March 15, 1927. 1,620,989

F. T. AGTHE

PACKING

Filed June 14, 1926

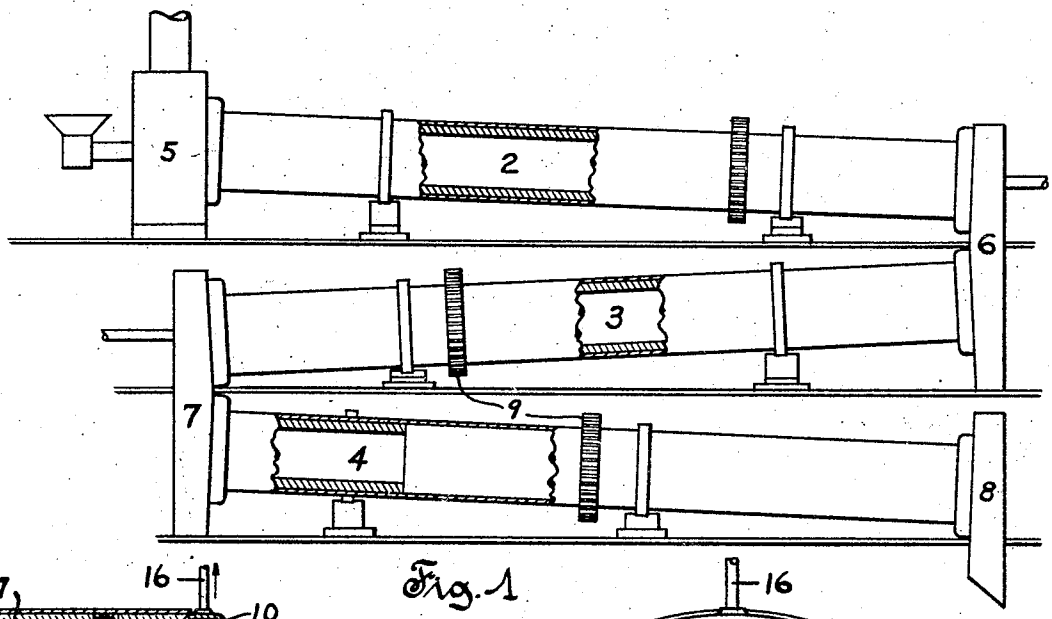


Fig. 1

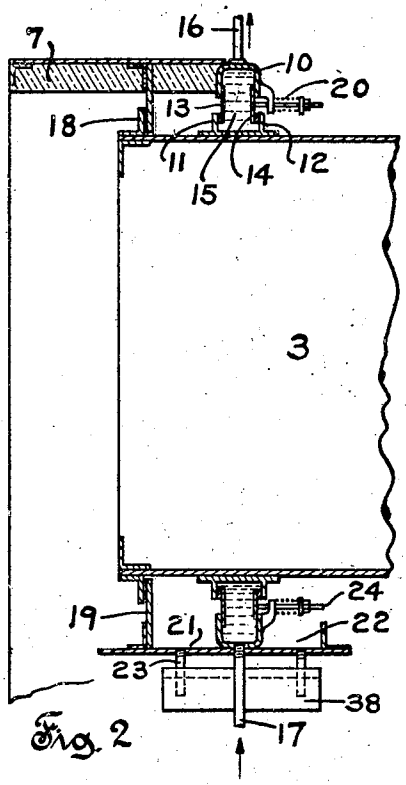


Fig. 2

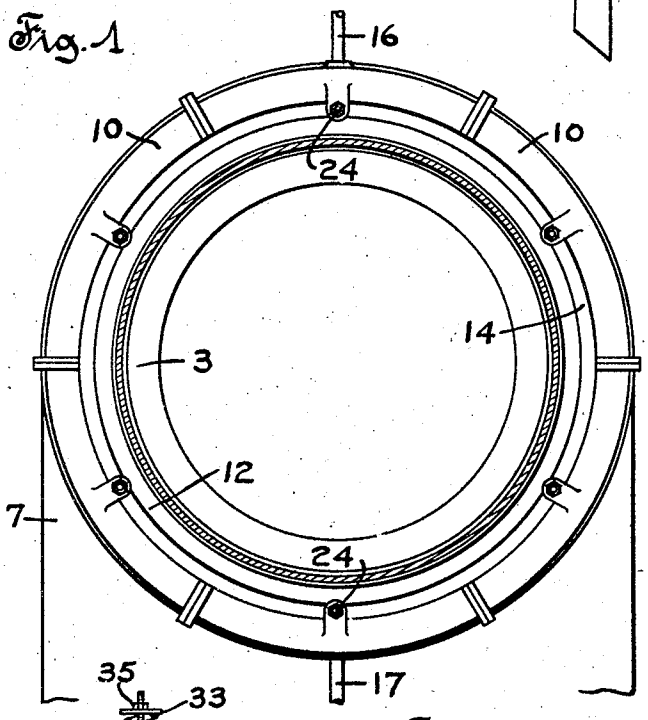


Fig. 3

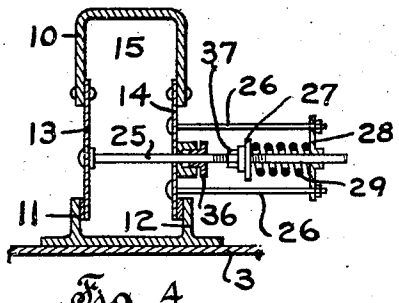


Fig. 4

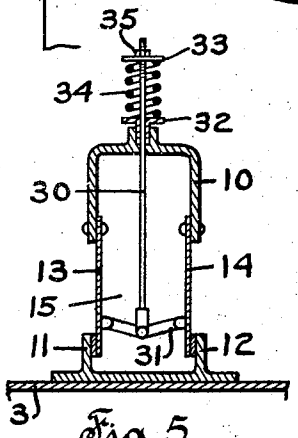


Fig. 5

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UNITED STATES PATENT OFFICE.

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PACKING.

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This invention relates in general to improvements in packings, and relates more specifically to improvements in the construction and operation of packings for sealing the joint between relatively rotating parts such as a rotary drum and an adjoining stationary member.

An object of the invention is to provide a new and useful packing which is simple in construction and efficient in operation.

When operating rotary kilns, dryers or furnaces, it is frequently desirable to introduce regulable quantities of air to the interior of the rotating drum, thereby making it necessary to provide air-tight seals at the ends of the drum so that air may be admitted only through suitable control apparatus. This is especially the case in the metallurgy of iron wherein a series of rotary drum furnaces are used to successively treat the ore, and wherein fresh air is admitted through one end only of one or more of the drums.

It is an object of the present invention to provide an improved packing for maintaining air-tight joints at one or both ends of such a rotary heating device. In accordance with the improvement, a hydraulic packing is provided which will effectively seal these joints. The water is circulated through a sealing chamber under pressure, and is preferably discharged when it becomes unduly heated. The heated water discharged from the packing or packings may be utilized in a feed water heater or other heat utilizing device, and the fluid pressure may be employed in conjunction with springs, in order to insure tight joints. These and other objects and advantages of the present invention will appear from the following description.

A clear conception of several embodiments of the invention and of the operation of devices constructed in accordance therewith, may be had by referring to the drawing accompanying and forming a part of this specification in which like reference characters designate the same or similar parts in the various views.

Fig. 1 is a part sectional side elevation of a group of three rotary drum furnaces arranged in series.

Fig. 2 is an enlarged fragmentary section through the end of a rotary drum furnace having one form of the improved packing applied thereto.

Fig. 3 is an end view of the improved packing disclosed in Fig. 2.

Fig. 4 is an enlarged section through another form of the improved packing.

Fig. 5 is an enlarged section through still another form of the improved packing.

