

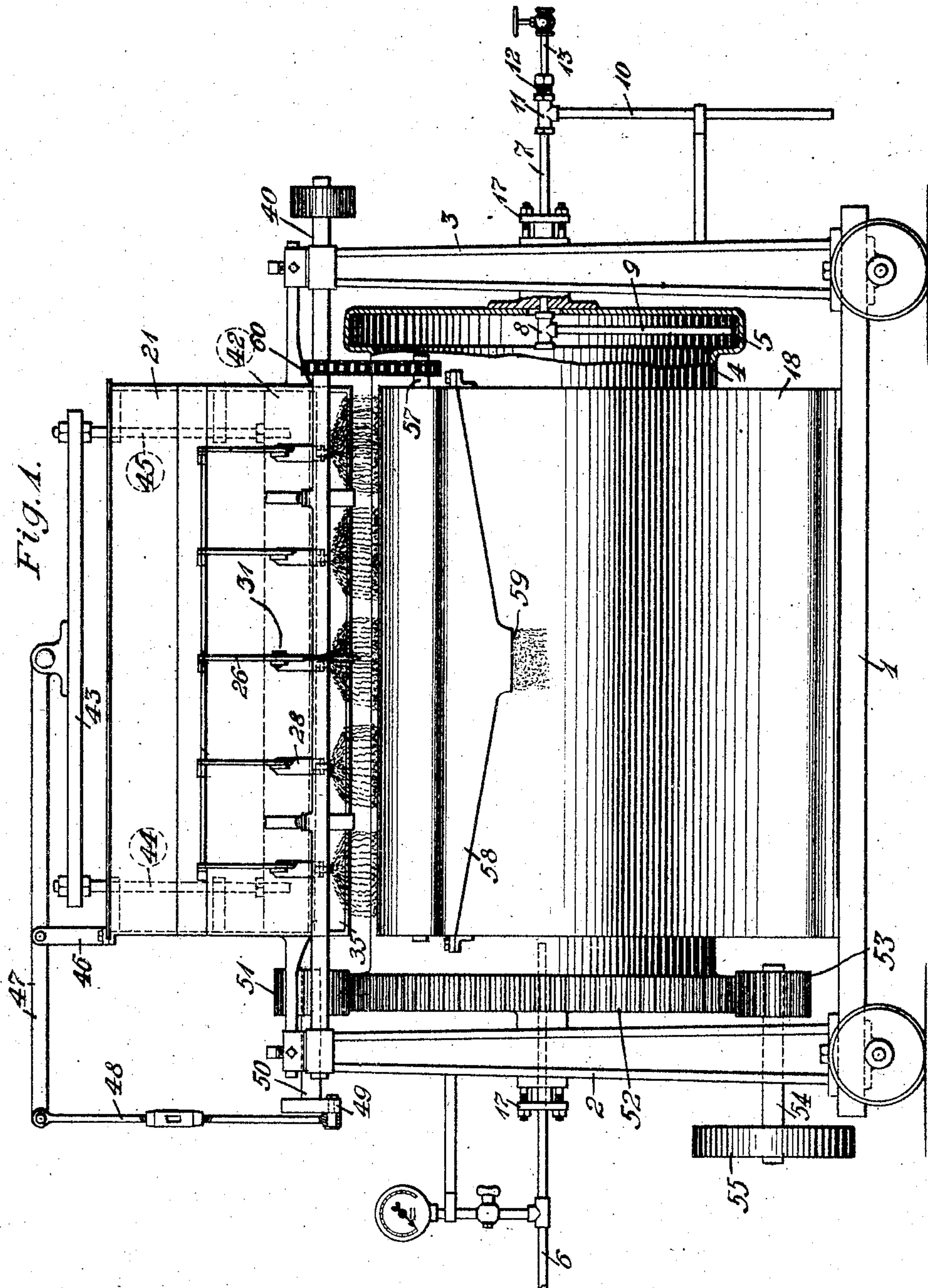
No. 789,984.

PATENTED MAY 16, 1905.

W. R. MACKLIND.  
DRIER.

APPLICATION FILED JULY 20, 1904.

