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SULFUR BURNER

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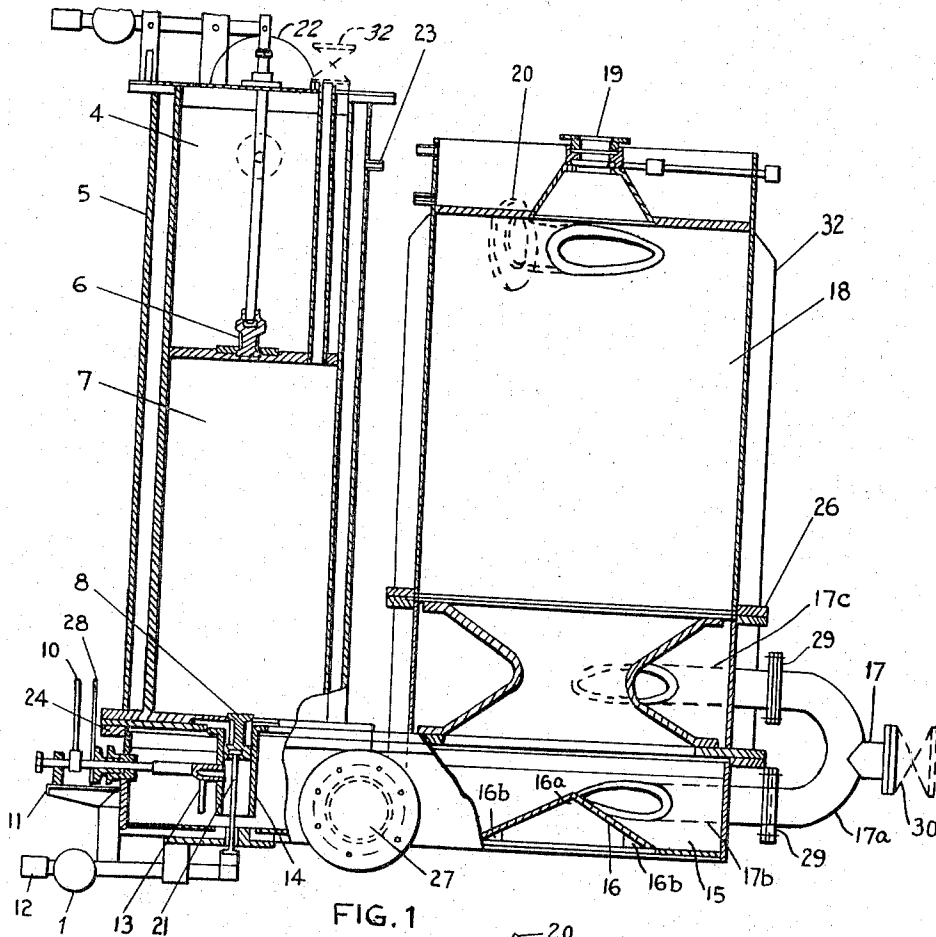


