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DEVICE FOR INTRODUCING SULPHITE CELLULOSE LIQUID INTO FURNACES

Filed July 14, 1923

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by
dating
Patented Dec. 9, 1924.

UNITED STATES PATENT OFFICE.

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DEVICE FOR INTRODUCING SULPHITE CELLULOSE LIQUID INTO FURNACES.

Device for introducing sulphite cellulose liquid into furnaces, of which the following is a specification.

Waste sulphite liquids invariably contain considerable amounts of combustible constituents, which may be utilized as fuel. My invention relates to improvements in apparatus for introducing the sulphite or cellulose liquid into furnaces of any kind suitable for the purpose, in particular furnaces adapted for mounting the apparatus therein at a place opposite the charging side.

The difficulties to be overcome in devising an apparatus of the stated kind come up to the following requirements, viz.,

1. The apparatus must be protected against incrustations settling from the liquid.

2. The apparatus must be constructed in a manner that the total grate area will be uniformly stoked and a ready combustion of the solid fuel produced in the furnace from the injected sulphite liquid by evaporation, will be ensured on the grate.

3. The apparatus must be constructed and arranged in a manner that the essential parts thereof are not exposed to destruction or damage due to the hot fire gases.

My invention relates to an improved apparatus of the stated type constructed and arranged in a manner to comply with and overcome the aforesaid difficulties. To this end the device for supplying the sulphite liquid in an undivided current or jet may be rotatably mounted in or behind a wall or partition having an opening of unvariable size for the injection of the liquid and being hollow in order to be cooled by any suitable cooling agent or, preferably, having a cooling jacket for the purpose.

In some cases it will be advisable to provide the injecting device in the liquid supply pipe, which preferably may likewise be provided with means, such as a jacket or the like, for cooling purposes. In such a modification the said device may be constituted by a distributing wheel or the like.

The injecting device may also comprise a movable tube or consist of a ball or similar spherical body mounted in the said wall or partition or within the supply pipe and having an axial bore to serve as an injecting passage or outlet.

Referring to the accompanying drawings, which illustrate several embodiments of my invention to the details of construction, to which the invention is not limited however.

Figure 1 is a sectional plan view of the embodiment comprising a movable tube arranged behind a cooled partition.

Figure 2 is a sectional view of a modified construction including a liquid feeding pipe, Figure 3 a side view to Figure 2.

Figure 4 is a vertical sectional view of a further embodiment of my invention including a distributing wheel in the plane of the ejecting opening of the liquid supply pipe.

Figure 5 is a section taken on the line D—D of Figure 4.

Figure 6 is a sectional view illustrating a modification of the embodiment shown in Figure 1 with the injecting ball mounted in a cooled partition.

Figure 7 is a sectional view of an embodiment of my invention with the injecting ball mounted in the liquid supply pipe.

Figure 8 is an horizontal section taken on the line E—E of Figure 7.

Figure 9 is a sectional view of a further modification with the liquid distributing wheel located in the liquid supply pipe and behind the cooled partition.

Figure 10 is a section taken on the line B—B of Figure 9.

As will be seen from the drawings the injecting device is mounted either behind or within the wall or partition or within a feeding pipe. In the former case the sulphite liquid will be discharged through the wall or partition into the grate and in the latter case the liquid will be ejected from the feeding pipe unto the grate through an outlet or outlets provided for the purpose in the wall of the said feeding pipe.

Obviously the two types of construction may, if desired, be combined in a plant.

In the embodiment shown in Figure 1 the injecting device comprises a tube 2 to which the sulphite liquid is supplied in any appropriate manner, e.g., by means of a suitable conduit, and a spherical body 4 carrying the said tube, as shown, and being mounted in a suitable support so as to be movable therein in the manner of an universal joint or a swivel-bearing. As it is of advantage to introduce the sul-
phite liquid from the back of the furnace, the described injecting device is located within the furnace opposite to the stoking or charging side of the furnace or grate, that is to say, at a place, where the combustion gases leave the furnace. The cooled wall or partition is a protecting means. The jet of liquid ejected from the tube passes through an opening provided in said partition for the purpose, and the conical or funnel shape of the opening allows of directing the jet over a wide field vertically and horizontally by turning the tube by means of its bearing ball, as indicated by dotted lines, so that the liquor can be uniformly distributed and spread over the whole of the grate area.