2 SHEETS—SHEET 1.



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O. F. Funk

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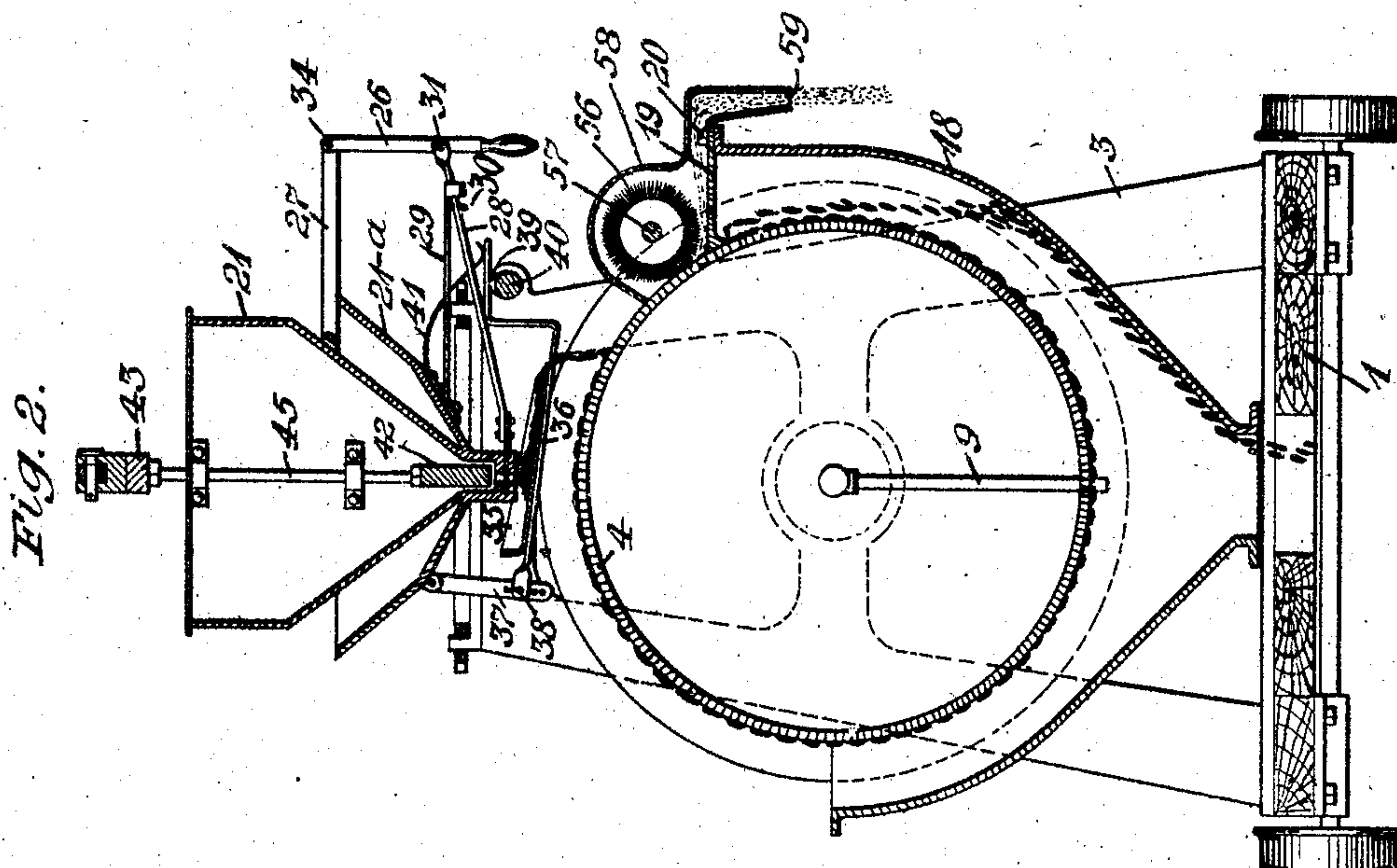
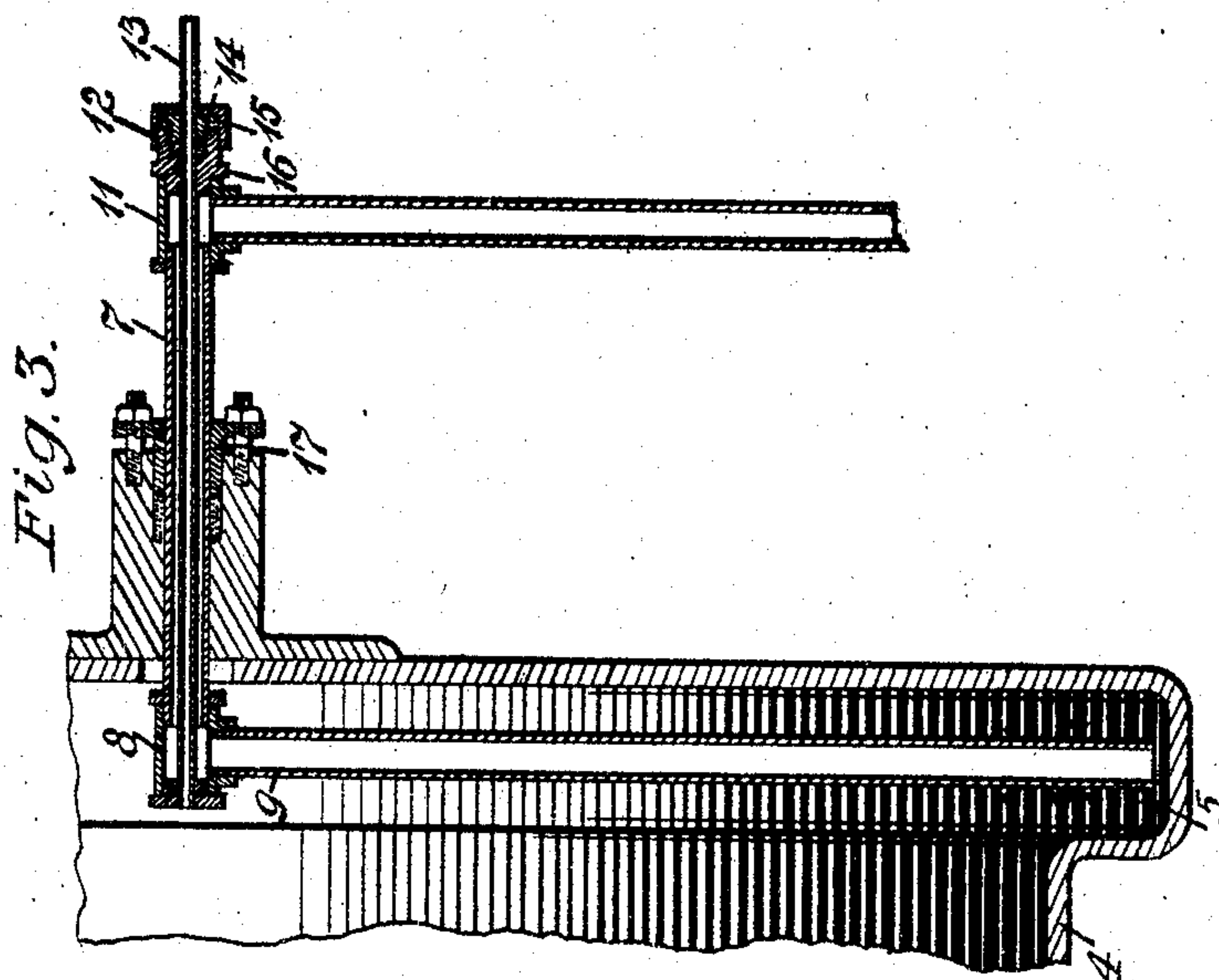
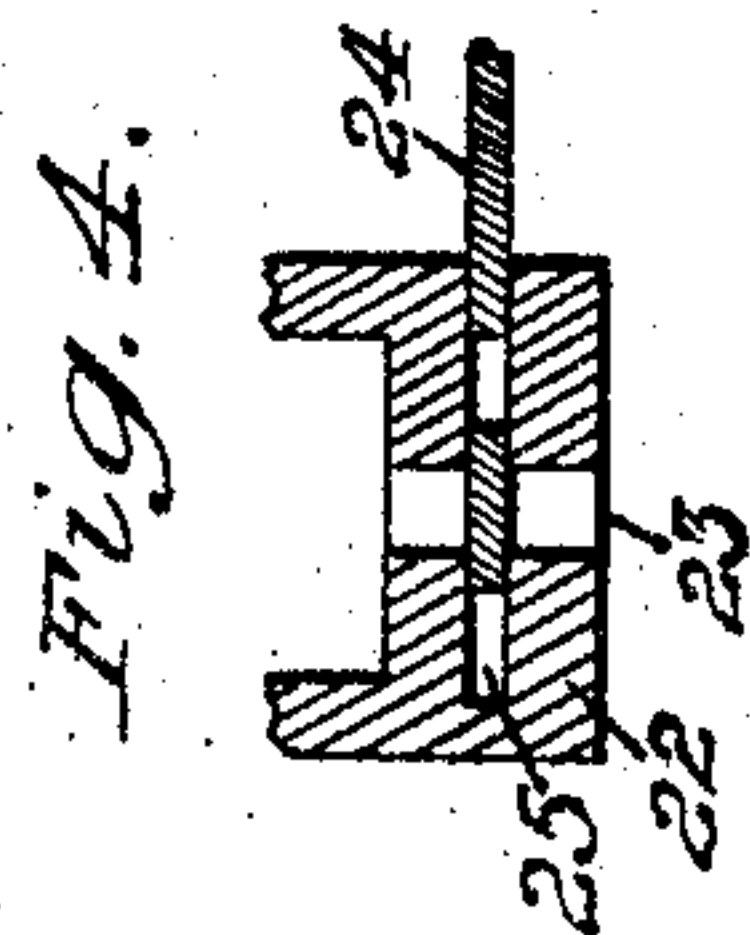
