PATENT SPECIFICATION

681,551

Date of filing Complete Specification : July 5, 1950.

No. 19675/49.

Application Date : July 26, 1949.

Complete Specification Published : Oct. 29, 1952.

Index at acceptance:—Class 55(ii), C(2:3), L1.

2636

COMPLETE SPECIFICATION.

Purification of Gases.

SPECIFICATION NO. 681551

INVENTOR: IAN HUGH PHILLIPPS

By a direction given under Section 17(1) of the Patents Act 1949 this application proceeded in the name of Humphreys & Glasgow Limited, a British company, of 22, Carlisle Place, London, S.W.1.

THE PATENT OFFICE,

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bed is coincident with [illegible] the gas path through it at any level, the purification material being progressively withdrawn from the bottom of the body or mass and being progressively added to the top and purification material which has become sulphidised or partly sulphidised being revivified for re-use by passage therethrough of air or of other oxygen-containing gas.

Such a process is described in British patent applications Nos. 599/48 (Serial No. 640,065) and 11367/49 (Serial No. 673,546), in both of which cases revivification of fouled or sulphidised purification material may be effected not only *in situ* during passage of the purification material through a purification chamber and while it is in contact with gas therein, but also externally, that is after removal of the purification material from such a chamber but before it is re-used in that chamber or in another purification chamber.

The present invention is concerned with means for revivification of fouled purification material after it has been removed from a gas purification chamber, and has for its object the performance of such "external" revivification without the necessity for a separate vessel or vessels for that purpose.

By use of the invention a considerable

[Price 2/8]

[illegible] gas, characterised in that purification material for revivification is traversed from a discharge location beneath the bed to a supply location above the bed in a conduit through which the oxygen-containing gas is forced so that at least the upright portion of the conduit is sufficiently obstructed by purification material to constrain or compel the oxygen-containing gas to penetrate and pass through the column thus formed.

Revivification according to the invention may, if desired, be applied to fouled material during its transport to a gas-purification chamber other than the one from which it has just been withdrawn.

It is also preferred that some agitation or disturbance of the material should occur during its passage through the conduit or conduits.

The invention also provides apparatus for carrying out the above-mentioned process comprising a gas purification chamber containing said downwardly-moving packed bed of hydrated iron-oxide-containing purification material, supply and discharge means for said purification material disposed respectively above and below the purification chamber, a conduit extending around the purification chamber in an upright plane said conduit having an inlet

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COMPLETE SPECIFICATION.

Purification of Gases.

We, HUMPHREYS & GLASGOW LIMITED, a British Company, and IAN HUGH PHILLIPPS, a British Subject, both of 22, Carlisle Place, London, S.W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to removal of hydrogen sulphide from gases by passing the gas through a packed bed of hydrated iron oxide-containing material which moves progressively downwards through a chamber, the horizontal cross-section of which bed is coincident with the cross-section of the gas path through it at any level, the purification material being progressively withdrawn from the bottom of the body or mass and being progressively added to the top and purification material which has become sulphidised or partly sulphidised being revivified for re-use by passage therethrough of air or of other oxygen-containing gas.

Such a process is described in British patent applications Nos. 599/48 (Serial No. 640,065) and 11367/49 (Serial No. 673,546), in both of which cases revivification of fouled or sulphidised purification material may be effected not only *in situ* during passage of the purification material through a purification chamber and while it is in contact with gas therein, but also externally, that is after removal of the purification material from such a chamber but before it is re-used in that chamber or in another purification chamber.

The present invention is concerned with means for revivification of fouled purification material after it has been removed from a gas purification chamber, and has for its object the performance of such "external" revivification without the necessity for a separate vessel or vessels for that purpose.

By use of the invention a considerable saving is achieved in ground space required for the process and in the cost of plant for the purpose.

According to the present invention there is provided a continuous process for the removal of hydrogen sulphide from gas in which the gas passes substantially vertically through a downwardly-moving packed bed of hydrated iron-oxide-containing material, the horizontal cross-section of which bed is coincident with the cross-section of the gas path through it at any level, and in which process sulphidised or partly sulphidised purification material is revivified for re-use by passage therethrough of air or other oxygen-containing gas, characterised in that purification material for revivification is traversed from a discharge location beneath the bed to a supply location above the bed in a conduit through which the oxygen-containing gas is forced so that at least the upright portion of the conduit is sufficiently obstructed by purification material to constrain or compel the oxygen-containing gas to penetrate and pass through the column thus formed.

Revivification according to the invention may, if desired, be applied to fouled material during its transport to a gas-purification chamber other than the one from which it has just been withdrawn.

It is also preferred that some agitation or disturbance of the material should occur during its passage through the conduit or conduits.