FIG. 1

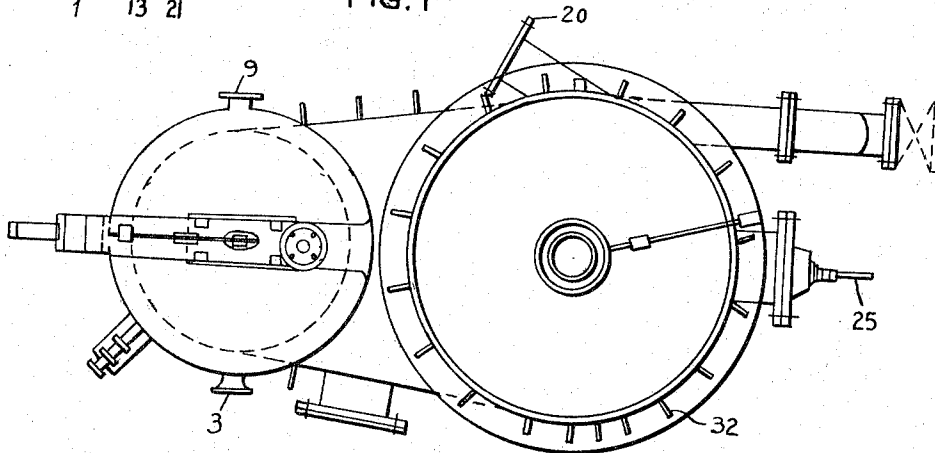


FIG. 2

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1

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SULFUR BURNER

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This invention relates to sulphur burners of the type in which the sulphur is vaporized from a pool of molten sulphur in the combustion chamber and the combustion of sulphur vapour takes place over the said pool of molten sulphur, and in which a means is provided for varying the vapourization area of the molten sulphur, thereby controlling the rate of combustion of the sulphur without interfering with the air supply for that purpose.

A sulphur burner of the type described has already been proposed which has, in combination, a combustion chamber wherein the combustion of sulphur will take place over a pool of molten sulphur contained in the said combustion chamber, a gas chamber above the said combustion chamber, means whereby the level of the said pool of molten sulphur may be varied in any desired manner, and a conical trough positioned in the vapourization zone of the said pool of molten sulphur, so that by the co-action of the said conical trough and the said means for varying the level of the molten sulphur in the said combustion chamber, the rate of the combustion taking place in the said combustion chamber may be controlled without interfering with air supply to the said combustion chamber.

Other features of the said sulphur burner are as follows:

(i) The supply of air to its combustion chamber is effected by means of an air supplying pipe fitted at the bottom of the gas chamber of the burner.

(ii) The discharge of the gases from the gas chamber is effected through a vertical pipe fitted at the top of the said gas chamber.

(iii) An observation pipe is fitted to the cylindrical wall of the gas chamber, whereby the phenomena taking place inside the said gas chamber may be inspected.

(iv) The feeder valve which regulates the level of the molten sulphur in the combustion chamber is operated by a valve rod.

The present invention has for its object improvements whereby (i) the supply of air to the combustion chamber of the said burner may be more effectively regulated; (ii) the discharge of the gases from the gas chamber may be more effectively regulated; (iii) the combustion process can be completed with much less excess air, (iv) a better arrangement of the means whereby the phenomena taking place inside the gas chamber may be better inspected, than is possible in the sulphur burner already proposed; and (v) the feeder valve whereby the level of the molten sulphur is regulated, may be more conveniently operated.

With this object in view one aspect of this invention consists of a sulphur burner which has, in combination a combustion chamber wherein the combustion of sulphur will take place over a pool of molten sulphur contained in the said combustion chamber, a gas chamber above the said combustion chamber, means whereby the level of the

2

said pool of molten sulphur may be varied in any desired manner, and a conical trough positioned in the vapourization zone of the said pool of molten sulphur, so characterised in that it is provided with a primary air supply pipe and a secondary air supply pipe for supplying air to the combustion chamber in two stages, the said primary air supply pipe supplying the air at the level of the conical combustion trough provided in the combustion chamber, and the said secondary air supply pipe supplying the air in the zone of the flame of the burning sulphur. The primary and secondary air connections are fixed tangentially to the combustion chamber.

As an improvement, the said primary air supply pipe, as well as the said secondary air supply pipe, is provided with its own regulating mechanism, which may be of the usual type, such as a regulating valve or a variable-opening orifice plate, so that the proportion of the primary air and/or the secondary air may be varied for obtaining the best possible combustion of sulphur.

By another improvement according to this invention, the cylindrical wall of the combustion chamber is provided with fins which will help to dissipate heat faster and thus maintain the temperature of the combustion at a temperature which is not too high.

A further improvement according to this invention consists in providing a sight glass (corresponding to the "observation pipe" fitted on the wall of the sulphur burner already proposed) and in locating the said sight glass on top of the gas chamber. This new position gives a better sight of the phenomena taking place inside the gas chamber, as the said sight glass will be cooled by a constant stream of air moving downwards, thereby preventing the diffusion of the sulphur gas and the deposition of sulphur thereon.

