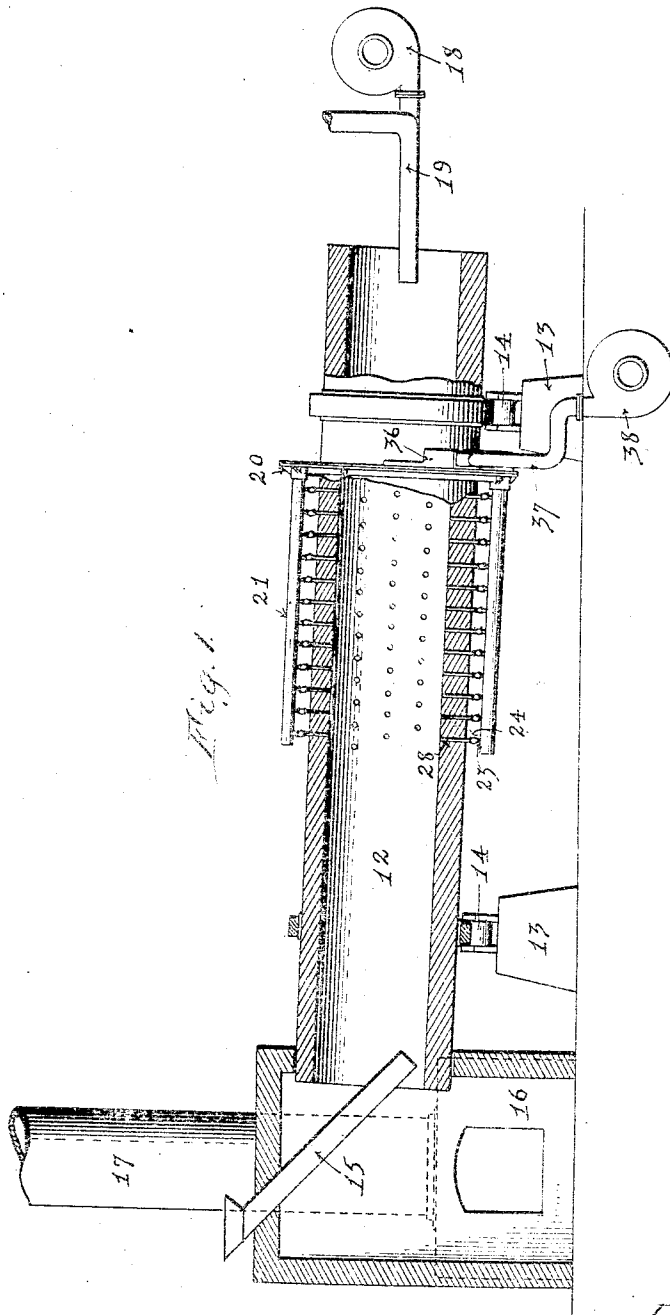


G. F. DOWNS.  
 ROTARY FURNACE OR KILN.  
 APPLICATION FILED APR. 25, 1914.

5 SHEETS--SHEET 1.



Witnesses:-  
Richard Sommer  
D. H. Harper

