

- [54] Title: APPARATUS FOR CARBON PUMP REACTIVATION
- [75] Inventor(s): PETER JAMES BREWART, of Maddington, Commonwealth of Australia
- [73] Assignee(s): SEAFORD NOMINEES PTY. LTD., of Western Australia, Australia
- [22] Filed: March 23, 1987
- [21] Application Serial No: 35066

FOREIGN APPLICATION PRIORITY DATA

- [31] Number(s) : PH 5247
- [32] Date(s) : March 27, 1986
- [33] Country(ies) : Australia
- [52] PH Class 165/66
- [51] Int. Class F26B 5/14; 3/02
- [58] Field of Search 165/66
- [56] Reference(s) Cited and/or Considered:
- | | | |
|---------------------------|---------|------------|
| U. S. Pat. Nos. 4,353,726 | 10/1982 | Hough |
| 4,380,057 | 11/1982 | Koump |
| 4,573,908 | 3/1986 | Ichiyunaji |

[57]

A B S T R A C T

A heat exchanger for heating fluid particulate material comprising a heating chamber, heating means associated with the heating chamber, a hopper mounted above the heating chamber, a delivery chamber located below the heating chamber, a set of flow passageways extending through the heating chamber between the hopper and delivery chamber, said delivery chamber having an outlet at its lower portion.

BAD ORIGINAL



26486

APPARATUS FOR CARBON PULP
REACTIVATION

ABSTRACT

A heat exchanger for heating fluid particulate

material comprising a heating chamber, heating means
associated with the heating chamber, a hopper mounted
above the heating chamber, a delivery chamber located below
the heating chamber, a set of flow passageways extending
through the heating chamber between the hopper and
delivery chamber, said delivery chamber having an outlet
at its lower portion.



APPARATUS FOR CARBON PULP REACTIVATION

Patented By: *8/14*

71 NOV -6 P 1 55

OFFICE OF PATENTS TRADE MARKS
AND TECHNICAL STAFF

5

SUMMARY OF THE INVENTION

This invention relates to a heat exchanger and in particular a heat exchanger which can be used to treat materials for the purpose of calcining, drying, effecting endothermic reactions and the like.

10

It is an object of the invention to ensure that material while undergoing the desired heating action is substantially isolated from the atmosphere.

15

In one form of the invention resides in a heat exchanger for heating particulate material comprising a heating chamber, heating means associated with the heating chamber, a hopper mounted above the heating chamber, a delivery chamber located below the heating chamber, a set of flow passageways extending through the heating chamber between the hopper and delivery chamber, said delivery

20

chamber having an outlet at its lower portion.

According to a further preferred feature of the invention cooling means are provided between heating chamber and the hopper.

5 According to a further preferred feature of the invention as injection means is provided at said outlet, said injection means being connected to a source of cooling fluid for providing a metered flow of cooling fluid to the material flowing from the delivery chamber.

10 According to a further preferred feature of the invention said passageways comprise tubes sealingly received in the lower wall of the hopper.

According to the preferred feature of the invention means are provided for injecting a gaseous fluid into the contents of the hopper.

15 According to a preferred feature of the previous feature the gaseous fluid is at ambient temperature.

BRIEF DISCRIPTION OF THE DRAWINGS

The invention will be more fully understood in the light of the following description of one specific
20 embodiment. The description is made with reference

to the accompanying drawings of which :

FIG. 1 is a part sectional elevation of a heat exchanger according to the embodiment;

5 FIG. 2 is a plan view of the heat exchanger of FIG. 1 along line 2-2;

FIG. 3 is an illustration of the form of mounting for the heat exchanger tubes in the hopper, and

10 FIG. 4 is an enlarged sectional elevation of the cooling fluid injection means in the outlet of the heat exchanger.

BEST MODE FOR CARRYING OUT THE INVENTION

The embodiment of the invention is particularly directed to a heat exchanger for the drying and reactivation of carbon used in the carbon - in - pulp processing of ores.

15 Such carbon is usually delivered to the heat exchanger with a very high water content for reactivation and dewatering. In addition it is necessary that during the reactivation process that the carbon when being heated is isolated from the atmosphere to prevent oxidation.

20 The heat exchanger of the embodiment comprises

a substantially cylindrical heating chamber 11 having insulated side walls 12 and a burner nozzle directed tangentially into the heating chamber through a port 13 provided towards the lower end of the combustion chamber. A flue pipe 15 for the combustion chamber 11 is mounted in the side wall of the heating chamber at the upper end. A cylindrical hopper 14 is supported above the upper end of the heating chamber 11 such that the lower wall of the hopper and the upper end of the combustion chamber are spaced apart. The hopper may be associated with an upper extension (not shown) to increase the capacity of the hopper.

