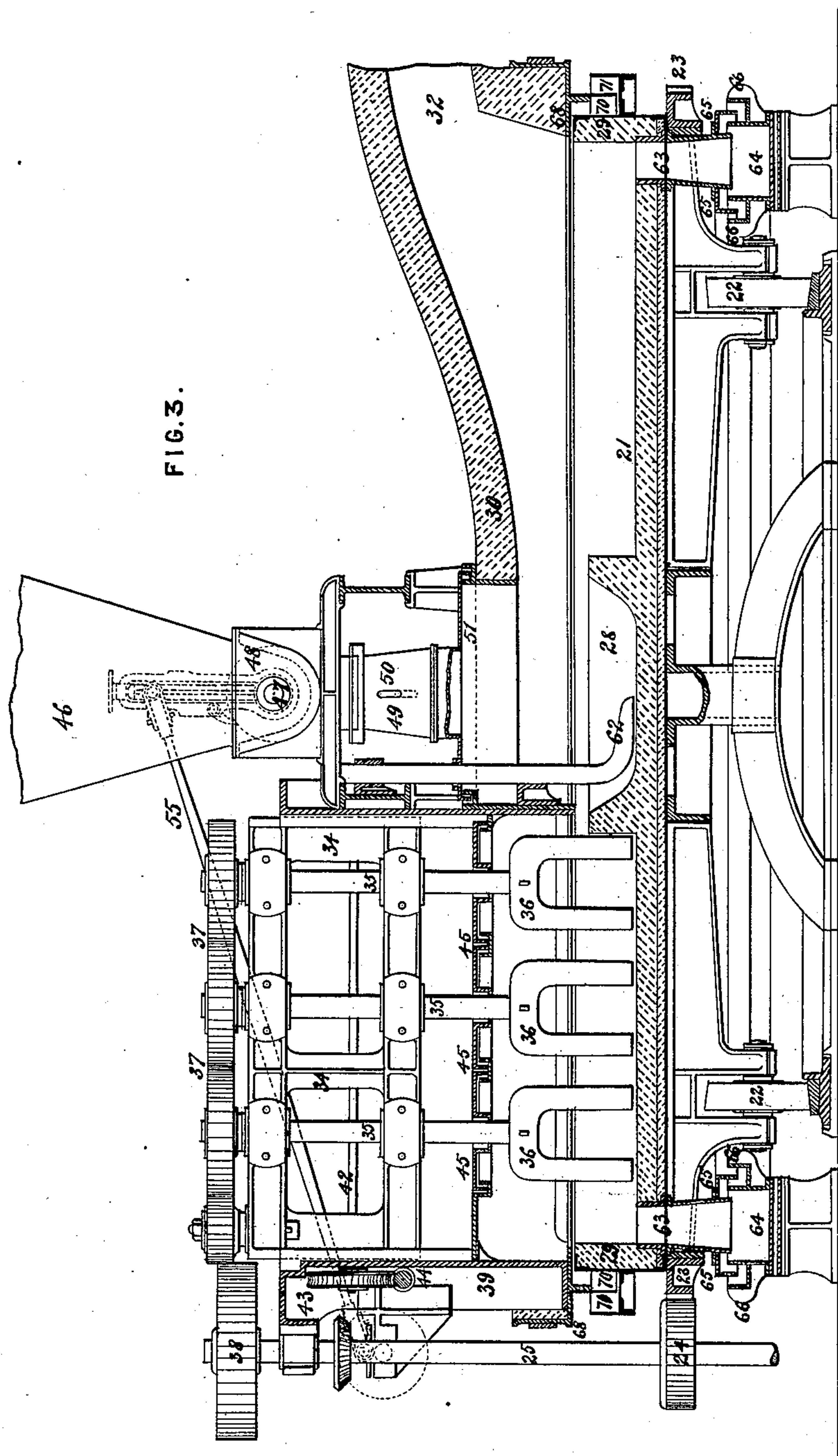
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4 Sheets—Sheet 4.

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FIG. 7.