Referring specifically to the disclosure of Fig. 1, a group of three rotary drum furnaces 2, 3, 4 is arranged in series so that the intermediate furnace 3 has its opposite ends connected respectively to the discharge and delivery ends of the drums 4, 2 by means of breechings or housings 6, 7. The drums 2, 3, 4 are continuously rotatable to transport material therethrough, by means of gearing 9. The lower end of the lower drum 4 is provided with a housing 8 for delivering treated material from the furnaces and for admitting regulable quantities of air to the drums. The upper end of the upper drum 2 is provided with a housing 5 for admitting untreated material to the furnaces and for delivering gases to the stack. A rotary packing constructed in accordance with the present invention, is preferably located between each end of each drum 2, 3, 4 and the adjacent housings 5, 6, 7, 8, in order to prevent ingress of air to the drums at the joints.

In accordance with the present invention, the end of each of the drums 2, 3, 4 is provided with outwardly projecting annular flanges 11, 12 forming annular surfaces rotatable with the drum and extending perpendicular to the axis thereof. An annular stationary member 10 which is formed in sections secured to the breeching 7, has flexible or resilient plate portions 13, 14 engaging the annular surfaces of the flanges 11, 12 respectively. The member 10 cooperates with the drum to provide an annular chamber 15 completely surrounding the drum 3. Fluid under pressure, preferably water, may be admitted to the chamber 15 through a lower inlet pipe 17 and as this fluid becomes heated within the chamber 15, it rises and may be discharged through an upper outlet pipe 16. The extreme end of the drum 3 may furthermore be provided with an annular flange 18 cooperating with a stationary baffle plate 19 to prevent excessive heat from

reaching the packing elements. Drip catches 21, 22 may be disposed on opposite sides of the packing for the purpose of collecting leakage fluid escaping from the chamber 15, and of delivering this leakage through pipes 23 to a water seal 38.

In the specific embodiment illustrated in Figs. 2 and 3, the outer plate portion 14 is provided with laterally projecting rods 24 having adjustable collars at the outer ends thereof. Helical compression springs coact with these adjustable collars of the rods 24 and with projections on the stationary member 10, thereby tending to constantly urge the flexible plate portion 14 in contact with the surface of the flange 12, and assisting the fluid pressure within the chamber 15 to prevent fluid from escaping from this chamber. In this embodiment of the invention, the fluid pressure within the chamber 15 is depended upon to urge the plate portion 13 against the annular surface of the flange 11 to a sufficient extent, to prevent excessive escape of fluid from the chamber 15 on that side of the packing.

In the embodiment of the invention illustrated in Fig. 4, the flexible plate portion 13 has rods 25 extending laterally therefrom through stuffing boxes 36 associated with the plate portion 14. The rods 25 have adjustable plates 27 associated therewith, these plates being adjustable by means of nuts 37 coacting with screw threads on the rods 25. The plate portion 14 has rods 26 projecting laterally therefrom on opposite sides of the rods 25, the outer extremities of the rods 26 being associated with plates 28 which are slidably associated with the rods 25. Helical compression springs 29 coact with the plates 27, 28 and tend to constantly urge the flexible plate portions 13, 14 against the surfaces of the flanges 11, 12 in an obvious manner. The tension of the springs 29 may be readily varied by adjustment of the nuts 37.

In the embodiment of the invention illustrated in Fig. 5, the flexible plate portions 13, 14 are interconnected within the chamber 15 by means of toggles 31, the connecting pins of the toggle links being secured to outwardly extending rods 30 which penetrate stuffing boxes 32 in the sections of the member 10. The outer extremity of each rod 30 has a plate 33 associated therewith and adjustable therealong by means of a nut 35 coacting with a screw thread at the end of the rod 30. Helical compression springs 34 coact with the plates 33 and with the adjacent stuffing boxes 32, the nuts 35 serving as means of adjustment of the tension of these springs.

