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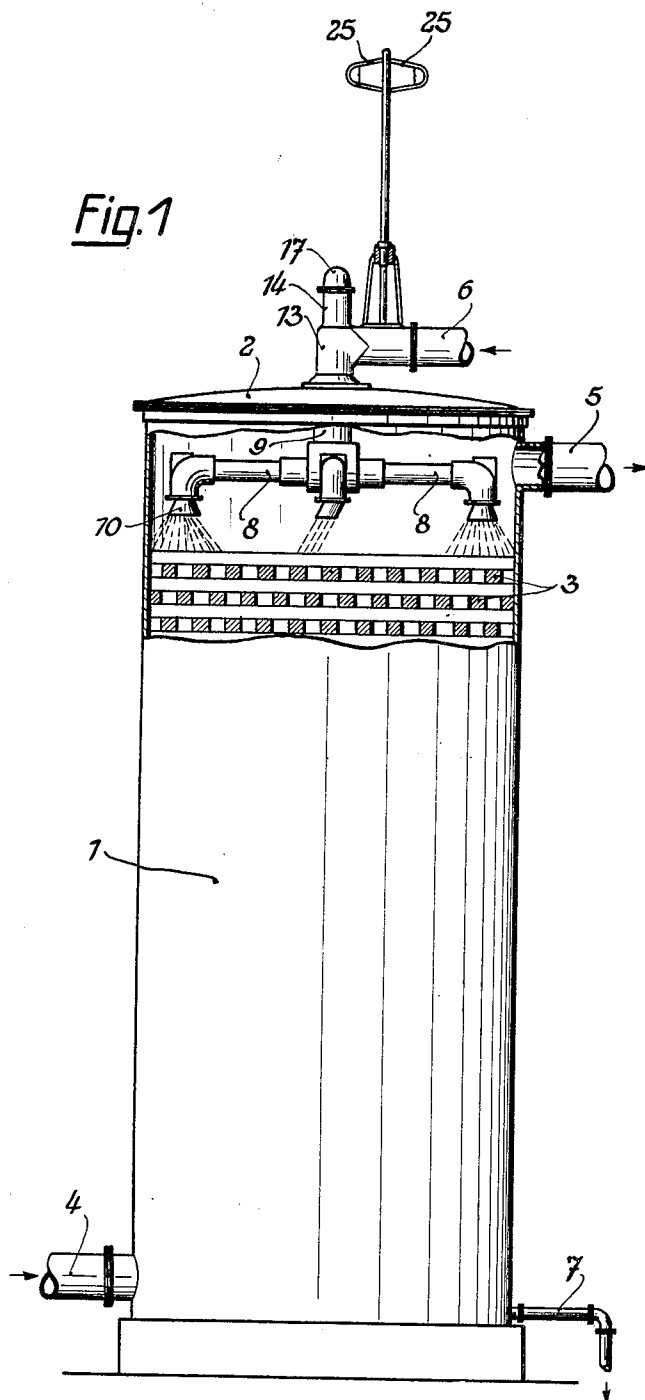
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2,621,032