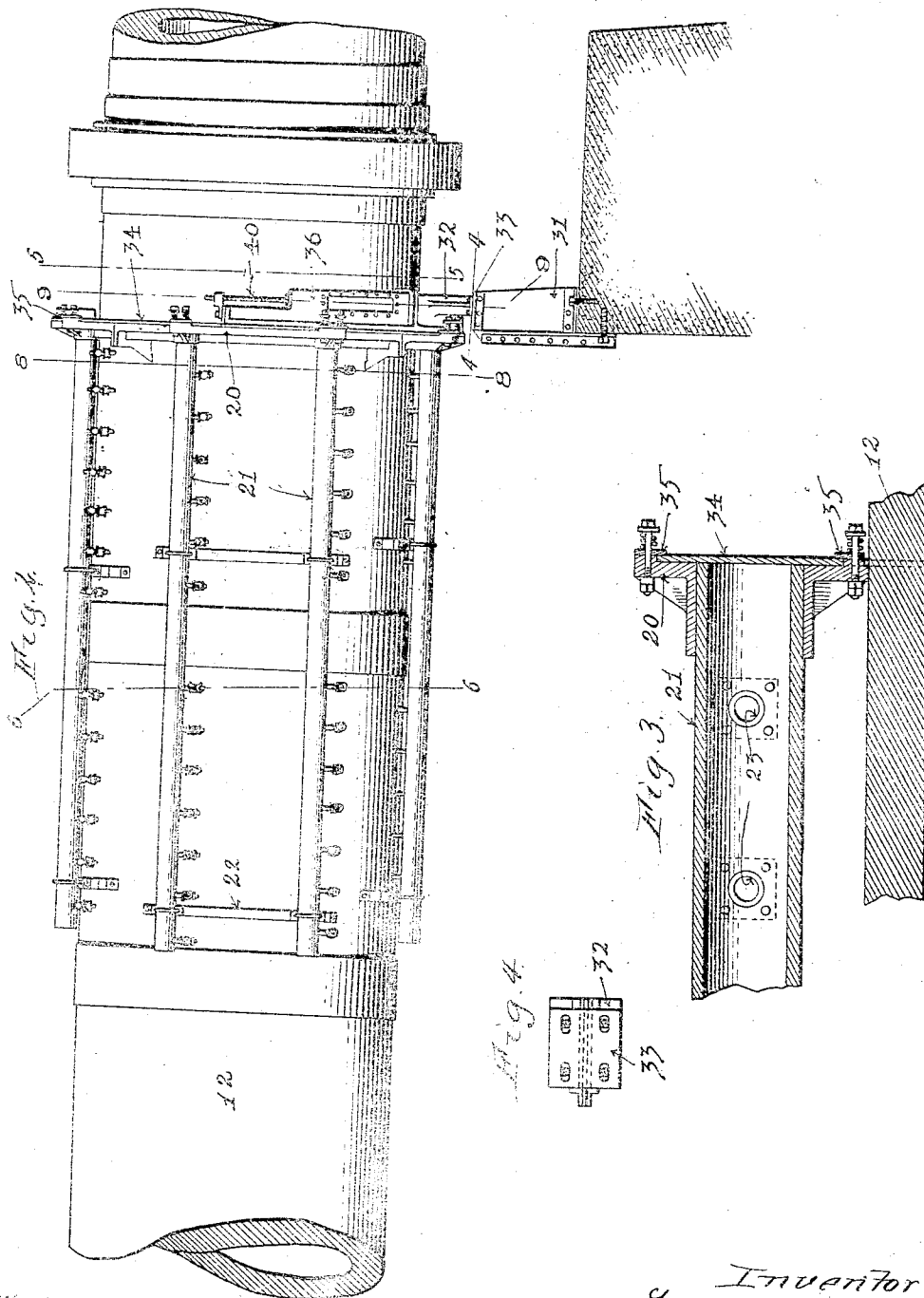
Encounter  
George F. Lowe  
by A. J. Langster  
Attorney

G. F. DOWNS.  
 ROTARY FURNACE OR KILN.  
 APPLICATION FILED APR. 25, 1914.

1,121,906.

Patented Dec. 22, 1914.