The combustion of the organic constituents of the sulphite liquid obviously is not possible unless the grate is covered with redhot fuel. The described apparatus for introducing the sulphite liquid ensures the following advantages. The organic matter of the liquid cannot burn away before all the water contained therein has been removed therefrom by evaporation. Since the described apparatus causes the jet of liquid to fall down intermittently in regular intervals into the very same portion or place of the grate area, it is possible to choose and obtain, by determining said intervals or periods in accordance with the particular quality of the sulphite liquid to be fired, conditions at which the portion of liquid injected at a certain portion or place of the grate area will have lost its water and be brought to redheat before a fresh portion of sulphite liquid will be thrown to the same portion or place of the grate area.

In grate-furnaces, generally speaking, there resides a disadvantage in that, particularly in the rear part thereof, portions of the grate are cleared due to total combustion of the fuel at said portions, so that rushes of air will pass therethrough. Also this disadvantage can be avoided by the use of my improved apparatus inasmuch as just the rear portions of the grate can be filled with solid fuel produced from the sulphite liquid, by properly directing the jet of liquid to said portions of the grate, so that clear places in the grate area will be efficiently eliminated.

In the embodiment of my invention shown in Figures 2 and 3 the liquid may be fed either by a hollow shaft or passages (not shown) in the wall immediately into the pipe which is properly supported in the wall of the grate and provided with one or a plurality of outlets. If desired the pipe may be provided with a jacket for cooling purposes. As shown in Figure 2 the pipe is supported in the wall by means of a sleeve so as to be rotatable therein. Integral with the outer end of the said sleeve is a worm-wheel engaging with a worm key to a horizontal shaft duly supported in a bracket and provided with a crank, as will be readily understood on inspection of Figure 3.

Loosely mounted on the projecting end of the pipe is a toothed wheel in engagement with a pinion key to a shaft supported in a bearing bracket and having a rope-pulley affixed to its outer end for imparting motion to the shaft, the toothed gear engaging 10 and 11 a toothed wheel key to a short shaft supported in a bearing bracket integral with the sleeve; the said wheel is connected with the closed end of the pipe by means of a crank and a rod pivotally attached to a ring key to the closed end of the pipe, so as to transmit its rotary motion to the pipe in order to impart reciprocatory movements to the latter. By turning the crank of the above described worm wheel drive 14, 15 the regular extent or stroke of the reciprocation imparted to the pipe can be manually controlled and determined. Thus the absolute position or direction of the jet will be correspondingly determined by means of the controlling device 14, 15, whereas the continuous reciprocatory movement of the pipe 5 will be brought about by the crank-wheel and the ring 10 with the aid of the rope-pulley receiving motion from any suitable source of power.

Obviously the movements of the tube may be produced if desired, by means of any other suitable driving devices.

As will be seen in Figure 4 a simple outlet is provided in the tube 5 of the embodiment shown. Inside in front of the outlet 15 a distributing wheel 16 is key to the shaft 7. The wheel is recessed on both sides of its periphery to form inclined radial faces 17 positioned at different angles with relation to the plane of the wheel, openings 18 being provided in the wheel for the liquid to pass therethrough, as indicated by the arrows in Figure 4.

The provision of the wheel 16 on the solid shaft duly supported in bearings within the tube and driven at a desired speed by means of any suitable driving mechanism ensures an efficient distribution of the sulphite liquid over the grate area. The jet of liquid forced out through the opening will be directed alternately towards the one and the other side of the plane of the wheel and since the directing faces are located at different angles with relation to the latter, the direction of the jet on either side of the plane of the wheel will change at the rotation of the wheel, so that the whole of the grate area will receive a uniform amount or layer of sulphite liquid uninterruptedly in intervals, that is to say, in one direction
by the action of the wheel 16 and in a direction perpendicularly thereto by the action of the reciprocating mechanism 9, 10. In the embodiment of my invention shown in Figure 6 the injecting tube 20 is tightly screwed into a perforated spherical body 19 rotatably embedded in a correspondingly shaped recess of the water-cooled wall 21. In front of the spherical portion of the nozzle thus formed by the two parts 19 and 20 the wall is provided with a conical or funnel-shaped opening for the distribution of the injected sulphite liquid over the grate in accordance with the rotary movements imparted to the spherical body by the tube 20 through the agency of suitable actuating mechanism not shown, which, however, may be of any appropriate kind, as will be readily understood by those skilled in the art.