GAS SCRUBBER PROVIDED WITH ROTARY SPRAYING DEVICE AND INDICATOR

Filed Sept. 28, 1949

2 SHEETS—SHEET 1



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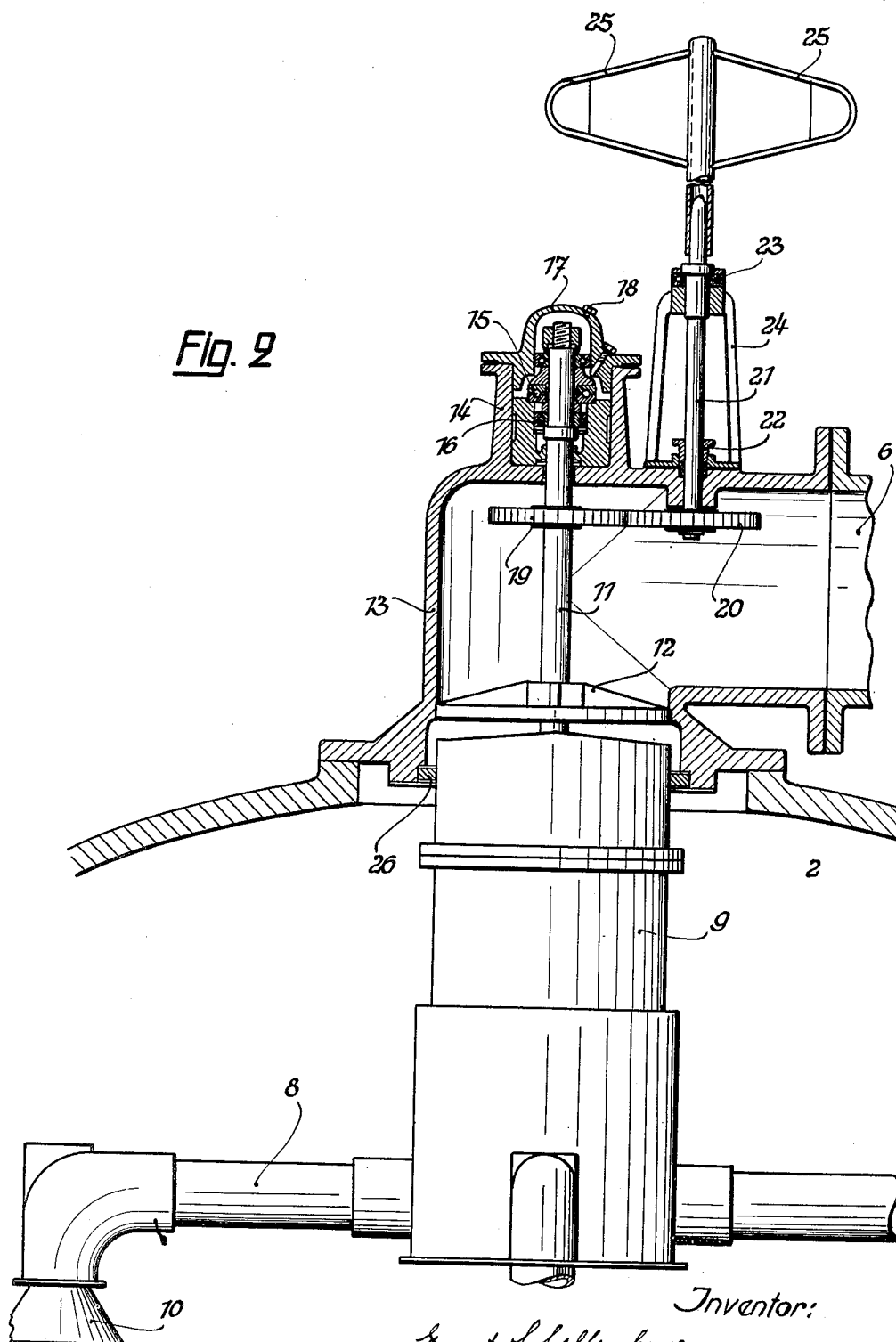
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2 SHEETS—SHEET 2

Fig. 2



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GAS SCRUBBER PROVIDED WITH ROTARY
SPRAYING DEVICE AND INDICATORErnst Schellenburg, Essen, Germany, assignor, by
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2 Claims. (Cl. 261-98)

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In coking technology and also in the chemical industry and for other purposes devices are frequently used in which gases are brought into contact with liquids, for example in order to remove or to wash out certain substances from the gases. Such so called gas scrubbers consist essentially of a tower-like round or polygonal housing in which are arranged filling bodies such as, for example, hurdles. The gas to be treated is introduced into the gas scrubber at the base and then flows upwardly through the column of filling bodies to the gas outlet provided at the upper end. The liquid which is to be brought into contact with the gases is discharged, at the top of the gas scrubber, on to the filling bodies and then flows in a state of fine division downwardly over the filling bodies so that the gas comes into contact with a large surface of liquid.

The washing liquid is discharged on to the column of filling bodies either by a fixed spraying apparatus or by means of a rotary spraying device which is rotatably operable by the propulsion of the entering washing liquid and so operates on the principle of a water wheel so that the washing liquid is distributed uniformly over the cross section of the column of filling bodies.

The invention relates to gas scrubbers which are provided with rotary spraying devices of the water wheel kind.

The object of the invention is to provide such improvements in gas scrubbers of this kind as to ensure a uniform distribution of the liquid even during a prolonged operating period whilst also enabling the spraying devices to be used for corrosive liquids.

In the hitherto known rotary spraying devices for gas scrubbers the rotary part is arranged on a vertical shaft which is generally carried above the cover of the scrubber in a ball bearing or the like. The liquid supply to the spraying device is thus effected uniformly below the bearing in order to secure the bearing means from contact with the washing liquid and thereby from eventual damage.