The invention also provides apparatus for carrying out the above-mentioned process comprising a gas purification chamber containing said downwardly-moving packed bed of hydrated iron-oxide-containing purification material, supply and discharge means for said purification material disposed respectively above and below the purification chamber, a conduit extending around the purification chamber in an upright plane said conduit having an inlet

[Price 2/8]

for receiving sulphidised material under gravity from said discharge means and an outlet for supplying said supply means with revivified material under gravity, elevating means of the drag-link, scraper, or chain type movable through said conduit so as to move material from the conduit inlet to the conduit outlet as a gas-obstructing mass through the upright portion of the conduit, and thereafter to return to the conduit inlet through the remainder of the conduit, the portion of the conduit through which said column of material passes being substantially air-tight and having an inlet for compressed air.

It is to be understood that the invention is not limited to use where no revivification of fouled purification material is effected *in situ* within a gas purification chamber, and that it may be employed in conjunction with such revivification.

Further, it is also to be understood that revivification of spent or fouled purification material according to this invention may be followed by other reconditioning of the said material, such as adjustment of its moisture content and of its pH before it is re-used for gas purification.

The nature of this invention and the manner in which it is to be performed will be appreciated from the following description of an example reference being made to the drawing accompanying the provisional specification which is a diagrammatic elevation (partly broken away) showing the application of an endless conveyor of the drag-link, scraper or chain type for the purpose of this invention.

The elevating and aerating of the fouled purification material takes place in the substantially air-tight conduit 26 which encloses an endless conveyor 31 of the drag-link, scraper or chain type. The fouled purification material passes from the purifier 12 through a rotary valve 32 and through discharge nozzle 33 into the receiver 34 whence it passes directly to the conveyor 31 which raises it in the form of a column and delivers it at 37 first through discharge chute 43 into hopper 15 and thence through a rotary valve 44 into the chamber 12, the conveyor chain returning empty down the other limb 26*a* of the endless conduit.

Air from the blower 35 is introduced at 36 into the conduit 26 and is forced upwardly and downwardly through the rising column of purification material, thereby effecting its revivification, leaving the conduit 26 via the outlets 43 and 34.

By means of suitable apparatus the moisture content and pH of the material delivered to the hopper 15 may be adjusted before it is returned to the gas purification chamber 12.

The gas for purification may be passed through chamber 12 either in counter-current to the downwardly-moving mass of purification material or in co-current flow with it, the pipes 17 and 18 serving either for exit or for entry of the gas. Spent purification material may be withdrawn from the system and replaced by fresh material.

What we claim is:—

1. A continuous process for the removal of hydrogen sulphide from gas in which the gas passes substantially vertically through a downwardly-moving packed bed of hydrated iron-oxide-containing material, the horizontal cross-section of which bed is coincident with the cross-section of the gas path through it at any level, and in which process sulphidised or partly sulphidised purification material is revivified for re-use by passage therethrough of air or other oxygen-containing gas, characterised in that purification material for revivification is traversed from a discharge location beneath the bed to a supply location above the bed in a conduit through which the oxygen-containing gas is forced so that at least the upright portion of the conduit is sufficiently obstructed by purification material to constrain or compel the oxygen-containing gas to penetrate and pass through the column thus formed.

2. A process as claimed in Claim 1 in which oxygen-containing gas is forced downwardly through at least part of the rising column of purification material.

3. A process as claimed in Claim 1 or Claim 2 in which some agitation or disturbance of the material occurs during its passage from the discharge to the delivery location.

4. A process as claimed in any of the preceding claims in which revivification of fouled or sulphidised material is applied to said material after removal from the base of one packed bed during the transport of said material to a gas-purifying chamber other than the one from which it has just been withdrawn.

5. Apparatus for carrying out the process of any of Claims 1 to 3 comprising a gas purification chamber containing said downwardly-moving packed bed of hydrated iron-oxide-containing purification material, supply and discharge means for said purification material disposed respectively above and below the purification chamber in an upright plane, said conduit having an inlet for receiving sulphidised material under gravity from said discharge means and an outlet for supplying said supply means with revivified material under gravity, elevating means of the drag-link, scraper, or chain type movable

through said conduit so as to move material from the conduit inlet to the conduit outlet as a gas-obstructing mass through the upright portion of the conduit, and thereafter to return to the conduit inlet through the remainder of the conduit, the portion of the conduit through which said column of material passes being substantially air-tight and having an inlet for compressed air.

6. Apparatus for carrying out the process of Claim 1 or Claim 2 substantially as hereinbefore described with reference to the drawing accompanying the provisional specification.

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Chartered Patent Agents.

PROVISIONAL SPECIFICATION.

Purification of Gases.