6 SHEETS-SHEET 2.



Witnesses:-  
 Richard Sommer  
 D. H. Harper

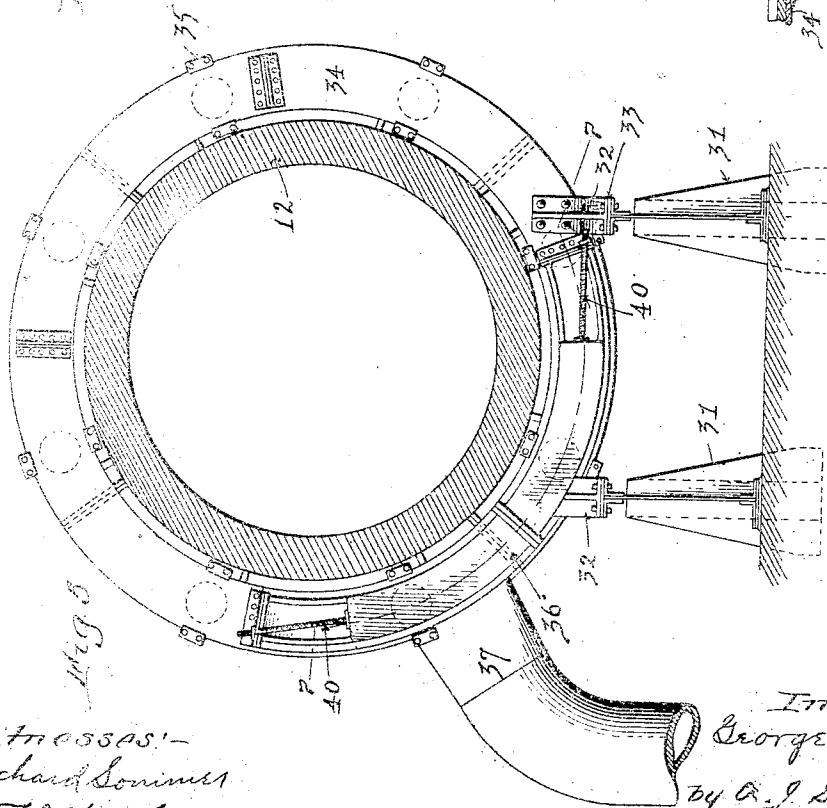
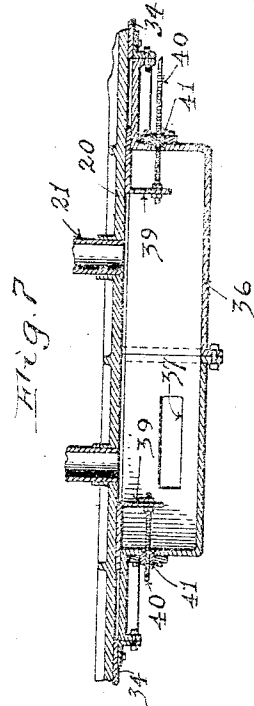
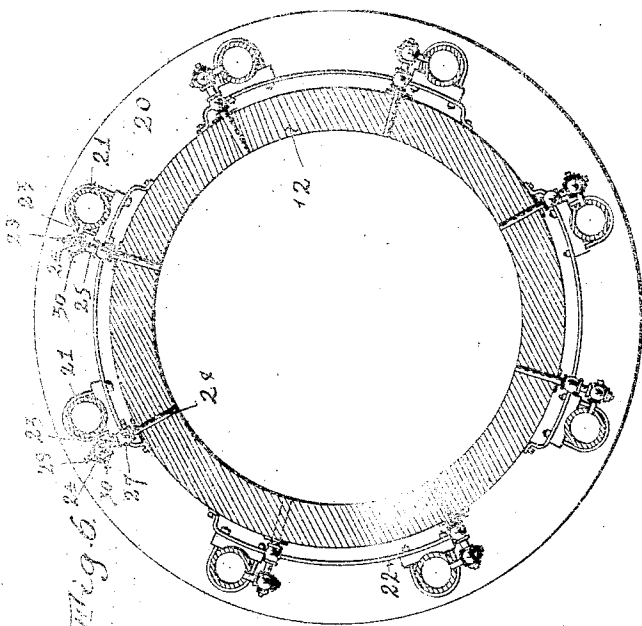
Inventor  
 George F. Downs  
 by A. J. Langster  
 Attorney

G. F. DOWNS.  
 ROTARY FURNACE OR KILN.  
 APPLICATION FILED APR. 25, 1914.

1,121,906.

