

4 Sheets—Sheet 1.

Patented June 21, 1892.



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A. M. Perkins

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(No Model.)

4 Sheets—Sheet 2.

J. A. YEADON & W. ADGIE.
RETORT FURNACE.

No. 477,286.

Patented June 21, 1892.

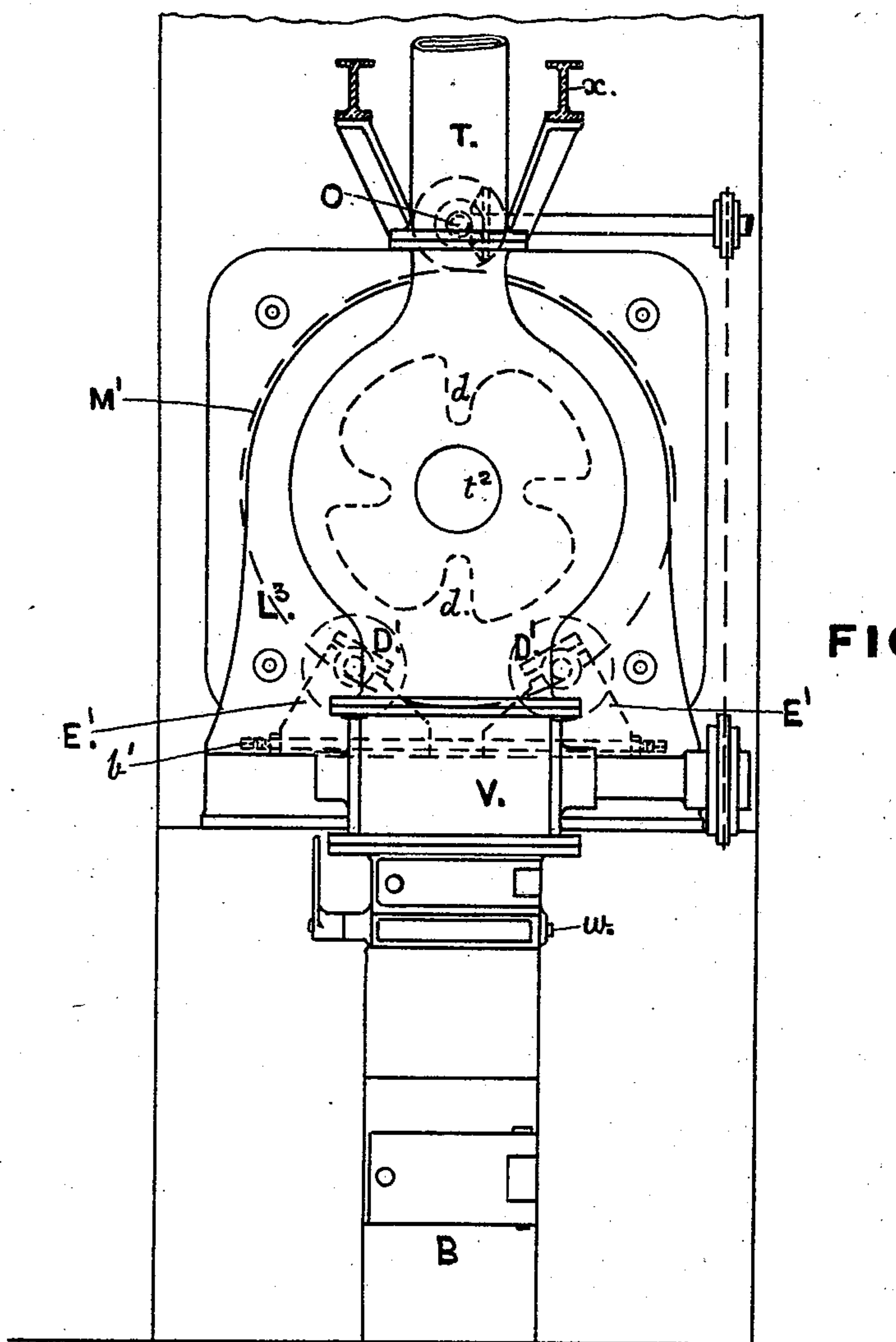
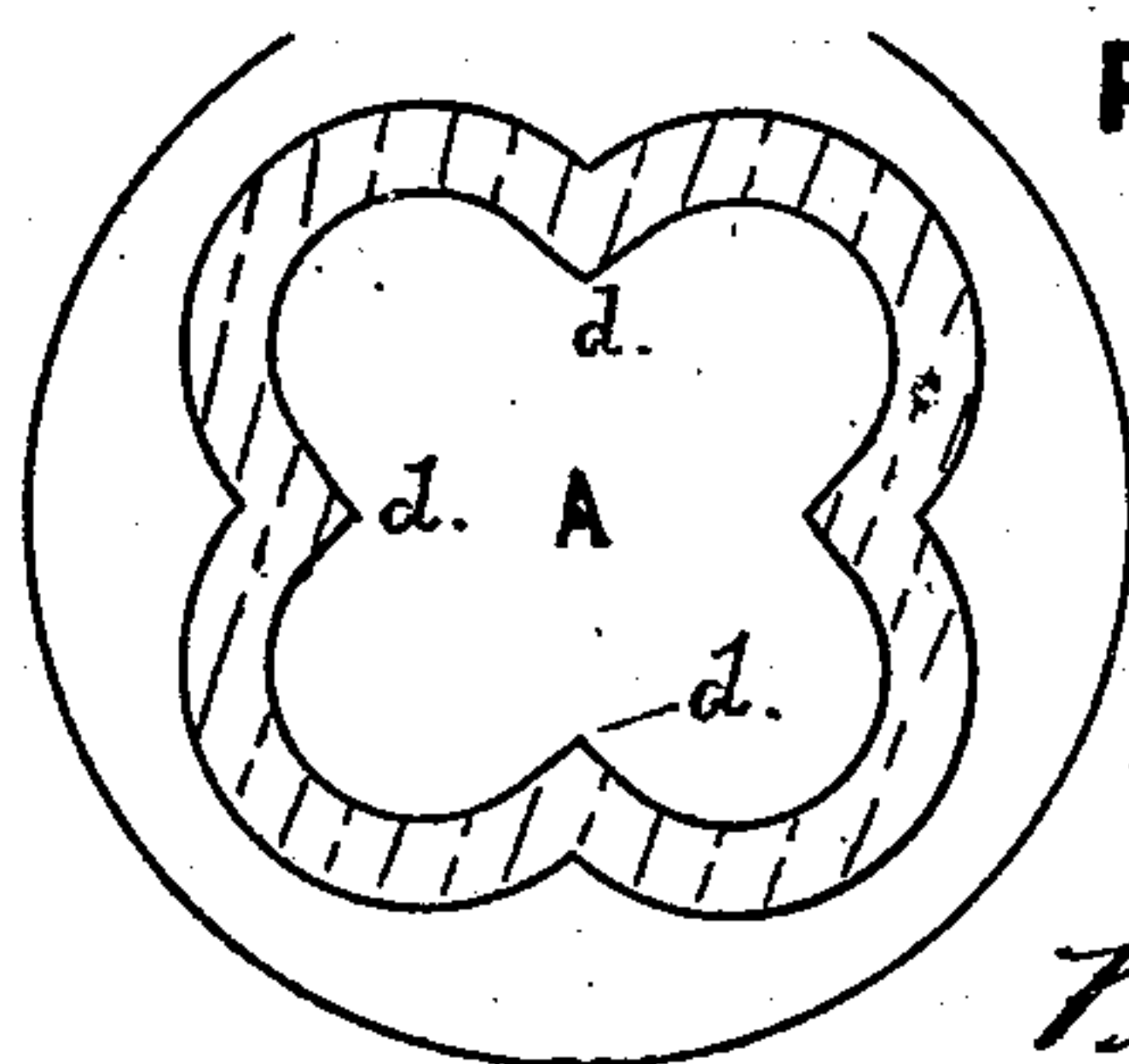