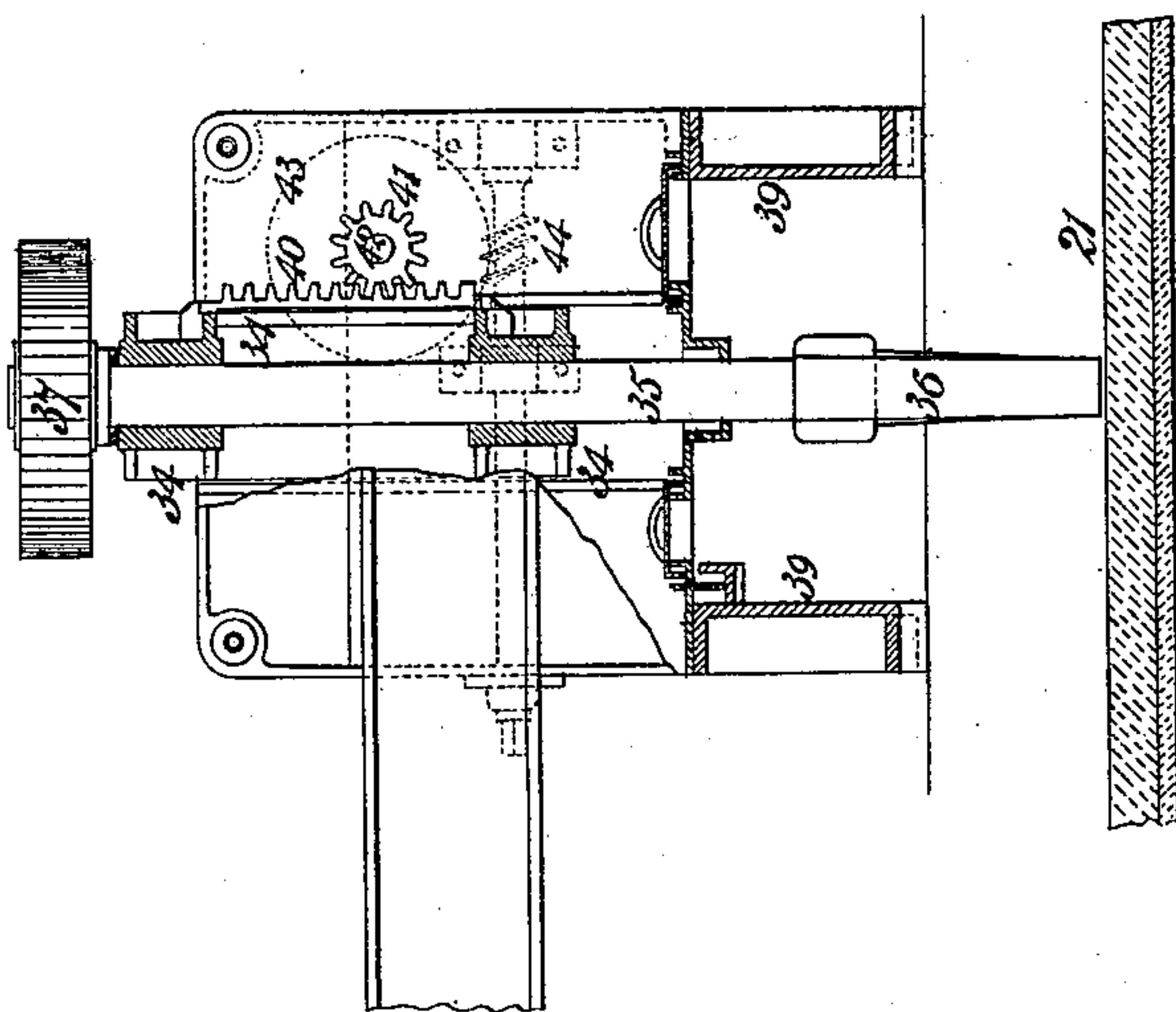


FIG. 9.