During normal operation of the furnaces, the drums 2, 3, 4 are constantly rotated by means of the gearing 9 to transport material longitudinally therethrough. Fluid under pressure is admitted to the chambers 15 through the pipes 17 and is delivered therefrom through the pipes 16. The fluid pressure thus established in the chambers 15 urges the flexible plate portions 13, 14 against the annular surfaces of the flanges 11, 12 thus tending to prevent escape of fluid from the chambers 15 along these annular surfaces. Any fluid which escapes past these surfaces flows into the drip catches 21, 22 from which it is immediately discharged through the pipes 23 to the water seal 38. The seal 38 effectively prevents air from entering the furnaces through the pipes 23.

In the embodiment of the invention illustrated in Figs. 2 and 3, the outer plate portion 14 is additionally urged against the annular surface of the flange 12 by means of the springs 20. In the embodiments disclosed in Figs. 4 and 5, both plate portions 13, 14 are additionally urged against the adjacent surfaces of the flanges 11, 12 by means of the springs 29, 34. In each embodiment, the tension of these springs is adjustable from the exterior of the furnaces and may be readily adjusted by the manipulation of the adjusting nuts.

It will be apparent that the present invention provides means for effectively preventing ingress of air to the furnaces at places other than the air admission control means. The improved packings may be readily applied to rotary furnaces of various kinds and the heat absorbed by the fluid passing through the packing chambers 15 may be utilized in any desired manner. The baffle plates 19 prevent the excessive heat from interfering with effective operation of the packings, and the tightness of these packings may be readily controlled by the adjusting means provided herein.

It should be understood that it is not desired to limit the invention to the exact details of construction herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In combination, a drum rotatable about an axis to transport material therethrough, means forming an annular surface rotatable with said drum and extending transversely of said axis, a member cooperating with said surface to provide an annular chamber surrounding said axis, and means for admitting liquid to said chamber to provide an air-tight joint between said drum and said member.

2. In combination, a drum rotatable about an axis to transport material therethrough, means forming an annular surface rotatable with said drum and extending transversely of said axis, a member cooperating with said surface to provide an annular chamber surrounding said axis, resilient means for urg-

ing said surface and said member in engagement with each other, and means for admitting liquid to said chamber.

3. In combination, a drum rotatable about an axis to transport material therethrough, means forming a pair of spaced annular surfaces rotatable with said drum and extending transversely of said axis, a member cooperating with said surfaces to provide an annular chamber surrounding said axis, and means for circulating liquid through said chamber to provide an air-tight joint between said drum and said member.

4. In combination, a drum rotatable about an axis to transport material therethrough, means forming a pair of spaced annular surfaces rotatable with said drum and extending transversely of said axis, a member cooperating with said surfaces to provide an annular chamber surrounding said axis, resilient means for urging said surfaces and said member in engagement with each other, and means for circulating liquid through said chamber.

5. In combination, a drum rotatable about an axis to transport material therethrough, means forming a pair of parallel annular surfaces rotatable with said drum and extending perpendicular to said axis, a stationary member cooperating with said surfaces to provide an annular chamber surrounding said drum, and means for admitting liquid to said chamber to provide an air-tight joint between said drum and said member.

6. In combination, a drum rotatable about an axis to transport material therethrough, means forming a pair of parallel annular surfaces rotatable with said drum and extending perpendicular to said axis, a stationary member cooperating with said surfaces to provide an annular chamber surrounding said axis, a series of springs for urging said member against said surfaces, and means for circulating liquid through said chamber.

7. In combination, a drum rotatable about an axis to transport material therethrough, means forming a pair of annular surfaces rotatable with and extending transversely of said axis, a stationary member having resilient portions coactable with said surfaces, said member cooperating with said drum to provide an annular chamber, and means for establishing fluid pressure within said chamber.

8. In combination, a drum rotatable about an axis to transport material therethrough, means forming a pair of annular surfaces rotatable with and extending perpendicular to said axis, a stationary member having resilient portions cooperating with said surfaces to provide an annular chamber surrounding said axis, spring means for urging said surfaces and said member portions into engagement with each other, and means for establishing fluid pressure within said chamber.

In testimony whereof, the signature of the inventor is affixed hereto.

FREDERICK T. AGTHE.