A plurality of tubes 16 (only one is shown in Fig. 1.) are mounted between the upper 14 and the combustion chamber 11 to extend between the lower wall of hopper and the lower face of the heating chamber. The tubes open at their lower end into a delivery chamber 17 which is of substantially inverted conical configuration and which is mounted to the lower end of the heating chamber 11. The lower end

of the delivery chamber 17 is formed with an outlet 18 which may be associated with a suitable gate control to control the flow of material from the delivery chamber 17. The mounting of the tube 16 to the lower wall of the hopper 14 is effected by (see Fig. 3) a flange 19 formed on the outer face of the upper end of the tubes 16 which is engaged with the upper face of the lower wall of the hopper 14 to prevent downward movement of the tube 16 post the flange 19. A ceramic washer or seal 2 is located between the flange 19 and the plate of the hopper 14 to effectively seal the opening accommodating the tube 16.

The hopper 14 is provided with a plurality of tubes 20(only one is shown in Fig. 1) which extends substantially vertically from the space between the heating chamber and hopper to a position clear of the material accommodated within the hopper 14. While the space 22 between the heating chamber and hopper serve in cooling the upper end of the flow passageways the tubes 20 serve in heating the contents of the hopper using the heat extracted from

the space.

5 The outlet 18 is provided with a water injection means (see Fig. 2) comprising a nozzle extending into the chamber 17 and connected to a source of water to provide for a metered supply of water to the outlet 18 whereby the amount of water provided is suffecient to effect cooling of the carbon passing from the outlet 18, to a temperature below that at which oxidation is likely to occur, but it insuffecient to retard the fluid
10 flow of the carbon passing from the outlet 18.

 As a result of the embodiment of heat exchanger is provided for reactivating carbon whereby the carbon can be heated in isolation from the atmosphere. The injection of the metered supply of cooling water to the
15 outlet of the heat exchanger not only serves in cooling the material flowing from the heat exchanger to a temperature below that at which substantial oxidation can take place but also serves in isolating the interior of the delivery chamber and heat exchanger tubes from
20 the atmosphere. Furthermore the air space created

26486

between the combustion chamber 11 and the hopper 14
serves in linking the heating of the hopper 14 and while
the tubes 20 serves in providing convectional air flow
through the space and tube 20 to enhance the limited
5 heating of the hopper and its contents.

If desired the hopper may be provided with means
for injecting air 24 or may suitable gas of ambient
temperature into the contents of the hopper towards the
base thereof. The percolation of the air through the
10 contents which are usually heated assists in the removal
of water prior to being heated further in the heating
chamber.

It should be appreciated that the scope of the present
invention need not be limited to the particular scope of the
15 embodiment described above.

I Claim :

1. A heat exchanger, for processing a material
fluid particulate comprising:
 - (a) a heating chamber;
 - 20 (b) heating means for heating said heating chamber;

(c) a hopper mounted above the heating chamber and supported in spaced relation to said heating chamber;

(d) a delivery chamber mounted below said heating chamber, said delivery chamber being provided with an outlets;

(e) injection means for injecting a metered quantity of a cooling liquid into the fluid particulate material prior to its discharge from the outlet at the outlet of said delivery chamber;

(f) a source of cooling liquid connected to said injection means; and

(g) a set of flow passageways supported from the hopper and extending from the hopper through the heating chamber to open into the delivery chamber, said flow passageways not being fixed to the heating chamber or delivery chamber.

2. Apparatus as in claim 1 wherein said flow passageways comprise tubes sealingly supported by the base of the hopper.

3. Apparatus as in claim 2 wherein the metered

flow of cooling liquid is sufficient to cool the fluid particulate material to a temperature below that at which substantial oxidation occurs.

4. Apparatus as in claim 1 wherein means are
5 provided for injecting a gaseous fluid into the contents of the hopper.

5. Apparatus as in claim 4 wherein the gaseous fluid is air.

6. Apparatus as in claim 1 wherein said fluid
10 particulate material is carbon.

7. A heat exchanger for heating carbon pulp discharged from the carbon-in-pulp processing of material ores, said heat exchanger comprising a heating chamber provided with a heating means, a hopper mounted above
15 the heating chamber and supported in spaced relation therefrom, a delivery chamber mounted below the heating chamber, said delivery chamber being provided with an outlet, an injection means at the outlet and connected to a source of cooling liquid to inject a
20 metered quantity of the cooling liquid into the carbon

26486

prior to its discharge from the outlet and a set of flow
passageway supported from the hopper and extending
from the hopper through the heating chamber to open
into the delivery chamber, said flow passageways not
5 being fixed to the heating chamber or delivery chamber.