By a further improvement according to this invention, the feeder valve of the sulphur burner is operated by a lever located at the bottom of the burner, instead of being operated by a valve rod. This is a more convenient arrangement from the operation point of view.

As another improvement according to this invention, the gas outlet pipe of the gas chamber is located tangentially at the top of the said chamber, instead of being located at the bottom thereof. The tangential arrangement of the primary and secondary air connections and of the gas outlet gives the gases a long spiral path inside the gas chamber thus helping to complete combustion of sulphur.

These and other features of this invention will now be more particularly described with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatic elevation, partly in section of an improved sulphur burner according to this invention, and

FIG. 2 is its plan.

The sulphur burner illustrated in the drawings has for its main parts, (i) a hopper 4 in which the sulphur is melted; (ii) a feeder 7 from which the molten sulphur is transferred to the combustion chamber 15; (iii) a conical combustion trough 16 partly submerged in the molten sulphur in the vapourization zone of the molten sulphur; (iv) an air supply pipe 17; and (v) a gas chamber 18 where combustion takes place.

3

The said hopper 4 and the said feeder 7 are provided with a steam jacket 5 into which steam may be led through the inlet 3. The steam jacket 5 is provided with a safety valve 23 and a condensate outlet 9.

The transfer of the molten sulphur from the hopper 4 to the feeder 7 is controlled by the hopper valve 6 which can be operated by the lever 2 and the transfer of the molten sulphur from the feeder 7 through the feed pipe is controlled by the feeder valve 8.

The feeder 7 is provided at its bottom with a feed pipe 14 which extends into the combustion chamber 15, and on the feed pipe 14 is rotatably mounted a level control L-shaped pipe 13 which communicates with the feed pipe 14.

Normally, the tips of the feed pipe 14 and the control pipe 13 will be substantially at the same level when the control pipe 13 is held in the vertical position. The level of the terminal end of control pipe 13 can, however, be moved in the vertical plane by rotating handle 10 attached to the level controlling shaft 24 the opposite end of which is secured to L-shaped pipe 13. The said shaft 24 is introduced into the combustion chamber 15 through a stuffing box 11.

So long as the tip of the feed pipe 14 or of the level controlling pipe 13, is above the level of the molten sulphur in the combustion chamber 15, the combustion gases from the said combustion chamber will be able to enter the feed pipe 14 and, if the feeder valve 8 is open, the said gases will enter the feeder 7 and cause the molten sulphur from the said feeder to descend into the combustion chamber 15 until the said tips are submerged in the molten sulphur in the combustion chamber. Thus, by moving the level control pipe 13 in the vertical plane, it will be possible to vary the level of the molten sulphur in the combustion chamber and to maintain it at any desired height.

The conical combustion trough 16 is positioned directly underneath the gas chamber 18 and, therefore, in the vapourization zone of the combustion chamber 15. The combustion chamber 15 and the gas chamber 18 are joined through a constricted area 34. Since vapourization occurs only from the surface, it will be directly related to the area of the surface of the molten sulphur in the vapourization zone, and the said area in its turn will vary with the level of the molten surface maintained in the combustion chamber 15 around the conical trough 16. Thus, by varying the level of the molten sulphur in the combustion chamber 15, the area of the surface of the molten sulphur in the vapourization zone, and consequently, the rate of vapourization and combustion of the sulphur may be varied without causing any fluctuation of the air supply for the purpose.

As an additional means of controlling the vapourization of the molten sulphur, the conical trough 16 is jacketed on its underside so that a cooling fluid such as water or air can be supplied through a connection 16A and the hot fluid let out through outlet 16B.

The air supply pipe 17 is fitted at the bottom of the gas chamber 18, so that the sulphur vapours produced in the vapourization zone may be intimately mixed with the air supply, for undergoing combustion in the gas chamber 18.