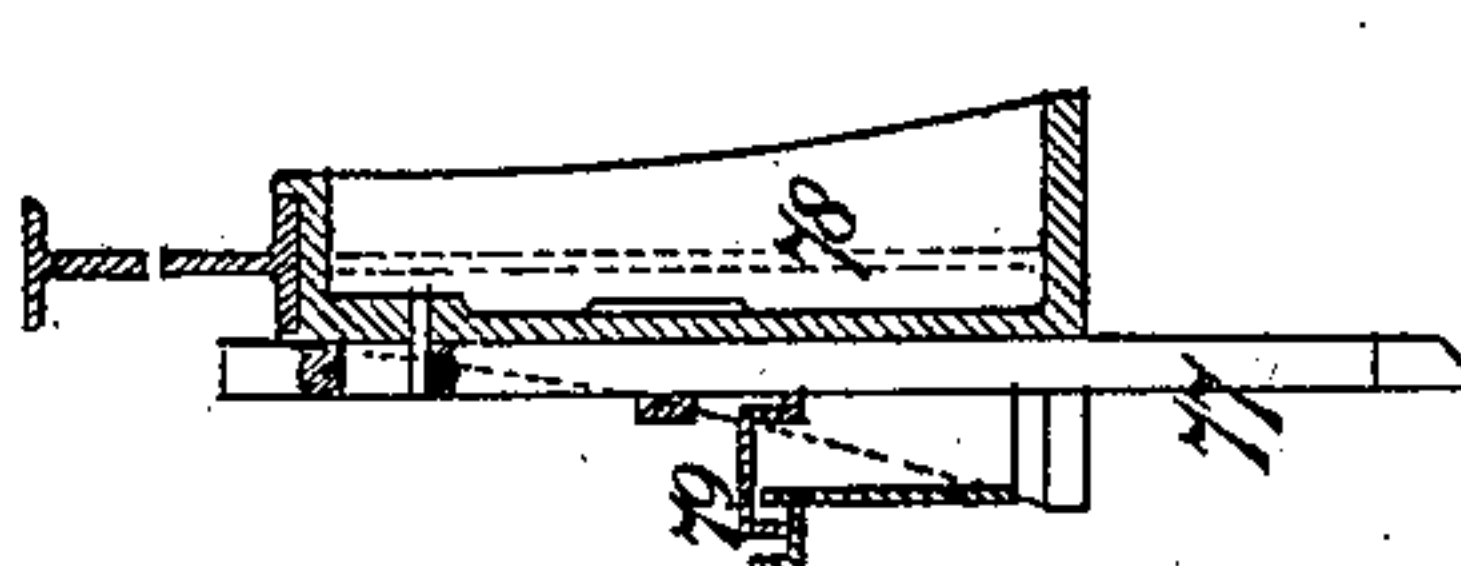


FIG. 8.