8. A heat exchanger as claimed at claim 7, wherein
a plurality of air flow passageways extend through the hopper
between the base and the upper end thereof and which open
into a space above said heating chamber at their lower
10 ends.

9. A heat exchanger as claimed at claim 7 wherein
said flow passageways comprise tubes and seals supported
by the base of the hopper.

10. A heat exchanger as claimed at claim 7
15 wherein the cooling liquid is water.

11. A heat exchanger as claimed at claim 10
wherein the metered flow of cooling water is sufficient
to cool the carbon to a temperature below that at which
substantial oxidation occurs.

20 12. A carbon reactivization apparatus for treating

26486

carbon pulp discharged from the carbon-in-pulp processing
of mineral ores, said apparatus comprising a heating
chamber provided with a heating means, a hopper
mounted above the heating chamber and supported in
5 spaced relation therefrom, a delivery chamber mounted
below the heating chamber, said delivery chamber being
provided with an outlet, an injection means at the outlet
and connected to a source of cooling liquid to inject
a metered quantity of the cooling liquid into the carbon
10 prior to its discharge from the outlet, a set of passageways
supported by and suspended from the hopper and extending
from the hopper through the heating chamber to open into
the delivery chamber, said passageways not being
inmoveably fixed to the heating chamber or delivery
15 chamber and a plurality of air flow passageways extending
through the hopper between the base and the upper end
thereof and opening into spaced above said heating
chamber at their lower ends.

13. A carbon reactivization apparatus for treating
20 carbon pulp discharged from the carbon-in-pulp processing

26486

of mineral ores, said apparatus comprising a heating
chamber provided with a heating means, a hopper
mounted above the heating chamber and supported in
spaced relation therefrom, a delivery chamber mounted
5 below the heating chamber, said delivery chamber
being provided with an outlet, an injection means at
the outlet and connected to a source of cooling liquid
to inject a metered quantity of the cooling liquid into
the carbon prior to its discharge from the outlet, a set
10 of passageways supported by and suspended from the
hopper and extending from the hopper through the heating
chamber to open into the delivery chamber, said passageways
not being inmoveably fixed to the heating chamber or
delivery chamber, a plurality of air flow passageways
15 extending through the hopper between the base and
the upper end thereof and opening into a space above
said heating chamber at their lower ends, and a means
for injection a gaseous fluid into the contents of said hopper.