FIG. 2.



FIC. 2^a.

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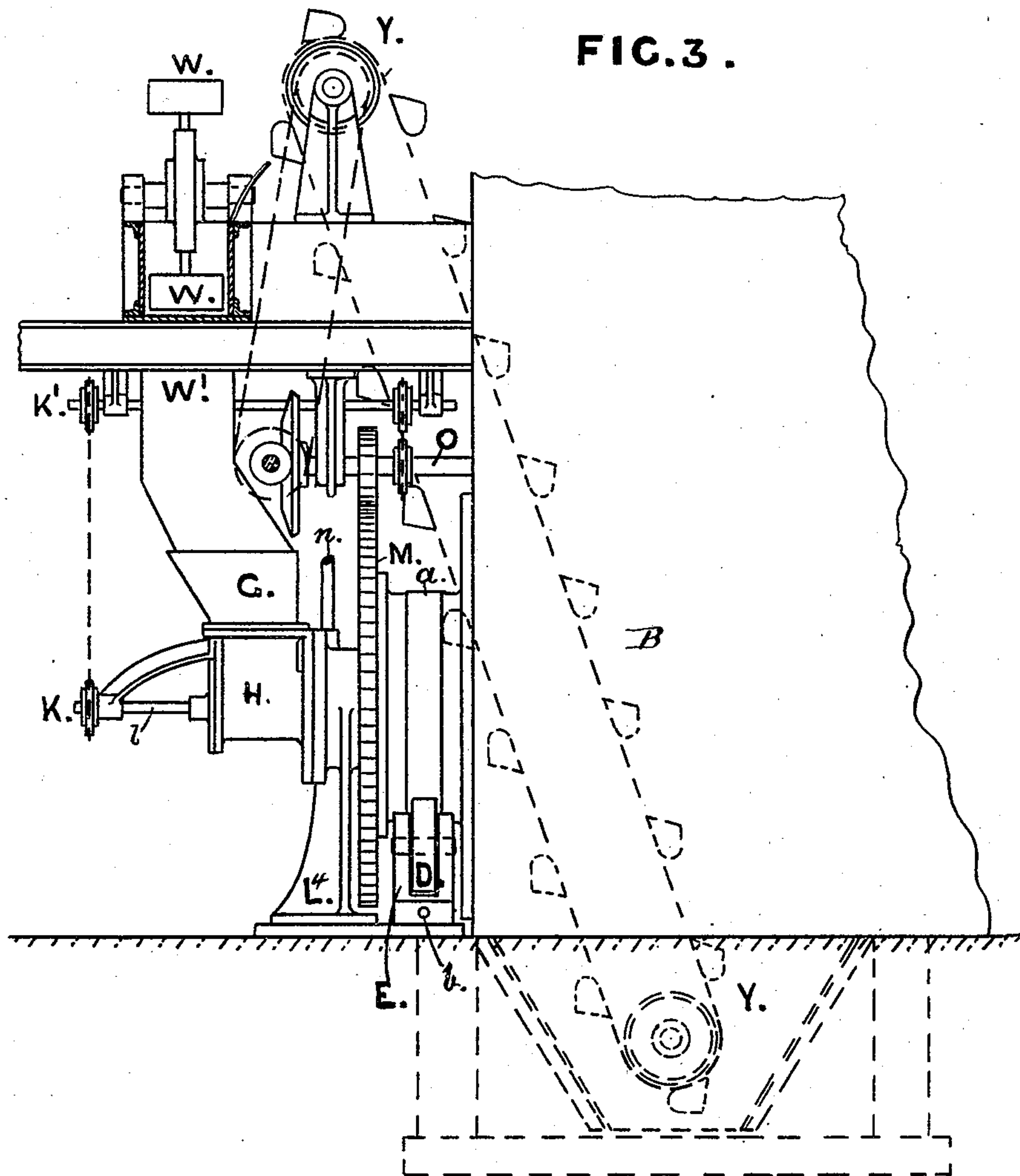
(No Model.)

4 Sheets—Sheet 3.

J. A. YEADON & W. ADGIE.
RETORT FURNACE.

No. 477,286.

Patented June 21, 1892.