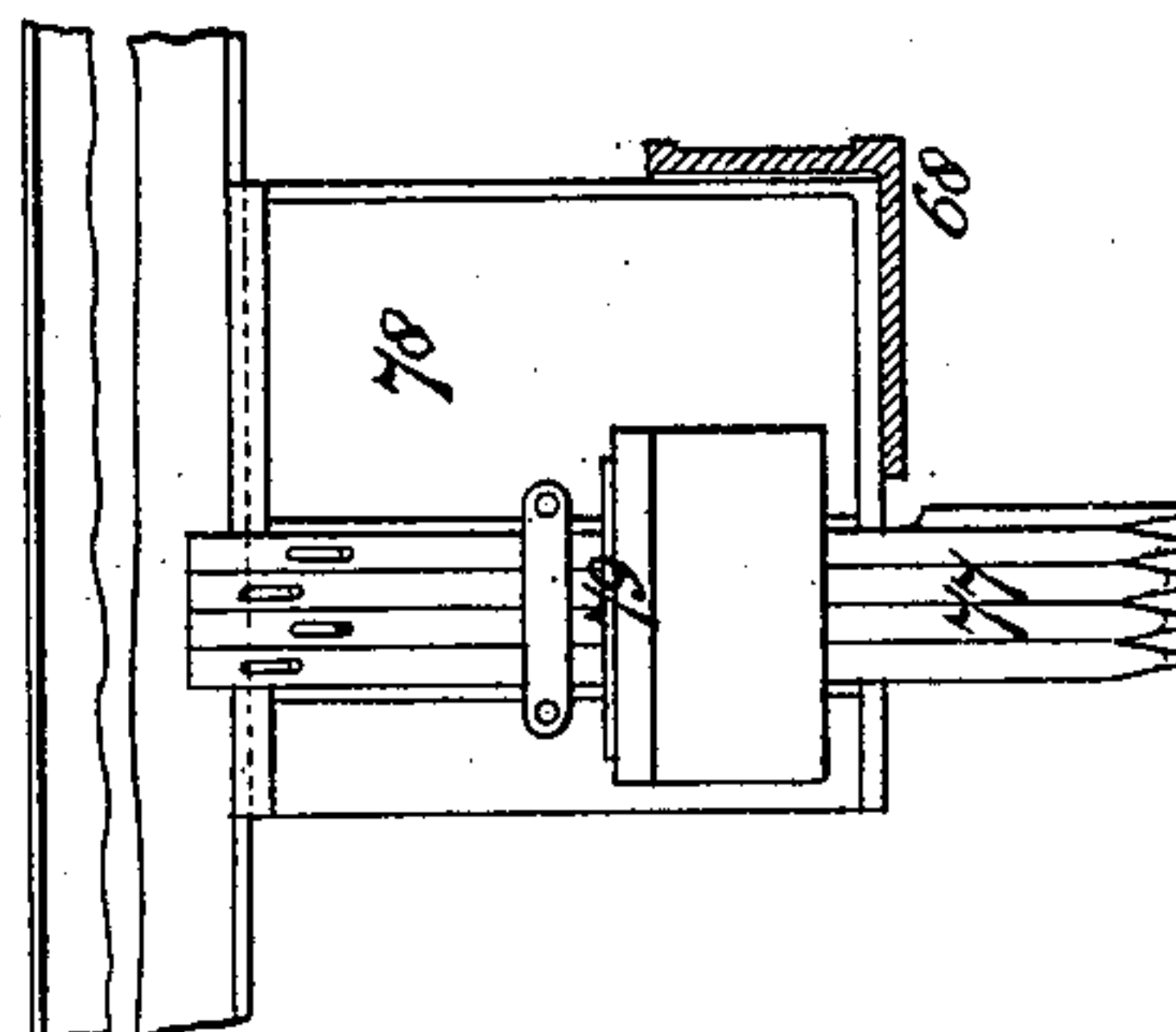


FIG. 4.