Patented Dec. 22, 1914.

6 SHEETS-SHEET 3.



Witnesses:-  
 Richard Sommer  
 D. H. Harper

Inventor  
 George F. Downs  
 by O. J. Langster  
 Attorney

G. F. DOWNS.  
 ROTARY FURNACE OR KILN.  
 APPLICATION FILED APR. 25, 1914.

1,121,906.

Patented Dec. 22, 1914

6 SHEETS-SHEET 4.

Fig. 9.

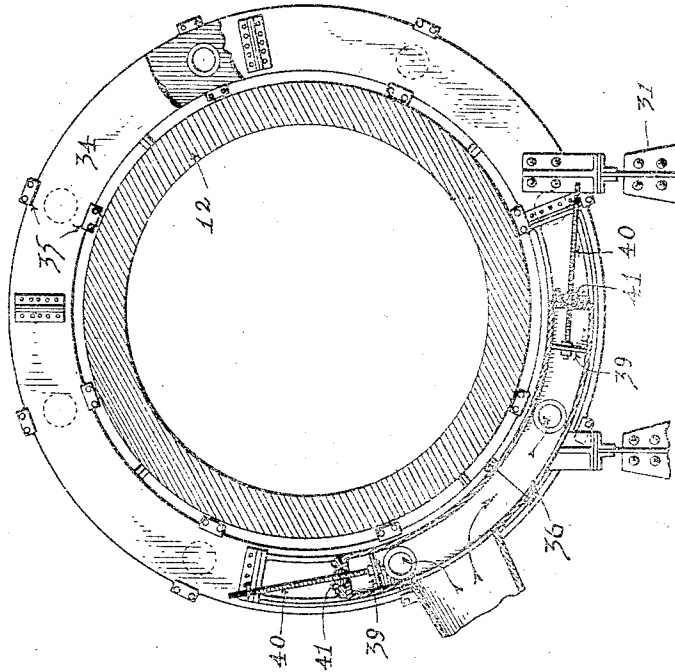
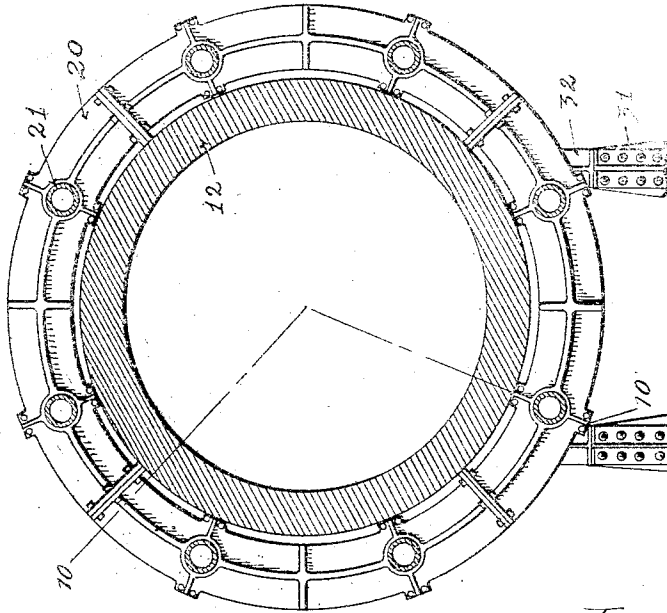


Fig. 8.