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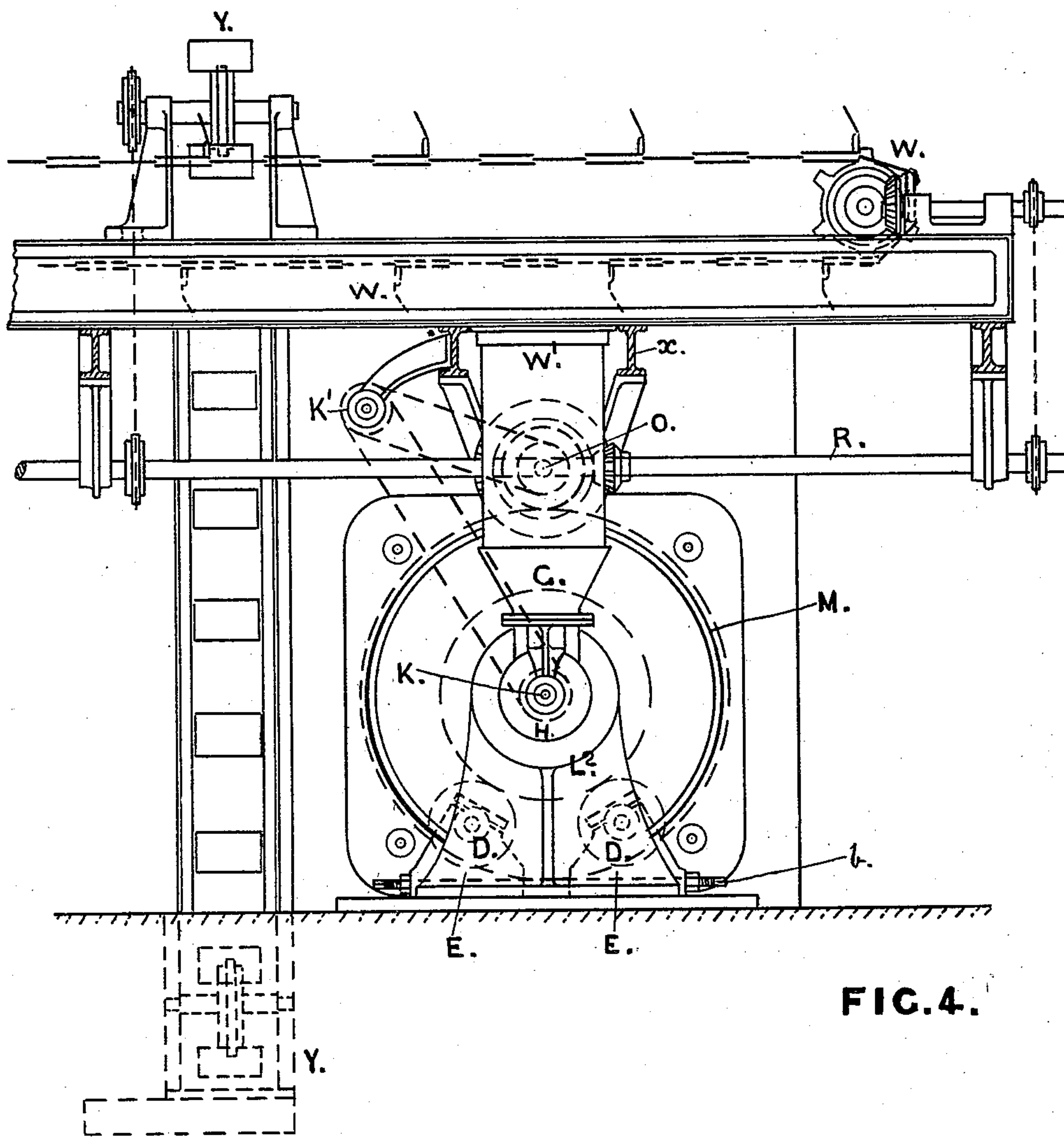
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4 Sheets—Sheet 4..

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RETORT FURNACE.

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UNITED STATES PATENT OFFICE.

JOHN ARTHUR YEADON AND WILLIAM ADGIE, OF LEEDS, ENGLAND.

RETORT-FURNACE.

[SPECIFICATION forming part of Letters Patent No. 477,286, dated June 21, 1892.

Application filed July 23, 1890. Serial No. 359,645. (No model.) Patented in England November 29, 1889, No. 19,183.