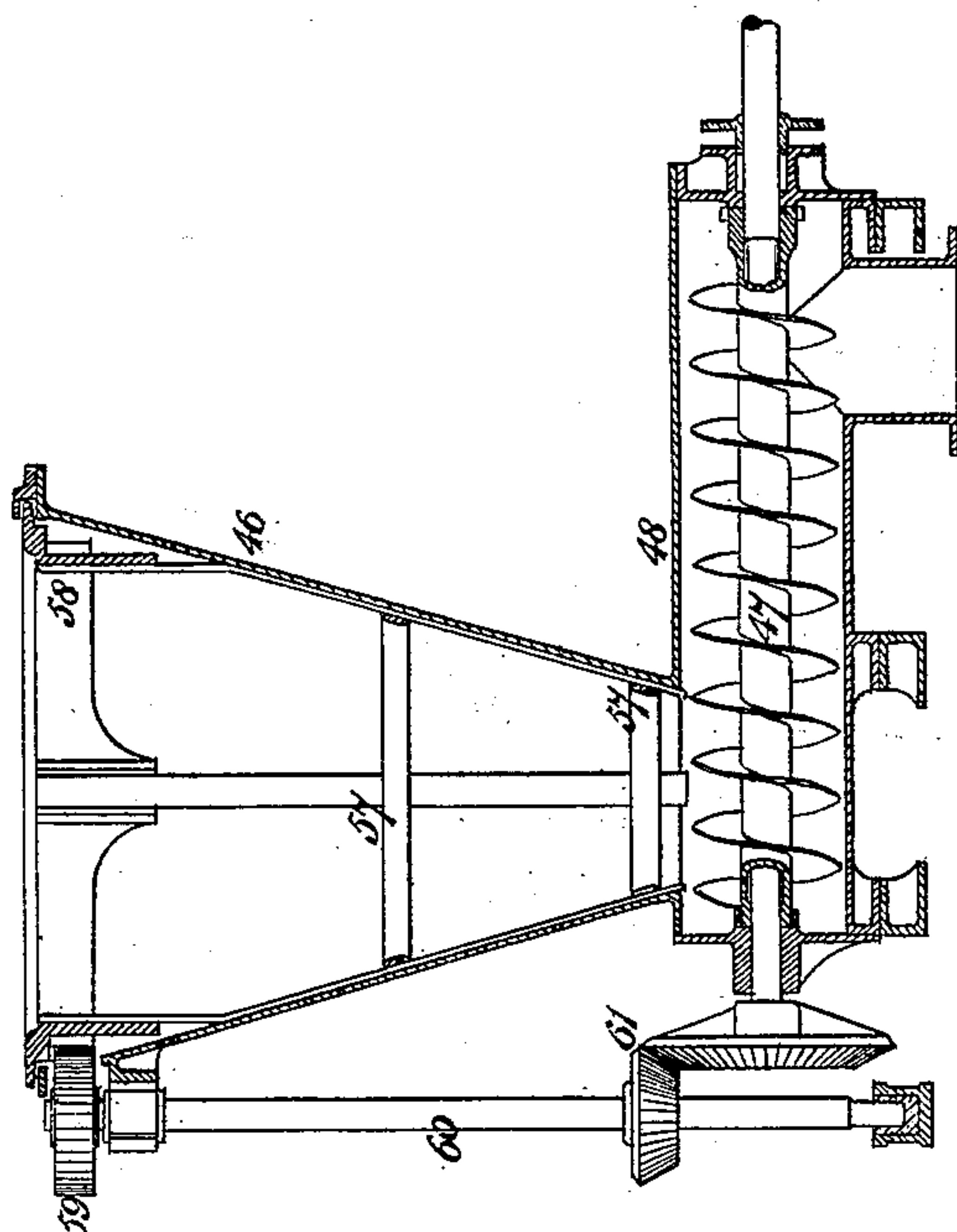


FIG. 6.

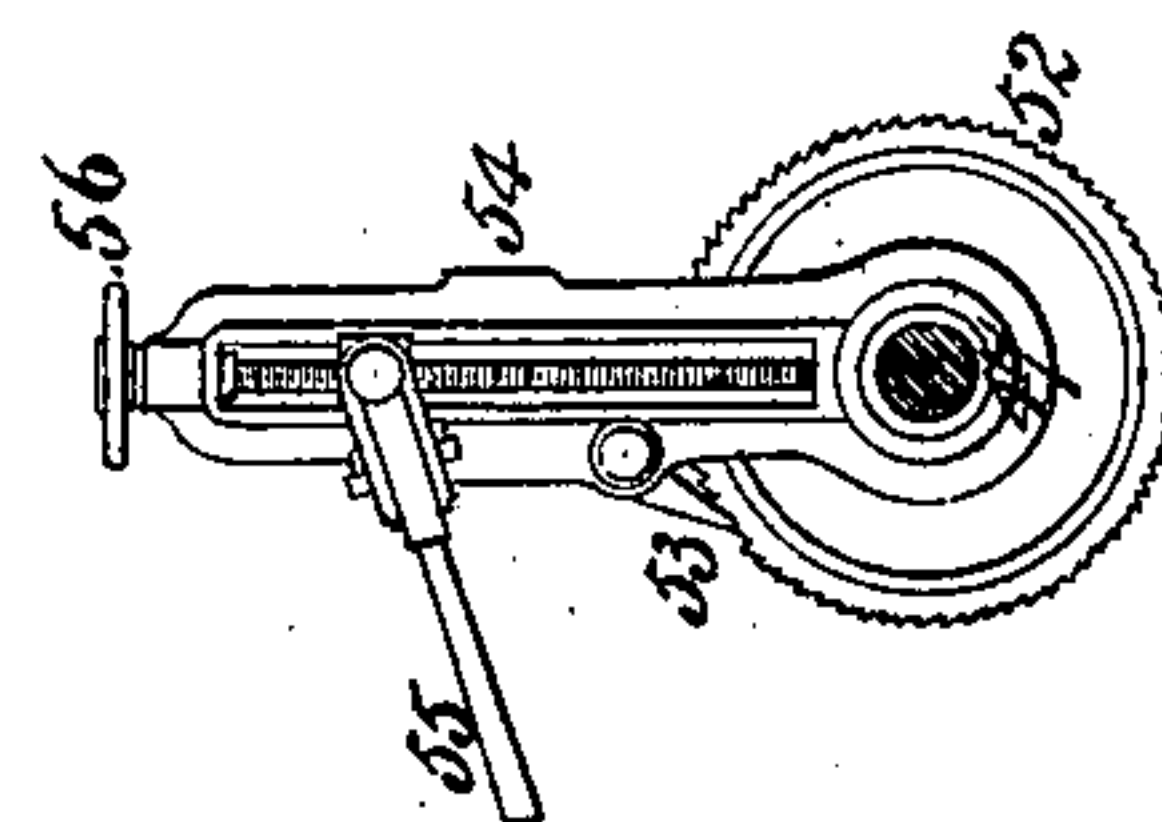
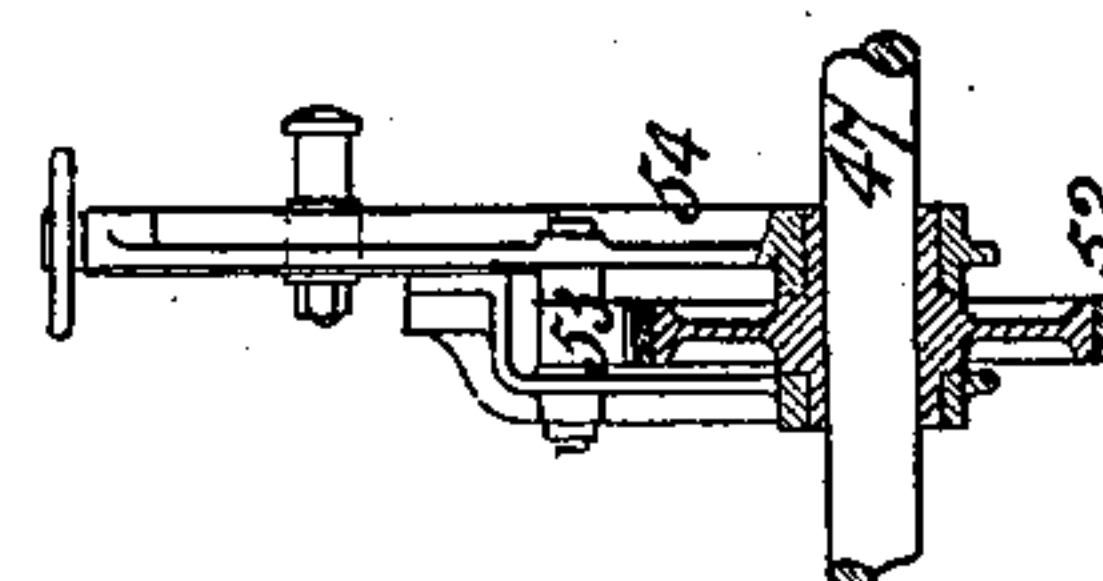