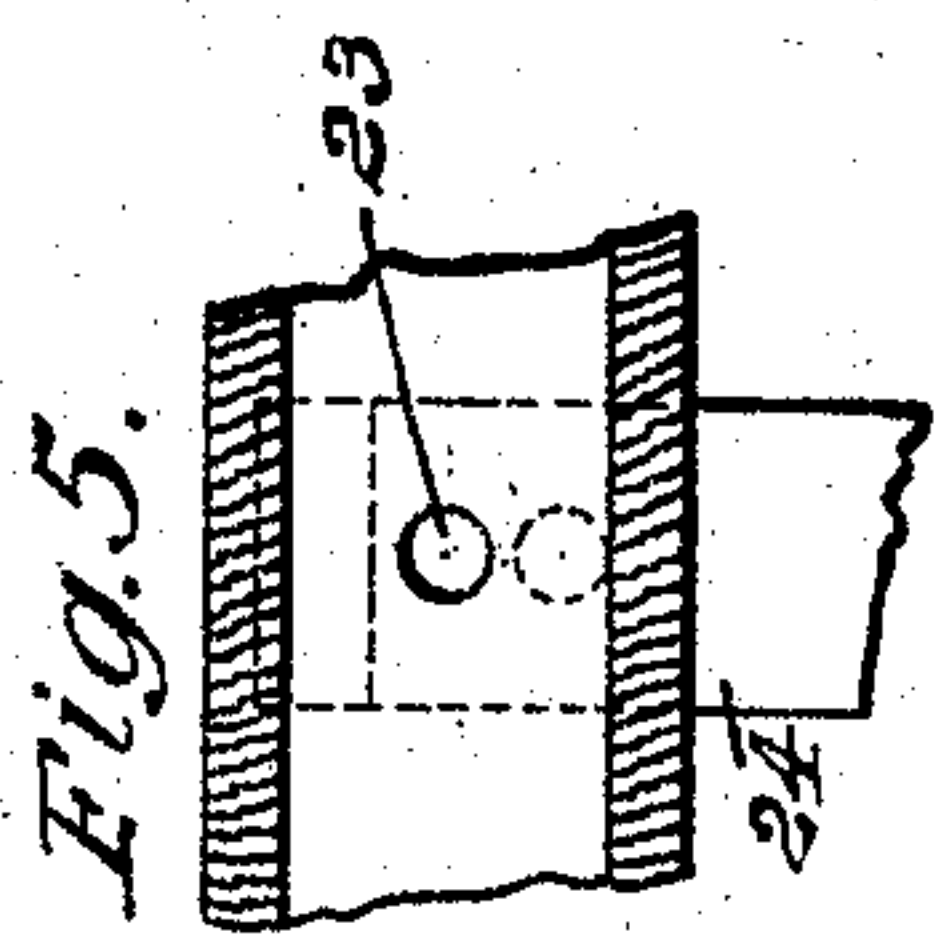
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2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