In the modification of my invention illustrated in Figures 7 and 8, the spherical body 23 provided for the injection of the sulphite liquid is located in the liquid feeding pipe. The inner end of the latter is enlarged to form a head 25 having a plug 22 inserted in its wall, in which the body 23 is embedded in a similar manner as described with reference to Figure 6. The bore of the body 23 is fitted with an exchangeable insert 24 having a longitudinal or axial bore of a determined diameter so that by changing the insert and substituting in lieu thereof another one of a different bore-width the cross-sectional area of the jet can be controlled and predetermined. The insert is screw-threaded externally and the bore of the body 23 is threaded internally for proper insertion of the former. The body 23 is held in place by means of a plate 26 resiliently supported through springs 28 on bolts with nuts 27. The said bolts are rigidly connected with the wall of the head 25 and adapted to freely pass through holes provided for the purpose in the plate 26. In lieu of the yieldingly mounted plate, however, a single spring may be employed for holding the spherical body 23 in place and said spring may be disposed in the head 25 to engage with its one end the flat inner face of the body 23 and abut with its other end against the opposite face of the wall of the head.

For cooling purposes the head 25 and the tube may be enclosed in a water jacket 29. Two pins 30 are firmly attached to the flat face of the body 23 and the projecting ends of the two pins are interconnected by a cross-piece 31, so as to form a yoke which is positively connected to the driving shaft 32 by means of an arm 33.

As to the shaft is imparted an angular movement corresponding to the angle \( \alpha \), Figure 7, the spherical body 23 will receive reciprocatory movements corresponding to an angle \( \beta \) in the plane of the section shown in Figure 7. Obviously the shaft may likewise be given reciprocatory movements lengthwise or axially and, if so, the spherical body will reciprocate correspondingly in a plane vertical to the section shown in Figure 7 or in the plane of the section illustrated in Figure 8.

In the semispherical cavity of the stationary bearing plug 22, a groove 34 may be provided in communication with a suitable conduit through an appropriate passage or bore. The conduit may be disposed, as shown in Figure 8, in the wall of the head 25 and extend through the feeding tube. The groove with its conduit may be utilized for lubricating purposes and for cooling the parts by means of a cooling liquid. Furthermore the groove 34 and the conduit constitute a means for receiving and removing sulphite liquid that may take its way between the bearing faces of the spherical body 23 and the plug 22, in order that the liquid escaping therebetween be prevented from pouring through the conical opening of the plug and the water-jacket and from dropping down to the bottom of the furnace into the ash accumulation. A further means serving the like purpose consists in the provision of a groove 35 at the lower portion of the conical opening of the plug 22 for collecting and removing the escaping sulphite liquid with the aid of any suitable conducting means. If desired the inner edge 36 of the cooling jacket 29 adjacent to said groove may be enlarged to project as shown.

In the embodiment of my invention illustrated in Figures 9 and 10 the distributing member provided in the feeding pipe 37 located behind and adjacent to a cooled partition 43, as hereinbefore described, comprises a wheel 38 having an annular recess or groove 41 on the one of its two sides intermediate between its axis and its periphery and the thus formed rim 39 is provided with radial bores 40 of alternately diverging direction. The sulphite liquid forced into the tube 37 is allowed to discharge therefrom through the said bores 40 into the outlet 42 and through the injecting opening of the wall 43.

While I have described hereinbefore specific constructions of my improved apparatus for introducing or injecting sulphite cellulose liquid into furnaces, it is obvious that the described and shown constructions can be modified without departing from the spirit of my invention. I have not attempted to explain the minute details of the construction of the apparatus and the parts of the furnace and driving devices supposed to be in co-operative connection therewith, for it will be understood by those, to whom this specification is addressed, that the parts will necessarily be of the proper size and relationship and will be properly shaped, mounted and supported according to the
The tenets of madrine constructions nor have I attempted to illustrate the parts in their sizes and dimensions as many of the parts are conventionally shown.