FIG. 5.



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UNITED STATES PATENT OFFICE.

JAMES MACTEAR, OF GLASGOW, COUNTY OF LANARK, SCOTLAND.

FURNACE FOR CHEMICAL PROCESSES.

SPECIFICATION forming part of Letters Patent No. 253,734, dated February 14, 1882.

Application filed December 27, 1881. (No model.) Patented in England November 23, 1879, in France December 16, 1880, and in Belgium May 23, 1881.

To all whom it may concern:

Be it known that I, JAMES MACTEAR, a subject of the Queen of Great Britain and Ireland, and residing at Glasgow, county of Lanark, Scotland, have invented certain Improvements in and connected with Furnaces for Chemical Processes, (for which I have obtained a patent in Great Britain, No. 4,870, November 28, 1879,) of which the following is a specification.

My invention has for its object to obtain increased efficiency and economy in the use of furnaces employed for chemical processes by securing a practically continuous action both in the feeding and in the discharging of the materials.

My improvements are applied to a furnace having a horizontal circular revolving bottom made of iron, combined with fire-brick or other suitable refractory material, and formed with a raised rim around the outer edge. This furnace-bottom, which is mounted on wheels and made to rotate by means of suitable gearing, is covered by a brick-work roof, and is heated by one or more fires, the flames or fire-gases being admitted at one side into the space between the furnace bottom and roof, and passing off by two outlets at the opposite side. At the part between the outlets a set of stirrers are placed, consisting of blades or prongs fixed on the lower ends of vertical shafts driven by gearing at their upper ends. The furnace-bottom is formed with a central compartment consisting of a circular dish having a raised periphery or rim, and from this central dish to the outer rim of the furnace-bottom there extends a flat, or nearly flat, fire-brick or other suitable surface.

The materials to be furnaced or heated are introduced into the central compartment or dish by preference continuously and at a regular rate. When the materials are, for example, chloride of sodium and sulphuric acid for making sulphate of soda, the chloride of sodium may be fed in by means of a screw and the sulphuric acid be led by a pipe. As the materials accumulate in the central dish they overflow over its edge or rim and spread over the furnace-bottom, from the outer part of which the finished materials pass down by one or more chutes or discharge-ducts into a sta-

tionary channel placed beneath the rotating furnace-bottom.