In practice it is now common for the carrying shaft of the spraying device to be provided with an upwardly projecting extension forming an indicator carrying shaft which carries on an outwardly protruding end thereof an indicator arm or the like. In this manner the rotary movement of the spraying device can be indicated conveniently and controlled from outside and the same carrying shaft and bearing function in common for both the indicating means and the rotary spraying device.

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A disadvantage arises in this case however, since a special stuffing box has to be provided for the indicator shaft, this being arranged on the extension of the indicator shaft above the bearing for the indicator device and the rotary spraying device where the indicator shaft projects outwardly of the scrubber for visual observation from the exterior of the scrubber. Stuffing boxes are inevitably subject to a certain degree of wear and require regular attention in order to remain completely tight. As gas scrubbers are in some circumstances of considerable height and the point of installation of the rotary spraying device and its indicator is usually not easily accessible, leaks in the stuffing boxes of the indicator shafts cannot in practice be effectively avoided.

As soon as a leak occurs in the stuffing box of the indicator shaft however, air escapes from the interior of the housing in which are arranged the bearing means (ball bearings). As a result of this, washing liquid can now penetrate into the bearing housing and come into direct contact with the delicate bearing means. The result is that the bearing means of the rotary spraying device are subjected to considerable wear causing a variation in the ratio of rotation of the spraying device, and hence variation in flow through the scrubber from time to time, and progressively, with the result that the gas treatment is not uniform during prolonged operating periods. In fact, very frequent repairs to the bearing means of rotary spraying devices have been generally necessary hitherto to maintain uniformity in distribution of liquid and gas through the scrubber.

The invention, which avoids the aforesaid disadvantages, provides in principal for arranging the stuffing box for the indicator shaft in such relation to the bearing means for the indicator shaft and for the rotary spraying device, by means of which the indicator shaft and the rotary spraying device connected therewith are mounted on the cover of the gas scrubber, that between the stuffing box and the bearing means for the indicator shaft a free space is left, from which the washing liquid, which may escape when a leak occurs in the stuffing box, can flow away without previously coming into contact with the bearing means for the indicator shaft and for the rotary spraying device.

This inventive feature can be carried out in various ways.

The drawing illustrates two different forms of construction of the invention.

Figure 1 shows a gas scrubber according to the

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invention, partly in side elevation and partly in vertical section. Figure 2 shows on a larger scale a vertical section through a part of the spraying device and the gas scrubber according to Figure 1.

The gas scrubber shown in Fig. 1 has a substantially cylindrical housing 1 closed on top by the cover 2. Within the housing 1 hurdles or battens of wood are arranged as filling bodies, as indicated at 3. The gas to be brought into contact with the washing liquid in the gas scrubber enters at the base through the pipe 4 and passes out at the top, from the interior of the gas scrubber, through the pipe 5. The washing liquid is supplied at the head of the gas scrubber through the pipe 6 in the manner to be described in greater detail hereafter and then passes on to the hurdles or filling bodies 3 on which the liquid flows downwards in a state of fine division. The liquid which accumulates at the base of the gas scrubber is withdrawn through the pipe 7.

In order to distribute the washing liquid uniformly over the cross section of the hurdles 3, which to some extent make a closely connected column, a rotary spraying device of the water wheel type is provided. The spraying device consists of a rotary hollow shaft 9 on which is provided a series of, for example, four hollow arms 8 which if necessary may be of different lengths. Each of the hollow arms 8 has a distributing head 10 which discharges the liquid at a definite angle (not shown on the drawing) to the vertical. Through the reaction resulting from the discharge of the washing liquid from the oblique nozzles at an angle to the vertical the arms 8, and with them the hollow shaft 9, are set in rotation. In this way the washing liquid is distributed uniformly over the entire cross section of the hurdles or filling body column 3.

The hollow shaft 9 is connected with an extension shaft 11 which at its lower end is carried in bearing arms 12 and at its upper end in ball bearings.

As can be seen from Fig. 2 the ball bearing of the shaft 11 is arranged, externally of the housing 13, which is connected with the liquid supplying pipe 6, in a cup-shaped bearing housing 14. The upper bearing of the shaft 11 consists of an axial ball bearing 15 and radial bearing 16. The bearing housing 14 is hermetically sealed at the top by means of a cover 17.