WILLIAM R. MACKLIND, OF MINERALPOINT, MISSOURI.

## DRIER.

SPECIFICATION forming part of Letters Patent No. 789,984, dated May 16, 1905.

Application filed July 20, 1904. Serial No. 217,380.

*To all whom it may concern:*

Be it known that I, WILLIAM R. MACKLIND, a citizen of the United States, residing at Mineralpoint, Washington county, Missouri, have invented a certain new and useful Improvement in Driers, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevational view, partly in section, of a drier constructed in accordance with my invention. Fig. 2 is a vertical cross-sectional view through the drier. Fig. 3 is a sectional view through a portion of one end of the cylinder and through the siphoning-pipe. Fig. 4 is an enlarged sectional view through the discharge portion of the hopper, and Fig. 5 is an enlarged fragmentary cross-sectional view through the same.

This invention relates to the general class of driers, but more particularly to a drier for drying sludge, in which a revolving cylinder is employed having means for heating it, whereby the moisture in the sludge will be evaporated.

One of the objects of the invention is to provide means for evenly and automatically feeding the sludge upon the cylinder.

Another object is to provide means whereby the sludge will be continuously fed upon the cylinder when the machine is in operation.

A still further object is to provide means for siphoning the water of condensation from the interior of the cylinder.

Another object is to provide means for permitting the steam to exhaust from the cylinder.

Other objects and advantages, as well as the novel details of construction, of this invention will be specifically described hereinafter, it being understood that changes in the form, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages thereof.

The preferred embodiment of this invention, as illustrated in the drawings, consists of a transportable base 1, having the stand-

ards 2 and 3 at the ends thereof. Mounted in bearings in the standards are the trunnions of the rotatable cylinder 4, which cylinder is provided with a water-trap 5, which is adapted to receive the water of condensation when steam is used for heating the cylinder. The trunnions which support the cylinder are provided with longitudinal perforations. One of the trunnions receives an inlet-pipe 6, whereby steam may be introduced into the cylinder. The opposite trunnion is provided with a siphon and an exit-pipe to permit the steam to pass therethrough. The siphon is illustrated as comprising a pipe 7, having on one end thereof a T-joint 8 with a depending tubular siphon-arm 9, one end of which is the receiving end of the siphon. The long arm of the siphon is designated by the reference-numeral 10, and it is connected to the pipe 7 by a T-coupling 11, at one end of which is a stuffing-box 12, through which the exit-pipe 13 projects, said pipe being in communication with the interior of the cylinder to permit the escape of the utilized steam.

14 designates a gland which is adjustable in the tubular flange portion 15 of the nut 16, which closes the T-coupling 11.

17 designates an ordinary stuffing-box for the respective trunnions.

Surrounding the cylinder is a casing 18, which is in the form of a hopper, the lower portion of the hopper-like casing being adjacent to an opening in the base, so that the material may be discharged upon a suitable receptacle. At one of the longitudinal edges of the hopper is a rigid knife or scraper, (designated by the numeral 19,) which is secured to the edge of the hopper by the bolts 20. By reference to Fig. 2 it will be observed that the inner edge of the scraper 19 is adjacent to the cylinder 4, so that during the revolution of the cylinder the dried sludge may be scraped therefrom and pass off through the hopper 18.

Suspended in the standards 2 and 3 is a hopper 21, which hopper is provided with a water-jacket 21<sup>a</sup>. The bottom or outlet portion of the hopper is constricted, as at 22, the constricted portion being provided with a plurality of perforations 23. In order that the



quantity of material fed from the hopper may be regulated, I have provided valves which are indicated as consisting of slide-plates 24, having perforations adapted to coincide with the perforations in the hopper 21. These valves slide in slots 25 in the hopper and are movable to positions whereby the quantity of discharged material can not only be governed but the outlet-orifices may be entirely closed. The mechanism for effecting this is illustrated as comprising levers 26, suspended from an arm 27 on the hopper, said levers being connected to the valves by links 28. Each link is guided in a looped bracket 29, and the outward movement of the link is limited by a projection 30 in rear of the loop of the bracket 29. A pivot 31 connects each link 28 to its lever 26, or a rod of approximately the same length as the length of the hopper may be used to connect auxiliary links to the fulcrum 34 of the lever 26, so that a uniform power will be exerted upon a slide acting as a valved element for all of the openings.

A novel means is provided for feeding the sludge from the hopper to the cylinder. This feeding means is illustrated as comprising a vibratory table 35, which is suspended beneath the hopper in slings 36. The rear of the slings, with which the vibratory table is rigid, are connected to the hopper by links 37, which are pivoted at their upper ends and which are provided at their lower ends with a series of perforations whereby the angle of inclination of the table may be adjusted by inserting the fastening-pins 38 in the proper openings in the links. The forward ends of the slings terminate in right-angularly-disposed fingers 39, which rest upon the eccentric-shaft 40, carried by the standards 2 and 3, so that the revolution of the shaft will impart a vibratory motion to the table. In order that the hangers will remain at all times upon the eccentric-shaft, I have provided springs 41, one end of each spring being secured to the hopper and the other end bearing upon the table.