Witnesses:  
 Richard Sommer  
 D. H. Harper

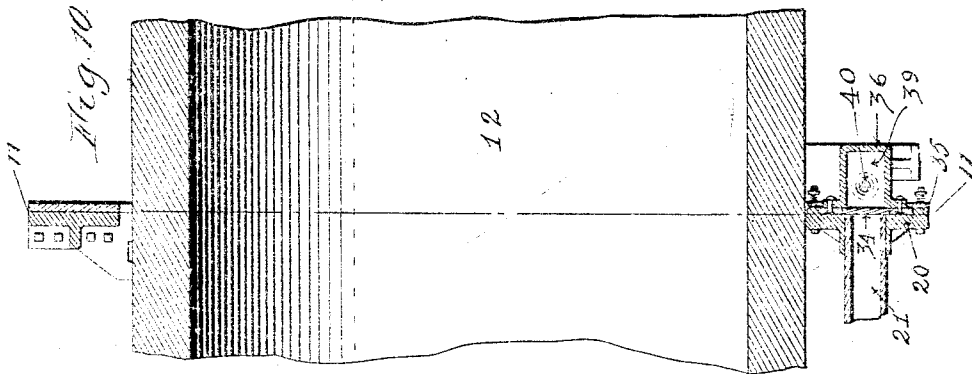
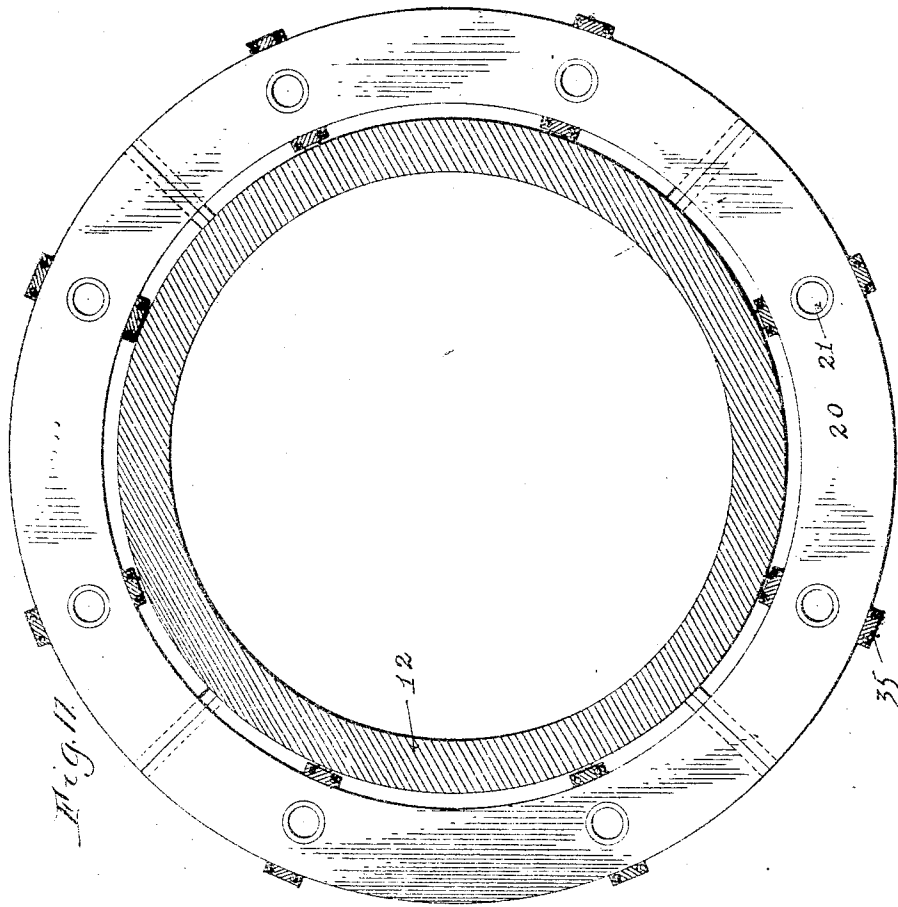
Inventor  
 George F. Downs  
 by A. J. Langster  
 Attorney

1,121,906.

G. F. DOWNS.  
ROTARY FURNACE OR KILN.  
APPLICATION FILED APR. 25, 1914.

Patented Dec. 22, 1914.