To all whom it may concern:

Be it known that we, JOHN ARTHUR YEADON and WILLIAM ADGIE, subjects of the Queen of England, both residing at Leeds, in the county of York, England, have invented certain new and useful Improvements in and Connected with Retorts or Ovens for the Distillation of Coal and other Analogous Purposes, (for which we have applied for British Letters Patent bearing date the 29th day of November, 1889, No. 19,183,) of which the following is a specification.

Our invention relates to certain new and useful improvements in retort-furnaces, and particularly to furnaces or ovens having revolving retorts adapted for use in the distillation of coal or for roasting, charring, or drying other substances.

In the accompanying drawings, illustrative of the invention, Figure 1 represents a longitudinal vertical section of a furnace embodying the same. Fig. 2 represents an elevation of the discharging end thereof. Fig. 2^a represents in cross-section a modification of the form of retort shown in the remaining figures. Fig. 3 represents in side elevation the receiving end of the furnace and the feeding, conveying, and distributing devices employed in connection therewith. Fig. 4 represents a like view in front elevation.

Similar letters of reference indicate similar parts throughout the several views.

Referring to the drawings, B indicates a furnace of any suitable character and which may be provided with the usual grate-bars B' and chimney B². The front wall of the furnace is provided with an opening containing a metallic annular rim e', and the rear wall of the furnace is provided with a similar metallic annular rim e², the inner surface of the said rims being turned true, so as to form a tight joint with the retort as the latter revolves within them.

The form of retort shown in the drawings is made up of a main body portion A, preferably of fire-clay or other highly-refractory material and of end portions C and C'. While we prefer to employ fire-clay for the main body portion of the retort both on account of its highly-refractory character as well as its narrow range of expansibility when highly

heated, yet we do not restrict ourselves to such material, but contemplate in some instances the employment of metal or any other material or combination of materials having the requisite capacity to resist the furnace heat.

The retort is preferably so arranged, as shown, that its axis will lie in a horizontal plane and the retort is made to flare outwardly from the receiving toward the discharge end thereof and is provided with ribs or projections d, tapering toward the discharge end and preferably straight, as shown. While we secure the best results with a retort as thus constructed and arranged, we do not limit ourselves to a flaring retort nor to a retort having its axis in a horizontal plane, nor to a retort whose tapering projections are straight. On the contrary we may employ the tapering projections in connection with a retort whose axis is out of the horizontal plane or in connection with a retort which does not flare outwardly or the projections themselves while tapering may deviate from a straight line, even to the extent of forming a screw-thread around the interior surface of the retort.

The ends of the main body portion of the retort are provided with recesses, within which fit the heads of bolts c, said bolts passing through flanges forming a part of the end portion C and C' and being provided with removable nuts c³, whereby upon removing the nuts c³ either of the end portions C or C' may be removed from the retort for repairs or otherwise without disarranging or removing the other parts. Where the flanges of the end portions C and C' enter the annular rims e' and e², they are trued off upon their peripheries and also at a and a', which represent the surfaces of contact resting upon the supporting friction-rollers D D and D' D'. The rollers D D and D' D' are mounted to revolve freely in frames or bearings E E and E' E', located outside of the furnace and which may be adjusted toward each other as wear takes place by means of screw-bolts b and b'.

At the receiving end the apparatus is provided with a hopper G for supplying a feed tube or cylinder H of a smaller diameter than the retort. This feed tube or cylinder H may project some little distance into the interior

of the retort for the better delivery of the coal or other material treated. It is provided with an internal shaft I, fitted with adjustable feeding-blades performing the function of a feeding-screw, the amount of feed being regulated by altering the pitch of the blades or by substituting other wheels for the particular removable sprocket-wheels K and K', which drive the shaft I.

It will be noted that the end portion C of the retort is provided with an annular flange c^4 , which fits within a metallic rim L^2 , whose base L^4 is supported outside of the furnace. The end portion C' is provided with a flange c^5 , which in like manner rests within a metallic rim L^3 , having a basal support L^5 . It will thus be seen that the end portions C and C' are journaled at their inner and outer extremities within annular metallic rims and that their pressure upon the rims is in part relieved by the adjustable intermediate rollers D D and D' D', so as to permit them to rotate freely therein. It will also be apparent that gears M and M' are attached to the end portions between the annular rims and that these gears are actuated by means of pinions N N' upon the cross-shaft O. This general arrangement is of importance, for the reason that the end portions of the retort are sustained at both ends, thereby protecting the main body of the retort against injurious strains, while at the same time the end portions move freely in their bearings and torsional strains upon the retort as a whole are obviated.