The operation of the sulphur burner described above will now be described:

The air supply pipe 17, which is provided with a U-bend 17A, can effect, through the arm 17B a primary air supply in the region of the combustion trough 16, and through the arm 17C a secondary air supply in the region where the combustion of the primary products of combustion will be completed. This arrangement of supplying air in two stages is advantageous, particularly where liquid or solid fuels are concerned. The primary air helps to convert the solid or liquid fuel into primary products of combustion which are gaseous in nature, and the secondary air supplied at a later stage helps to complete the combustion. An important advantage of this two stage system of supplying air is that the combustion process

can be completed with much less excess air than if all the air had been supplied in a single stage as in the original invention.

Each of the arms 17A and 17B is provided with a regulating mechanism 29, which can be of any well known type such as a regulating valve, or a variable-opening orifice plate. As a result of having two such regulating mechanisms, the proportions of the primary air and the secondary air can be more effectively varied so as to obtain the best possible combustion of sulphur.

The fins 32 help to dissipate the heat of the combustion chamber 15 fast and thereby make it possible to maintain the temperature of the said chamber at a level which is not too high.

The sight glass 19 being located on top of the gas chamber 18, gives a good sight of the phenomena taking place inside the gas chamber 18.

The said sight glass 19 is cooled by a constant stream of air moving downwards, and no sulphur vapour can diffuse towards the glass and get deposited thereon.

The lever 1 located at the bottom of the burner, for operating the valve 8, is found to be a very convenient arrangement for raising the said valve 8.

A further improvement according to this invention resides in the location of the gas outlet pipe 20, which as shown in the accompanying drawings, is located tangentially at the top of the gas chamber 18, instead of extending vertically above the gas chamber 18, as in sulphur burners of known construction.

What I claim is:

1. A sulphur burner comprising a combustion chamber having a substantially vertical cylindrical side wall and an upwardly extending conical base whereby an annulus is formed therebetween, said annulus increasing in size from the bottom to the top of said conical base, means for controlling the surface level of a pool of molten sulphur contained in said combustion chamber whereby the surface area of said molten sulphur surrounding said conical base may be controlled thereby controlling the rate of vaporization and combustion of said sulphur, a gas chamber above said combustion chamber wherein combustion of sulphur takes place over said pool of molten sulphur contained in said combustion chamber, said combustion and gas chambers being joined through a cylindrical member of restricted cross section, means for supplying primary and secondary air to said sulphur burner, said primary air being supplied tangentially adjacent to the surface of said molten sulphur and said secondary air being supplied tangentially at said restriction, and a gas outlet pipe located tangentially at the top of said gas chamber whereby the gases follow a spiral path through said burner during combustion.

2. A sulphur burner as claimed in claim 1 wherein valve means are provided in both said primary and secondary air supply means whereby the proportion of primary and secondary air may be varied to obtain proper combustion of sulphur.

3. A sulphur burner as claimed in claim 1 wherein the walls of said sulphur burner are provided with fins to dissipate the heat and thereby lower the temperature of said burner.

4. A sulphur burner as claimed in claim 1 wherein means is provided adjacent the underside of said conical bottom wall of said combustion chamber to cool said conical bottom wall, said means comprising a system for circulating a cooling fluid.

5. A sulphur burner as claimed in claim 1 wherein said means for controlling the surface level of said molten sulphur in said combustion chamber comprises an enclosed molten sulphur reservoir and a feed pipe extending downwardly from said reservoir into said combustion chamber and terminating therein, the effective horizontal level of said feed pipe in said combustion chamber being adjustable whereby the surface level of said molten sulphur in said combustion chamber may be controlled.

5

6. A sulphur burner as claimed in claim 5 wherein an L-shaped pipe communicates with and is rotatably mounted on the side of said feed pipe above the terminal end thereof within said combustion chamber whereby the surface level of said molten sulphur may be controlled by rotation of said L-shaped pipe. 5

7. A sulphur burner as claimed in claim 1 which is provided with a sight glass located on top of the gas chamber of the sulphur burner, on which sight glass may be blown a steady stream of cool air to prevent the deposition of sublimed sulphur. 10

6

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