A novel means is provided for forcing the material from the hopper 21 onto the table. In the present instance this is accomplished by a longitudinally-disposed vertically-reciprocating bar 42, which has a continuous movement during the operation of the machine, so as to evenly force the sludge through the opening or openings in the hopper. The bar 42 is attached to a second bar 43 by means of the connecting-rods 44 and 45, which work in guide-lugs in the hopper.

Fulcrumed to a standard 46 on the edge of the hopper 21 is a lever 47, which is suitably connected to the bar 43. This lever is rocked by means of a pitman 48, which is connected to the eccentric 49 on the shaft 50. The shaft 50 is capable of having motion imparted thereto by means of the supported pinion 51, which meshes with the large gear 52, carried

by the cylindrical drum. The gear 52 is in turn driven by a pinion 53 on the shaft 54, on which is a drive-pulley 55.

All of the parts being assembled, the operation is as follows: The steam or some suitable heating medium is admitted into the cylinder and through the pipe 6, which cylinder is started in operation by means of a suitable power device cooperating with the pulley on the shaft 54. Rotation of the cylinder will cause the shaft 50 to rotate and start the hopper-feeding device in operation. The eccentric-shaft 40 is driven at a comparatively high rate of speed and usually by different motive power from that which drives the drum. The rapid rotation of the shaft will cause a rapid vibratory motion of the table, so that as the sludge is fed thereon it will be caused to evenly pass onto the drum. As the drum completes its revolution the sludge will have sufficiently dried, and it will be removed by the rigid knife 19, which knife is so spaced away from the drum as to prevent contact of the dried sludge therewith and consequent discoloration. After the sludge is removed and passed through the bottom of the hopper it can be removed by a suitable receptacle, which has previously been placed under the discharge end of the hopper.

Under certain conditions I have found it advisable to provide means for removing any adhering particles from the drum after it has passed the knife 19. In order to provide for this, I attach a rotary brush 56 on the shaft 57, which shaft rests in suitable bearings in an inclosing casing 58. The brush is preferably a wire one, and any particles of material which will have adhered to the surface of the drum after it has passed the knife 19 will be efficiently removed and discharged from the casing through the discharge-opening 59. The shaft on which is positioned the brush receives its rotation by means of a sprocket-chain 60, which passes around suitable sprockets on the eccentric-shaft 40 and the shaft 57. The shaft 57 will be so geared to the eccentric-shaft that the brush will be caused to rotate in a direction opposite to the direction of movement of the drum and it will rotate at approximately the same speed as the speed of the eccentric-shaft, or, in other words, at a relatively higher speed than the speed of the drum.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is--

1. In a drier, the combination with a heated rotating cylinder, a vibrating table for feeding sludge on said cylinder, a hopper for supplying sludge to the vibrating table, and a reciprocatory agitator in the hopper for feeding the sludge continuously and uniformly to the vibrating table; substantially as described.

2. In a drier, the combination with a heated rotary cylinder, of a vibratory table above



said cylinder, and means for feeding sludge on the table; substantially as described.

3. In a drier, the combination with a rotary, heated cylinder, means for rotating said cylinder, a vibratory table above the cylinder, means for feeding material on the table, and a shaft for vibrating the table, said shaft traveling at a relatively high rate of speed with relation to the speed of travel of the cylinder; substantially as described.

4. In a drier, the combination with a heated rotary cylinder, a hopper above the cylinder, an agitator therein, and a spring-pressed vibratory table interposed between the hopper and the cylinder; substantially as described.

5. In a drier, the combination with a heated rotary cylinder, a hopper above the cylinder, a vibratory table between the cylinder and hopper, and means for varying the angle of inclination of the table; substantially as described.

6. In a drier, the combination with a heated rotary cylinder, a hopper above the cylinder, an angularly-adjustable vibratory table interposed between the cylinder and hopper, and springs carried by the hopper and resting ad-

jacent to the ends of the table; substantially as described.

7. In a drier, the combination with a rotary cylinder having a fluid-exit for the cylinder, comprising a pipe, a siphon, one portion of which surrounds said pipe, a T-coupling forming a part of the siphon and surrounding the pipe, a nut cooperating with the T-joint, a gland surrounding the pipe and adjacent to the nut, a packing between the gland and the nut, and means for holding the nut and gland together; substantially as described.

8. In a drier, the combination with a rotating cylinder, of a brush for removing material from the cylinder, a knife for removing material from the cylinder and forming the bottom of a casing for the brush, and means for inclosing the upper portion of the brush; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 12th day of July, 1904.

WILLIAM R. MACKLIND.

Witnesses:

W. W. THROOP,

G. C. QUASEBARTH.