In order to prevent an escape of gases between the feed-tube H and the flange c^4 , we locate a packing within the space or recess formed between the edge of the flange c^4 and the flat face of a flange c^6 upon the feed-tube. This packing consists, preferably, of two metal rings l' and l^2 , having an interposed ring or body—say of asbestos—and having set-screws, (one of which is shown at p ,) which serve to keep the outer rim in place. In front of the outer ring L' is a space into which steam is led by the pipe n . A slight steam-pressure thus serves to keep the packings up to the end of the flange c^4 , while giving freedom for expansion or contraction. Any condensed water from the steam serves as a lubricant to the joint, and air cannot enter through the joint from without nor gas pass through it from within the retort.

At the discharge end of the retort is arranged a closing-plate S, having an outlet-pipe T and having a flange s , adapted to fit within the space formed between the flange c^5 and the adjacent periphery of the end portion C'. The joint thus formed serves to resist the outflow of gases or the entrance of air. It is further reinforced, however, by the interposition of a similar packing of rings l' l^2 and asbestos L, interposed in the recess between the end of the flange c^5 and the closing-plate S, and a steam-pipe n' serves to admit a similar slight steam-pressure to the packing. The

steam-pressure of the pipes n and n' need only be slightly in excess of any pressure that may exist in the retort.

At the discharge end of the retort a scraper t' is attached to the closing-plate S and directs the coke, cinder, or other solid residuum into the passage U, which is fitted with a revolving cylinder V, having pockets v for receiving said residuum. The cylinder V is kept revolving, say, by suitable chain gearing from an overhead shaft, as shown, so that the pockets successively discharge themselves below, either into the furnace B or by reversing a door or valve w into a barrow or into a water-trough or into an endless carrier or the like.

In case we employ a furnace containing more than one revolving retort, each retort may be operated independently, so that its revolution and its supply of fuel may be stopped, started, and regulated at will. Any number of retorts may, however, be operated simultaneously by continuing the power-shaft R along the front of the furnace within which the retorts are located, each cross-shaft O having a gear P' driven from the power-shaft R.

An endless coal-conveyer W (see Figs. 3 and 4) may be arranged over the feeding-hoppers, the coal being discharged into the conveyer by the elevator Y and being gradually carried forward over the entire series of hoppers. The connection W' with each hopper is fitted with a sliding valve or door to regulate the quantity delivered in each case. Similar conveying devices may be arranged to collect the material from the outlet ends of the retorts and deliver it mechanically at any given spot.

The mode of operation is as follows: The feeding-hopper G being full, the coal or other substance is fed forward through the cylinder H by the blades on the revolving shaft I into the interior of the retort, and on entering the retort is fed forward by the combined action of the tapering projections d and the flaring interior of the retort, being prevented from working backward by the forwardly-inclined portion g . During the forward movement of the material through the retort the projections d , while gradually working the coal onward, also lift and turn it from off the bottom, thus constantly keeping it loose and open, and thereby accelerating the distillation. On account of their tapering character, they exert their greatest lifting and storing action at the point where the coal enters the retort and where it is most desirable to agitate it in order to permit the free liberation of the distilling gases. The stirring action diminishes gradually as the material progresses toward the discharge end of the retort, so as to prevent any unnecessary breaking of the coke after the gases have been liberated. It will be understood that the feeding-tube H is to be kept constantly filled with the material to be treated, so as to prevent the escape of gas through said tube. This is effected by main-

5 taining the hopper G constantly full. Arriv-
ing at the discharge end of the retort, the
scraper *t'* directs the coke, cinder, or other
solid residue into the passage U, and the re-
volving cylinder V receives said residue by
means of the pockets *v* and drops them either
upon the furnace-fire or outside of the furnace,
according as the valve *w* is in the position
shown in full lines or the position shown in
10 dotted lines in Fig. 1.