The figures on the four accompanying sheets of drawings represent my improved furnace as arranged for continuously decomposing salt or converting sodium chloride into sulphate of soda, Figure 1 being an elevation; Fig. 2, a plan with the furnace-roof removed; Fig. 3, a vertical section, and Figs. 4 to 9 enlarged views of details.

The furnace bed or hearth 21, which is of a generally flat form and circular in plan, is constructed with an iron frame-work, which is mounted on wheels 22, and is driven by means of a ring of spur-teeth, 23, with which there gears a pinion, 24, on a vertical shaft, 25. This shaft 25, which serves also to drive the stirrers, as hereinafter explained, receives its motion through bevel-wheels 26 from a horizontal first-motion shaft, 27.

At the center of the hearth 21 there is a dish, 28, having a raised rim, into which dish the materials to be operated on are first supplied. This dish 28 may be constructed of the fire-brick or other suitable refractory material of which the general surface of the hearth is formed; or it may be made of cast-iron with or without a refractory lining.

A raised rim or wall, 29, extends round the circumference of the hearth, and the hearth is covered by a brick-work roof, 30, carried by an annular iron frame which rests on pillars, the space between the hearth and roof forming a reverberatory chamber which is heated by means of a furnace or pair of furnaces (indicated by dotted lines at 31, Fig. 1) communicating with the chamber by a single flue, 32. From the inlet-flue 32 the flames or fire-gases pass over the hearth 21 to the opposite side and leave the chamber by two outlets, 33, a little on each side of a point diametrically opposite to the inlet-flue 32. At the part between the two outlets 33 there is a framing, 34, carrying vertical shafts 35, which have fixed to their lower ends forks or prongs 36 for stirring the materials on the hearth 21. The stirrer-shafts 35 are geared together by spur-wheels 37, and are driven by a spur-wheel, 38, on the vertical shaft 25.

The framing 34, carrying the stirrers, is fitted

in a casing, 39, inserted in the roof of the furnace-chamber, the parts being shown enlarged in Fig. 7; and it can be raised or lowered, having fixed or formed on it racks 40, with which there gear pinions 41 on a horizontal shaft, 42. This pinion-shaft 42 has a worm-wheel, 43, on its outer end, with which there gears a worm on a shaft, 44, having a squared outer end to receive a crank-handle.

The stirrers 36 can be raised through separate openings in the casing 39 for examination, repair, or renewal, and covers 45 are provided to close the openings, these covers being made with rims which dip into sand or other suitable luting material, and with boxes for luting or packing material at the holes through which the stirrer-shafts 35 pass.

The driving spur-wheel 38 is made with teeth of extra depth to allow of some vertical adjustment of the stirrer-shafts without the wheels getting out of gear.

The furnace is delineated with feeding apparatus suitable for supplying sodium chloride and sulphuric acid; but this apparatus may be modified, if necessary, for other materials. The sodium chloride is put into a hopper, 46, (shown in vertical section and enlarged in Fig. 4,) and from the bottom of this hopper a screw-shaft, 47, conveys it along a horizontal pipe or duct, 48, to a position directly above the central dish or compartment, 28, of the hearth, and it falls thence into the dish through a duct or casing, 49. The sulphuric acid is led continuously at a suitable rate through a pipe, 50, into the casing 49, or into any convenient part of a cover, 51, attached to the casing 49, and covering an opening in the roof directly over the dish 28.

The screw feeding-shaft 47 is driven in a practically continuous manner at a rate which can be varied or adjusted as is in practice found to best suit the action of the furnace, and for this purpose it has fast on it a ratchet-wheel, 52, Figs. 5 and 6, which is acted on by a pawl, 53, jointed to a lever, 54, and to this lever is connected one end of a rod, 55, the other end of which is on a crank-pin on a shaft driven from the vertical shaft 25. The rod 55 is jointed on a block which can be adjusted inward or outward along the lever 54 by means of a screw-spindle, 56, and with this arrangement the reciprocating motion imparted to the lever 54 can be made to turn the screw-shaft 47 to a greater or less extent at each stroke, as may be required.