It is unnecessary to reiterate the operation of the apparatus or the several modifications thereof, for the operation of the single parts has been described in details.

What I claim is:

1. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member located inside the furnace for directing the liquid in the form of a single jet, and a supporting member adapted to movably support said injecting member.

2. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member located inside the furnace shaped and arranged to direct the liquid in a single jet, and a liquid feeding pipe supporting said member, substantially as described and shown.

3. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member located inside the furnace shaped and arranged to direct the liquid in a single jet, and a wall supporting said member, substantially as described and shown.

4. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member located inside the furnace shaped and arranged to direct the liquid in a single jet, a wall supporting said member, and means for cooling said wall, substantially as described and shown.

5. A device for the introduction of sulphite cellulose liquid into a furnace, comprising an injecting member of spherical shape with a central bore, a liquid feeding pipe, a correspondingly spherical bearing in or adjacent to the wall of the said pipe for the reception of said member and means for cooling the wall, substantially as described and shown.

6. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member located inside the furnace for directing the liquid in the form of a single jet, a liquid feeding pipe supporting said member, means for supporting said pipe in the wall of the furnace so as to allow the pipe to rotate, and means for rotating the pipe substantially as described and shown.

7. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member of spherical shape with a central bore, a liquid feeding pipe, a tubular plug inserted into the wall thereof and a correspondingly spherical bearing in the said plug for the accommodation of said member, substantially as described and shown.

8. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member of spherical shape with a central bore, a liquid feeding pipe, a tubular plug inserted into the wall thereof, a correspondingly spherical bearing in the said plug for the accommodation of said member, and means for cooling the said pipe, substantially as described and shown.

9. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member of spherical shape with a central bore, a liquid feeding pipe, a tubular plug inserted into the wall thereof, a correspondingly spherical bearing in the plug for the accommodation of said member, and a resilient means adapted to yieldingly hold the said member in intimate contact with the bearing in the plug, substantially as described and shown.

10. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member of spherical shape having a central discharge bore, a liquid feeding pipe, a tubular plug inserted into the wall thereof, a correspondingly spherical bearing in the plug to accommodate for the said member, a resilient means adapted to yieldingly hold the said member in intimate contact with the bearing in the plug, and means for cooling the said pipe, substantially as described and shown.

11. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member of spherical shape having a central discharge bore, a liquid feeding pipe, a tubular plug inserted into the wall of said pipe, a correspondingly spherical bearing provided in the plug for the accommodation of said member, a resilient means for holding the latter in yielding contact with the bearing in the plug, a shaft within the pipe, and a yoke connected with the said shaft and with the spherical member, substantially as described and shown.

12. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member of spherical shape with a central discharge bore, a liquid feeding pipe, a tubular plug inserted into the wall of the pipe, a correspondingly spherical bearing provided in the plug for the accommodation of said member, a resilient means for holding the latter in yielding contact with the bearing in the plug, a shaft within the pipe a yoke in connection with the said shaft and with the spherical member, and means for cooling the feeding pipe, substantially as described and shown.

13. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member of spherical shape with a central discharging hole, a liquid feeding pipe, a tubular plug inserted into the wall of
the pipe, a correspondingly spherical bearing provided in the plug for the reception of said member, a resilient means for holding the latter in yielding touch with the bearing in the plug, and an exchangeable insert embedded in the discharging hole of the said member and having an axial bore of a predetermined width, substantially as described and shown.

14. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member of spherical shape having a central discharging hole, a liquid feeding pipe, a tubular plug inserted into the wall of the pipe, a correspondingly spherical bearing in the said plug for the reception of the said member, a resilient means holding the latter in yielding contact with the bearing in the plug, an exchangeable insert
in said member, having an axial bore, and a groove in the bearing surface of the plug, substantially as and for the purpose set forth.

15. A device for introducing sulphite cellulose liquid into a furnace, comprising an injecting member of spherical shape having a central discharging hole, a liquid feeding pipe, a tubular plug inserted into the wall of the pipe, a correspondingly spherical bearing in the plug for the reception of the said member, a cooling jacket surrounding the pipe, a discharge opening in the jacket in front of the tubular plug, a groove between the contacting faces of the plug and the jacket, and a projecting edge at the inner side of the discharge opening of the jacket, substantially as and for the purpose set forth.

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