5 SHEETS SHEET 5



Witnesses:-  
Richard L. Downes  
D. H. Harper

Inventor  
George F. Downs  
by A. J. Langster  
Attorney

# UNITED STATES PATENT OFFICE.

GEORGE F. DOWNS, OF BUFFALO, NEW YORK.

## ROTARY FURNACE OR KILN.

1,121,906.

Specification of Letters Patent.

Patented Dec. 22, 1914.

Application filed April 25, 1914. Serial No. 334,389.

*To all whom it may concern:*

Be it known that I, GEORGE F. DOWNS, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful improvements in Rotary Furnaces or Kilns, of which the following is a specification.

My invention relates to rotary furnaces, and more particularly my invention relates to improved apparatus for supplying air or other gas to rotary furnaces or kilns while the same are in motion.

My invention further contemplates supplying air or other gas or vapor under any desired degree of pressure and preheated or otherwise.

My invention is further adaptable to apparatus generally which employs a hollow, rotating cylinder into which it is desired to inject a fluid under pressure; but I shall show and describe the same applied to a rotary furnace for the recovery of metallic oxides from fine dust.

The object of my invention is to provide a new and improved apparatus for injecting a fluid, such as a gas or a vapor, under pressure into a rotating furnace or kiln at any desired point or points radially at any angle or over any given segment of the circle of the furnace chamber, and to provide means whereby the volume of air, gas or vapor injected may not only have the ordinary control by variation in intensity of pressure but may also be controlled as to volume and location of delivery under a given and substantially constant degree of pressure; and, furthermore, specifically regulated by means of the damper arrangement hereafter described.

My invention, furthermore, is simple of construction, is not disturbed by heat-strain or difference in coefficient of expansion between parts, and presents minimum of friction surfaces and surfaces which are readily lubricated and calculated to retain such lubricant.

As it is necessary that the air, gas or vapor passages be kept free and unobstructed, my invention possesses the further important feature of providing means whereby said passages may be directly and readily cleaned; and this is of special importance in treating certain substances which are liable to clog such passages.

Other and further novel features will be

evident from the following description and claims and from the drawings forming a part of this specification.

Referring to the drawings herewith, in which like characters of reference indicate corresponding parts, Figure 1 is a longitudinal, vertical section of a furnace provided with my improvements. Fig. 2 is an enlarged detail side elevation. Fig. 3 is an enlarged detail section of a part of one of my manifolds. Fig. 4 is a section on 4—4 of Fig. 2. Fig. 5 is a section on 5—5 of Fig. 2. Fig. 6 is a section on 6—6 of Fig. 2. Fig. 7 is a section on 7—7 of Fig. 5. Fig. 8 is a section on 8—8 of Fig. 2. Fig. 9 is a section on 9—9 of Fig. 2. Fig. 10 is a section on 10—10 of Fig. 8. Fig. 11 is a section on 11—11 of Fig. 10.

The hollow cylindrical body of the furnace, 12, which is properly lined with refractory material, is mounted upon supports 13 provided with antifriction rollers 14 upon which the cylinder rotates. The cylinder is driven in rotation by any desired means (not shown). The furnace may be provided with any desired form of feeding apparatus, such, for example, as is diagrammatically shown at 15 in Fig. 1. A chamber 16 and a stack 17 and also ordinary means for providing a fuel supply, such as shown at 18 and 19 at the other end of the cylinder may be provided. These are all old and well-known features of construction.

At the point upon the length of the furnace cylinder at which it is desired to apply air, gas, or vapor to the material under treatment I mount a circular manifold head or upstanding circular plate 20, which is preferably built up of segments and clamped or secured to the cylinder in any desired manner. Secured in flanged openings in this circular manifold head 20 are manifolds or air pipes 21 which lie parallel with the axis of the cylinder and which are supported at the other ends by yokes 22, or by other means, which are secured to the surface of the cylinder. These manifolds are arranged, preferably, symmetrically about the cylinder, and may be of any desired length or frequency. The ends of these manifolds opposite the ends secured to said manifold head are plugged. These plugs should be removable in order that the manifolds may be cleaned readily.