By means of this arrangement of the ball bearing in the housing 14, the washing liquid from within the housing 13 can in practice penetrate within the chamber 14 only until a pressure equalisation is achieved between the liquid pressure in the housing 13 and the pressure of the gas or grease in the chamber 14. By suitable construction of the chamber 14 it is easy to limit the amount of liquid which may penetrate from the gas washing liquid supply pipe 6, to such a degree that the liquid level thereof is always below the ball bearings 15, 16. In this way damage to the delicate ball bearings by the washing liquid is avoided.

In order to be able to provide the ball bearings in operation with a lubricant such as grease, which fills the chamber 14, an opening closable by means of the plug 18 is provided.

In the form of construction according to Fig. 2, within the housing 13 there is a gear wheel 19 provided on the shaft 11 which meshes with another gear wheel 20 which is carried at the lower end of a vertical shaft 21. The shaft 21 extends out through the housing 13 from the inside

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through the stuffing box 22 to outside the housing and is rotatably mounted outside the housing in a bearing 23 which is held by the bearing block 24.

At the other top end, the shaft 21 carries two indicator arms 25 whose movement, as can be seen from the drawing, can be observed from outside.

The arrangement illustrated in Fig. 2 is, as will now be readily understood, such that on the occurrence of a leak in the stuffing box 22, which closes the outwardly extending part of the indicator shaft 21, although washing liquid can leave the housing 13 the washing liquid so forced out can neither reach the delicate bearings 15, 16 of the main shaft 11 nor the bearing 23 of the indicator shaft 21, but flows away laterally through the free spaces in the bearing blocks 24. Both the ball bearings of the main shaft 11 and also the ball bearing 21 are thus securely protected against attack by the washing liquid.

The sealing between the hollow shaft 9 of the rotary spraying devices and the scrubber cover 2 is effected by means of an elastic member 26 which permits a certain transverse movement of the hollow shaft 9 relative to the scrubber cover 2 on rotation of the spraying device 8, 9.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

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

1. A gas scrubber having a washing liquid inlet at the top; a rotary spraying device operable by propulsion of entering liquid in the manner of a water wheel, arranged inside the top of said scrubber and connected with said inlet for rotation thereby and introducing and distributing washing liquid therefrom downwardly from the top of the scrubber; an axle supporting the rotary spraying device and extending upwardly through said washing liquid inlet and out through the scrubber housing externally of the scrubber into a housing hermetically sealed to the atmosphere; a bearing in said housing for rotatably supporting said axle; an indicating device arranged externally of said inlet and of the scrubber housing above the top thereof; an axle for said indicating device arranged laterally of the axle of the spraying device, said axle extending from the indicating device down through the scrubber housing and into the washing liquid inlet; means within the washing liquid inlet for connecting the axle of the indicating device with the axle of the rotary spraying device so as to be rotated in synchronism therewith; bearing means outside the scrubber housing arranged between the upper ends of the axle of the indicating device and the scrubber housing for rotatably supporting the axle of the indicating means outside the scrubber housing; a stuffing box for said indicating axle between the bearing therefor and the scrubber housing for closing the joint between the scrubber housing and the axle of the indicating device, and a passage arranged outside the scrubber housing between the bearing means for the

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indicating device axle and the stuffing box therefor, from which liquid escaping out of the washing liquid inlet and the scrubber, on leakage through said stuffing box, can flow away without coming into contact with the bearing means for the axle of the indicating device.

2. A gas scrubber having a washing liquid inlet at the top; a rotary spraying device operable by propulsion of entering liquid in the manner of a water wheel, arranged inside the top of said scrubber and connected with said inlet for rotation thereby and introducing and distributing washing liquid therefrom downwardly from the top of the scrubber; an axle supporting the rotary spraying device and extending upwardly through said washing liquid inlet and out through the scrubber housing externally of the scrubber into a housing hermetically sealed to the atmosphere; a bearing in said housing for rotatably supporting said axle; an indicating device for indicating rotation of said spraying device comprising indicator means arranged outside the scrubber in the atmosphere, a vertical axle for said indicator means extending from outside the scrubber into the washing liquid inlet means inside the scrubber, means inside the washing liquid inlet means connecting the axle of the indicator means with the axle of the rotary spray-

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ing device for rotating the axle of the indicator means in synchronism with said spraying device, bearing means for the vertical axle of the indicating means spaced above the top of the scrubber exteriorly thereof, and a stuffing box for closing the joint between the scrubber housing and the axle of the indicator means, said stuffing box and bearing means being spaced from each other to provide a passage for free passage of liquid that may leak out of the stuffing box without contacting the bearing means for the indicating and the rotary spraying devices.

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