PETER JAMES STEWART
Inventor

20

26486

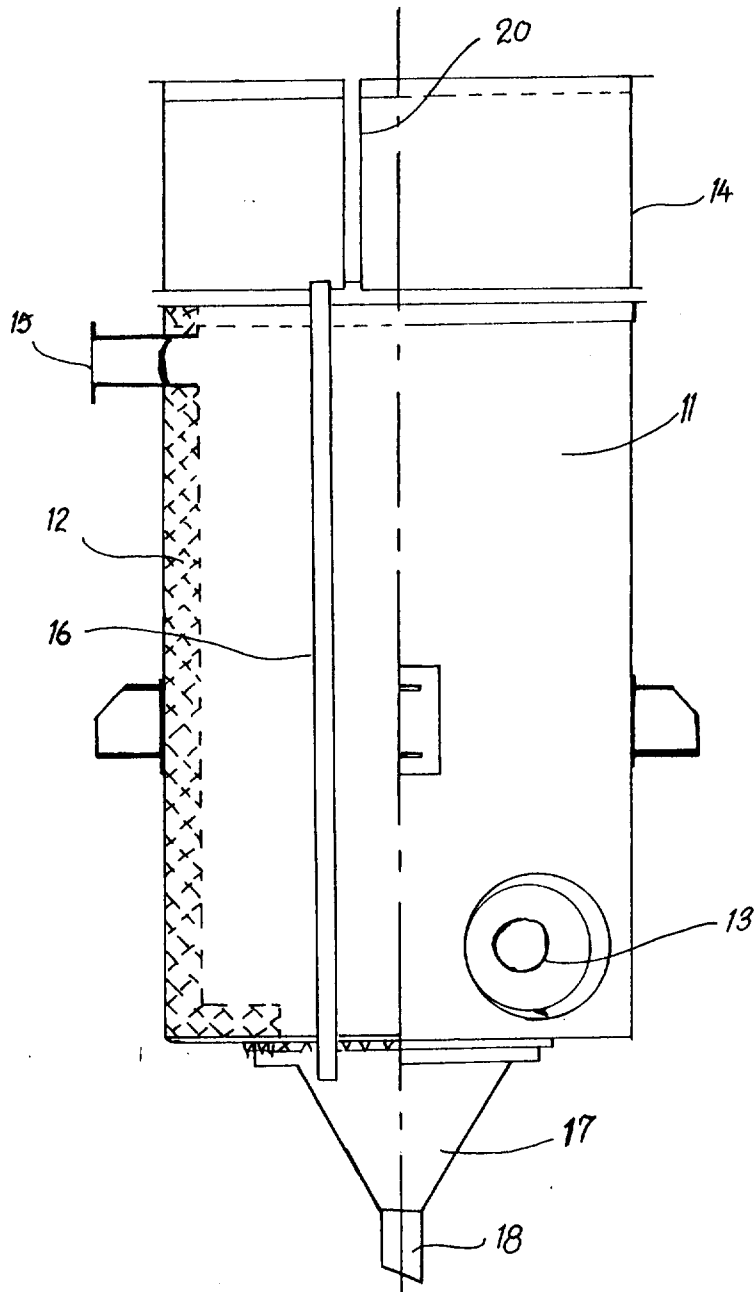


Fig. 1.

Peter James Stewart
Inventor
G. Gonzalez & Associates

By 
Attorneys

26486

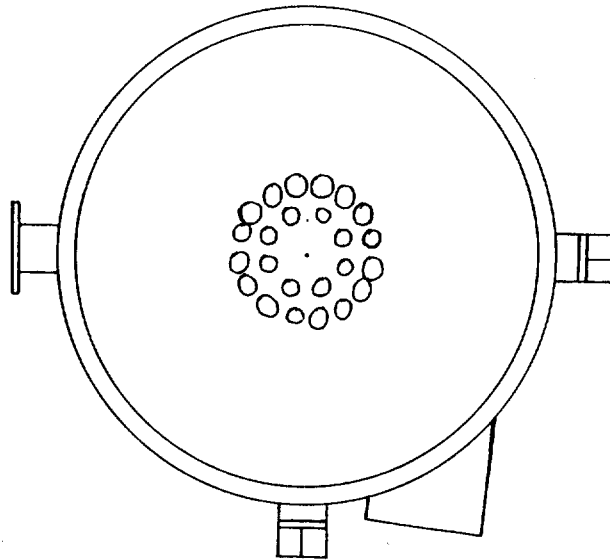


Fig. 2

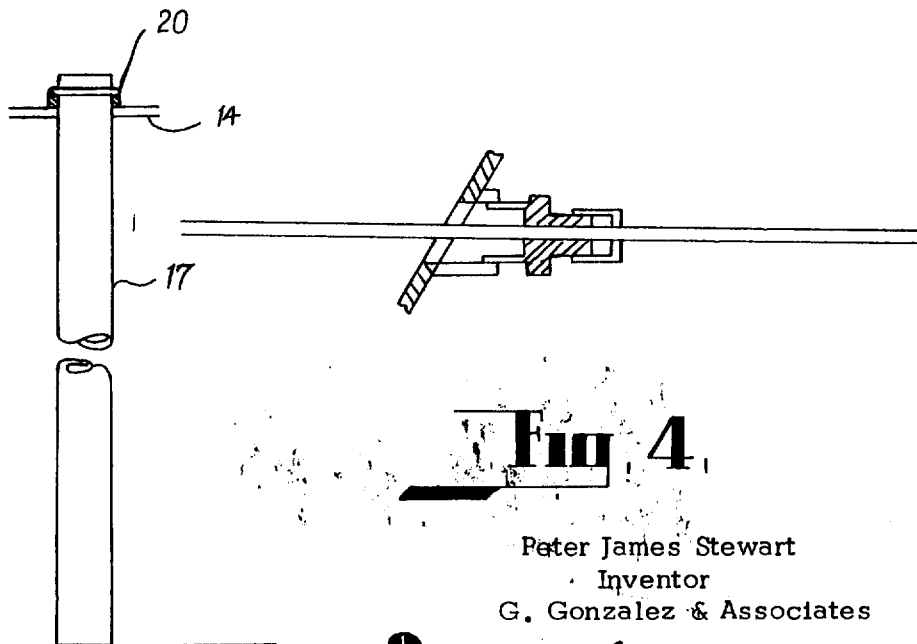


Fig. 4

Fig. 3

Peter James Stewart
Inventor
G. Gonzalez & Associates

By *[Signature]*
Attorneys