Leading from the manifolds at points of any desired frequency are nipples 23 (see

Fig. 6) which connect with cross-connections 24, which connect with nipples 25, which connect with valves 27, which connect with pipes 28 which pass into the interior of the cylinder. The cross-connections 24 are provided with screw-plugs 29 and 30, by the removal of which free access may be had to the interiors of these connecting parts for the purpose of cleaning the same. The valves 27 may be gate-valves, check-valves, or any desired form; and the arrangement of the pipes 28 may be as desired, as, for example, staggered, as shown in Fig. 1.

Mounted adjustably upon supports 31 are brackets 32, which have slots for bolts and interposed shims 33, as shown in Fig. 4, by means of which the brackets are adjustable longitudinally and vertically with reference to the furnace cylinder. Rigidly secured to these brackets is an annular plate 34, preferably built up of segments, which sets up face-to-face with the manifold head 20. This plate 34 is held up to the face of the manifold head 20 so as to make a substantially gas-tight contact by means of spring-held clips 35, which are mounted upon the manifold head 20, and which are clearly shown in Figs. 3 and 10. In this manner the plate 34, which is non-rotating, sets up against the manifold head 20 and over the open ends of the manifolds 21, except as presently described. These contacting surfaces, the one fixed and the other rotating, are well removed from the interior of the furnace and may, therefore, be readily lubricated.

Mounted gas tight upon the plate 34 is a wind-box 36, which is segmental, of any desired length or capacity, and is secured to said plate 34 at any desired radial position. The portion of the plate 34 covered by the wind-box 36 is slotted to permit passage of air or other fluid from the wind-box to the manifolds 21, as they come by rotation within the segmental and unobstructed area covered by said wind-box. Connected with the wind-box 36 is a duct 37 which supplies air, gas, or vapor under pressure from any desired source, as from a blower 38, shown in Fig. 1.

It will now be evident that, when the furnace cylinder is in rotation and the blower 38 is in operation, the fluid under pressure will pass from blower into the wind-box and produce pressure therein. As the circular manifold head 20 rotates with the cylinder and brings the open ends of the manifolds 21 successively within the slot area in the plate 34 within the wind-box, the air, gas, or vapor will be forced into said manifolds and thence through the connections above described into the interior of the furnace, which discharge will continue with reference to each manifold and its discharge ducts during the time the open

end of the manifold is passing over said slot in said plate 34; and said plate 34 will prevent both ingress and egress at all other times.

In order to further regulate the treatment of any given substance by such air, gas, or vapor discharge, I provide within the wind-box 36 dampers 39 which, by regulation, close down or open up the slot area within the wind-box from which such fluid can pass to said manifolds—thus reducing or increasing the period of discharge through each manifold with every revolution of the furnace or kiln. It is important that not only shall the initial adaptation of the apparatus to a specific substance to be treated be had by determining the segmental length of the wind-box, as described, but it is also equally important that a more refined adjustment may be effected by these dampers 39, in order to meet varying conditions; such as varying content of material treated, speed of rotation of furnace or kiln, pressure of air or gas supplied, and similar variables. These dampers, preferably one at each end of the wind-box, are regulated by means of damper-screws 40, which are revolvably secured to the dampers 39 and engaged by ball-nuts 41 which are mounted in ball sockets 42 secured to the end walls of the wind-box 36. By rotation of these damper screws 40 (which have hand-wheels or other means of rotation, not shown) the dampers 39 are moved over an arc of a circle, extending or reducing the length of the slot in the plate 34 through which the manifolds 21 can receive air from the wind-box as the manifold head 20 is rotated.