In order to prevent the sodium chloride from hanging in the hopper 46, there is arranged inside a skeleton or frame, 57, consisting of longitudinal ribs touching, or nearly touching, the sides of the cone and connected by rings. This frame 57 is attached to an upper toothed and flanged ring, 58, which rests by its flange upon the top edge or rim of the hopper, while its teeth are in gear with a pinion, 59, on a vertical shaft, 60, driven by bevel-wheels 61 from the screw-shaft 47. By these means the

skeleton or frame 57 is kept slowly turning, and it prevents the materials from adhering to the sides of the hopper and keeps them in a loose condition, such as to insure their descent in a uniform manner as the screw-shaft 47 gradually moves them away from the bottom of the hopper. The materials gradually overflow from the central dish, 28, (being prevented from adhering to the sides of the dish by a stationary scraper, 62,) and they gradually move outward over the surface of the hearth 21, being thoroughly and repeatedly stirred by the stirrers 36, under which they are brought over and over again by the rotation of the hearth 21.

The stirrers 36 are represented as not being wide enough to cover the entire space between them, in consequence of which there is a tendency to the formation of low annular walls by the materials themselves, and these quasi walls prevent the materials from working too rapidly outward toward the circumference of the hearth. This retarding action may be made different in different cases by making the stirrers 36 relatively wider or narrower, so as to more or less completely cover or operate upon the space between the central dish, 28, and the circumference.

A number of descending discharge-ducts, 63, are formed at the circumference of the hearth 21, close to the rim or wall 29, and beneath these there is a stationary annular channel, 64, to receive the materials as they fall through the ducts or openings 63. The ducts 63 communicate with or have attached to them an annular piece, 65, shaped like an inverted channel, and which forms a cover to the stationary channel 64, its sides dipping down into lute-grooves 66, formed upon the sides of the stationary channel 64. Portions of the materials enter the lute-grooves 66; or sand or other suitable luting materials may be put therein, so as to prevent the entrance of air into the furnace or the egress of gases or vapors therefrom.

The stationary channel 64 has fixed in connection with it one or more hopper-shaped discharge-boxes, 67, Fig. 1, fitted with bottom doors or valves for periodically emptying the sulphate or other materials into trucks or other receptacles.

The outer rim, 29, of the hearth 21 is beneath an annular plate or frame, 68, which is made up of separate pieces bound by a wrought-iron hoop, and is supported on pillars 69, and which supports, or partly supports, the roof 30, and this plate 68 is formed with a cylindrical flange, which has fixed to it a sheet-iron band, 70, dipping down into an annular channel, 71, fixed to the revolving hearth, and having placed in it suitable luting materials to prevent ingress or egress of air or gas or vapor.

A set of stationary scrapers is shown as fitted at 76 in Fig. 2, and they are shown enlarged in face view and side view in Figs. 8 and 9. The set of scrapers consists of four rods, 77,

held in guides against the vertical face of a bracket, 78, and passing down through a box or casing provided with a cover, 79. These rods 77 can move independently of each other, 5 their upper parts being formed with slots, into which project pins fixed into the bracket 78 to prevent the rods from descending too far, while allowing them to rise over small obstructions, which action is also facilitated by their bottom 10 ends being beveled. The scrapers 77 serve to dislodge materials from the parts of the hearth 21 between the discharge-openings 63.

My improved furnaces may be fired by means of any suitable fuel; but I prefer to employ 15 coke, or to fire them by means of combustible furnace-gas, such as is formed in what are known as "gas-producers."

What I claim as my invention in furnaces for chemical processes is—

20 1. In combination, a rotating hearth in a reverberatory chamber, the said rotating hearth being made with a dish or rimmed compartment at the center and with a raised rim at the circumference, continuous feeding apparatus for 25 supplying materials to the central dish, and

continuous discharge apparatus near the circumferential rim, substantially as and for the purposes set forth.

2. In combination, the feeding-screw 47, the ratchet 52, and pawl-lever 54, with screw-ad- 30 justment to vary the stroke given by the connecting-rod 55, the hopper 46, with its rotating skeleton-frame 57 58, the pipe 48, with its delivery-outlet above the central dish, 28, of the rotating hearth, and the said rotating hearth, 35 all arranged and operating substantially as set forth.

3. The continuous discharge apparatus consisting of the ducts 63, fitted to the outer part of the rotating hearth, and having the annular 40 channel-cover 65 fixed to them, and also of the fixed annular channel 64 and its discharge box or boxes 67, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two sub- 45 scribing witnesses.

JAMES MACTEAR.

Witnesses:

EDMUND HUNT,
ROBERT WYLIE.