While, as we have hereinbefore stated, our
apparatus is applicable generally to the roast-
ing, charring, or drying of various substances,
and while for that reason we use the word "re-
15 tort" in a very general sense, we find that the
apparatus is especially useful for the distil-
lation of coal-dust and the production of gas
and coke therefrom. Such coal-dust is very
largely a waste product at the present time,
20 but may be quickly and economically distilled
and utilized by means of our apparatus, care
being taken that, if not sufficiently fine to seal
the feeding-tube H against the escape of gases
from the retort, it be suitably pulverized to
25 bring it to the requisite degree of fineness.
The mechanical stoking of the retort or re-
torts by means of the hoisting and conveying
devices minimizes the labor of conducting the
operation, and the precautions taken to effect-
30 ually seal the apparatus against the escape
of gases at the joints and at the feeding and
discharging ends serve as an efficient safe-
guard against loss and danger in carrying the
invention into practice.

35 It will be understood that the gas-exit T
may lead to any suitable place of storage or
may discharge into the open air, according as
it is desired to save the said gases or to per-
mit them to be dissipated. A peep-hole, closed
40 by a plate *z*, may be provided for permitting
the operator to note the progress of the oper-
ation within the retort. The hangers for the
shafting may be supported from suitable gird-
ers *x* or the like.

45 Having thus described our invention, what
we claim is—

1. A retort-furnace, in combination with a
retort revolubly mounted in the furnace, the
interior of said retort being provided with
50 stirrer-blades tapering or diminishing in
height toward the discharge end of the retort,
substantially as described.

2. A retort-furnace, in combination with a
retort revolubly mounted in the furnace, the
interior of said retort flaring toward its dis-
55 charge end and provided with stirrer-blades,
said blades tapering or diminishing in height
toward the flaring end of the retort, substan-
tially as described.

60 3. A retort-furnace, in combination with a
revolubly-mounted retort consisting of a main
body portion and end portions separably con-
nected to the main body portion, said main
body portion being located within the com-

bustion-chamber of the furnace and the end 65
portions being located outside the combus-
tion-chamber, annular rims in the furnace-
walls, within which rims the inner extremities
of the end portions are journaled, an addi-
tional annular rim within which the outer 70
extremity of the discharge end portion is jour-
naled, supporting-rollers intermediate of the
said additional annular rim and proximate
furnace-wall rim to relieve them from the
weight of the discharge end portion, and pow- 75
er-transmitting mechanism geared to both end
portions and driving them simultaneously,
substantially as described.

4. A retort-furnace provided with openings
in its front and rear walls, said openings be- 80
ing faced with annular metallic rims, in com-
bination with a retort consisting of a main
body portion and auxiliary end portions, the
ends of the main body portion being provided
with annular circumferential grooves and 85
with radial grooves, bolts whose heads rest
within the circumferential grooves and whose
bodies rest within the radial grooves, and re-
movable nuts for securing the main body por-
tion to the auxiliary end portions by means 90
of said bolts, substantially as described.

5. In a retort-furnace, a retort revolubly
mounted therein, said retort having at its dis-
charge end an annular flange separated there-
from by an intervening socket-space, in com- 95
bination with an end plate communicating
with the gas-exit and having an inwardly-ex-
tending annular flange fitting within the said
socket-space and an outer casing surround-
ing the flange, substantially as described. 100

6. In a retort-furnace, a retort revolubly
mounted therein, said retort having at its
discharge end an annular flange separated
therefrom by an intervening socket-space, in 105
combination with an end plate S, communi-
cating with the gas-exit and having an in-
wardly-extending annular flange fitting with-
in the said socket-space, a casing surround-
ing the flange, packing within the casing, and
a steam-pipe, substantially as described. 110

7. In a retort-furnace, a retort revolubly
mounted therein, said retort having at its re-
ceiving end a projecting annular flange, in
combination with a feed-tube fitting within 115
said annular flange, a casing surrounding the
annular flange, said feed-tube and casing be-
ing supported independently of the retort,
packing within the casing, and a steam-pipe,
substantially as described.

In testimony whereof we have signed this 120
specification in the presence of two subscrib-
ing witnesses.

JOHN ARTHUR YEADON.
WILLIAM ADGIE.

Witnesses:

WILLIAM SNOWDON,
CHARLES PERCY BABB.