We, HUMPHREYS & GLASGOW LIMITED, a British Company, and IAN HUGH PHILLIPPS, a British Subject, both of 22, Carlisle Place, London, S.W.1, do hereby declare the nature of this invention to be as follows:—

This invention relates to removal of hydrogen sulphide from gases by passing the gas through a packed bed of hydrated iron oxide-containing material which moves progressively downwards through a chamber, the horizontal cross-section of which bed is coincident with the cross-section of the gas path through it at any level, the purification material being progressively withdrawn from the bottom of the body or mass and being progressively added to the top and purification material which has become sulphidised or partly sulphidised being revivified for re-use by passage therethrough of air or of other oxygen-containing gas.

Such a process is described in British patent applications Nos. 599/48 and 11367/49, in both of which cases revivification of fouled or sulphidised purification material may be effected not only *in situ* during passage of the purification material through a purification chamber and while it is in contact with gas therein, but also externally, that is after removal of the purification material from such a chamber but before it is re-used in that chamber or in another purification chamber.

The present invention is concerned with means for revivification of fouled purification material after it has been removed from a gas purification chamber, and has for its object the performance of such "external" revivification without the necessity for a separate vessel or vessels for that purpose.

By use of the invention a considerable saving is achieved in ground space required for the process and in the cost of plant for the purpose.

According to the invention, in a continuous process for the removal of hydrogen sulphide from gas in which the gas passes substantially vertically through a downwardly-moving packed bed of hydrated iron-oxide-containing material, the horizontal cross-section of which bed is coincident with the cross-section of the gas path through it at any level, and in which sulphidised or partly-sulphised purification material is revivified for re-use by passage therethrough of air or other oxygen-containing gas, some or all of the revivification of fouled or sulphidised material is effected after removal of the material from the base of the packed bed but during its transport to re-use or to other reconditioning for re-use, through a conduit or pipe through which the purification material being revivified is constrained to pass in contact with said stream of oxygen-containing gas.

The invention is not restricted to use with any particular type of conveyor or elevator, nor need it be effected in one stage, and revivification according to the invention may, if desired, be applied to fouled material during its transport to a gas-purification chamber other than the one from which it has just been withdrawn.

This invention includes in particular the case where the conduit forming the conveyor or elevator for fouled material acts also as the revivifying device for such fouled material.

It is preferred to carry out revivification according to this invention in the elevator serving to raise the material for re-use and comprising a casing or conduit substantially air-tight throughout its height wherein there is an elevating means of the drag-link, scraper, or chain type which, while raising the material, either as a column or in quanta, itself occupies only a minor part of the crosss-section of the conduit and does not substantially obstruct the access of air to the particles of solid or the passage of air through the body of the solid.

It is also preferred that some agitation or disturbance of the material should occur during its passage through the conduit or conduits.

It is to be understood that the invention

is not limited to use where no revivification of fouled purification material is effected *in situ* within a gas purification chamber, and that it may be employed in conjunction with such revivification.

Further, it is also to be understood that revivification of spent or fouled purification material according to this invention may be followed by other reconditioning of the said material, such as adjustment of its moisture content and of its pH before it is re-used for gas purification.

The nature of this invention and the manner in which it is to be performed will be appreciated from the following description of three examples, reference being made to the accompanying drawing which is a diagrammatic elevation (partly broken away) showing the application of an endless conveyor of the drag-link, scraper or chain type for the purpose of this invention.

Referring to the drawing, the elevating and aerating of the fouled purification material takes place in the substantially air-tight conduit 26 which encloses an endless conveyor 31 of the drag-link, scraper or chain type. The fouled purification material passes from the purifier 12 through a rotary valve 32 and through discharge nozzle 33 into the receiver 34 whence it passes directly to the conveyor 31 which raises it in the form of a column and delivers it at 37 first through discharge chute 43 into hopper 15 and thence through a rotary valve 44 into the chamber 12, the conveyor chain returning empty down the other limb 26*a* of the endless conduit.

Air from the blower 35 is introduced at 36 into the conduit 26 and is forced upwardly and downwardly through the rising column of purification material, thereby effecting its revivification, leaving the conduit 26 via the outlets 43 and 34.

By means of suitable apparatus the moisture content and pH of the material delivered to the hopper 15 may be adjusted before it is returned to the gas purification chamber 12.

The gas for purification may be passed through chamber 12 either in countercurrent to the downwardly-moving mass of purification material or in co-current flow with it, the pipes 17 and 18 serving either for exit or for entry of the gas. Spent purification material may be withdrawn from the system and replaced by fresh material.

Dated this 26th day of July, 1949.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London, E.C.1.
Chartered Patent Agents.

681,551 PROVISIONAL SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.