My invention is capable of mechanical variation and adaptation to meet varying conditions other than above specified and also to various analogous uses, and I do not limit myself strictly to the construction shown and described, but

I claim:—

1. In a furnace of the type described, the combination of a rotary cylinder manifolds mounted on said cylinder and communicating with the interior thereof, said manifolds having open ends adapted to receive air or gas, and a wind box with which said open ends of the manifolds register during a part of their revolution to receive air or gas.

2. In a furnace of the type described, the combination of a rotary cylinder, manifolds mounted on said cylinder and communicating with the interior thereof, said manifolds having open ends adapted to receive air or gas, a wind box with which the open ends of the manifolds register during a part of their revolutions to receive air or gas, and a fixed plate which closes said open ends of the manifolds when they are out of registration with said wind box.

3. In a furnace of the type described, in

- combination with a rotating cylinder, a circular manifold head secured to said cylinder, manifolds mounted through said circular manifold head and pipes connecting  
 5 said manifolds with the interior of said cylinder, a wind-box and means for supplying air or gas pressure thereto, a plate facing against said circular manifold head and means for holding the two in contact, said  
 10 wind-box being mounted upon said plate and said plate having a slot within the area covered by said wind-box for the admission of gas or air to said manifolds as they pass said slots in their rotation.
- 15 4. In a furnace of the type described, in combination with a rotating cylinder, a circular manifold head secured to said cylinder, manifolds mounted through said circular manifold head and pipes connecting said  
 20 manifolds with the interior of said cylinder, a circular plate adjustably mounted and facing against said circular manifold head, spring-held plates for holding said circular manifold head and said plate in contact,  
 25 a wind-box carried by said plate inclosing a segmental slot in said plate and means for supplying air or gas under pressure to said wind-box.
5. In a furnace of the type described, in  
 30 combination with a rotary cylinder, manifolds and pipes mounted in rotation therewith for conveying gas or air into said cylinder, means for supplying gas or air under pressure to said manifolds at one end there-  
 35 of and removable plugs in said manifolds at the other ends thereof and in said pipes to permit cleaning of the same.
6. In a furnace of the type described, in  
 40 combination with a rotating cylinder, manifolds arranged circumferentially about said cylinder, pipes leading from said manifolds into said cylinder, a wind-box and means for supplying air or gas under pressure to  
 45 said wind-box and a non-rotating plate interposed between said wind-box and the open ends of said manifolds, whereby said manifolds are closed by said interposed plate at all times except when passing the segment

covered by said wind-box, and a limited passage from said wind-box to said manifolds. 50

7. In a furnace of the type described, in combination with a rotating cylinder, means for supplying gas or air under pressure to the interior of said cylinder comprising a plurality of manifolds mounted in rotation 55 with said cylinder and pipes connecting said manifolds with the interior of said cylinder, means for supplying air or gas to said manifolds successively as they are rotated and for closing said manifolds except when so 60 receiving gas or air.

8. In a furnace of the type described, in combination with a rotating cylinder, manifolds for supplying air or other gas or vapor to the interior of said cylinder through a 65 plurality of pipes leading thereto, pipes so connecting said manifolds with the interior of said cylinder, a non-rotating wind-box for supplying air or other gas to said manifolds as they pass the open face of said 70 wind-box, and a damper for regulating the length of opening in said wind-box through which said manifolds may take air or other gas.

9. In a furnace of the type described, in 75 combination with a rotating cylinder, a circular manifold head mounted to rotate therewith, manifolds mounted through said circular manifold head, pipes connecting said manifolds with the interior of said cylinder, a circular plate facing said circular manifold head and spring-held plates for holding said circular manifold head and said plate in substantially gas-tight relation, a wind-box mounted on said plate and a slot 85 in said plate within the area covered by said wind-box, means for supplying air or gas under pressure to said wind-box, and a damper for regulating the length of period during which each manifold may receive gas 90 or air from said wind-box during each rotation.

GEORGE F. DOWNS.

Witnesses:

D. H. HARPER,  
 A. E. HARPER.