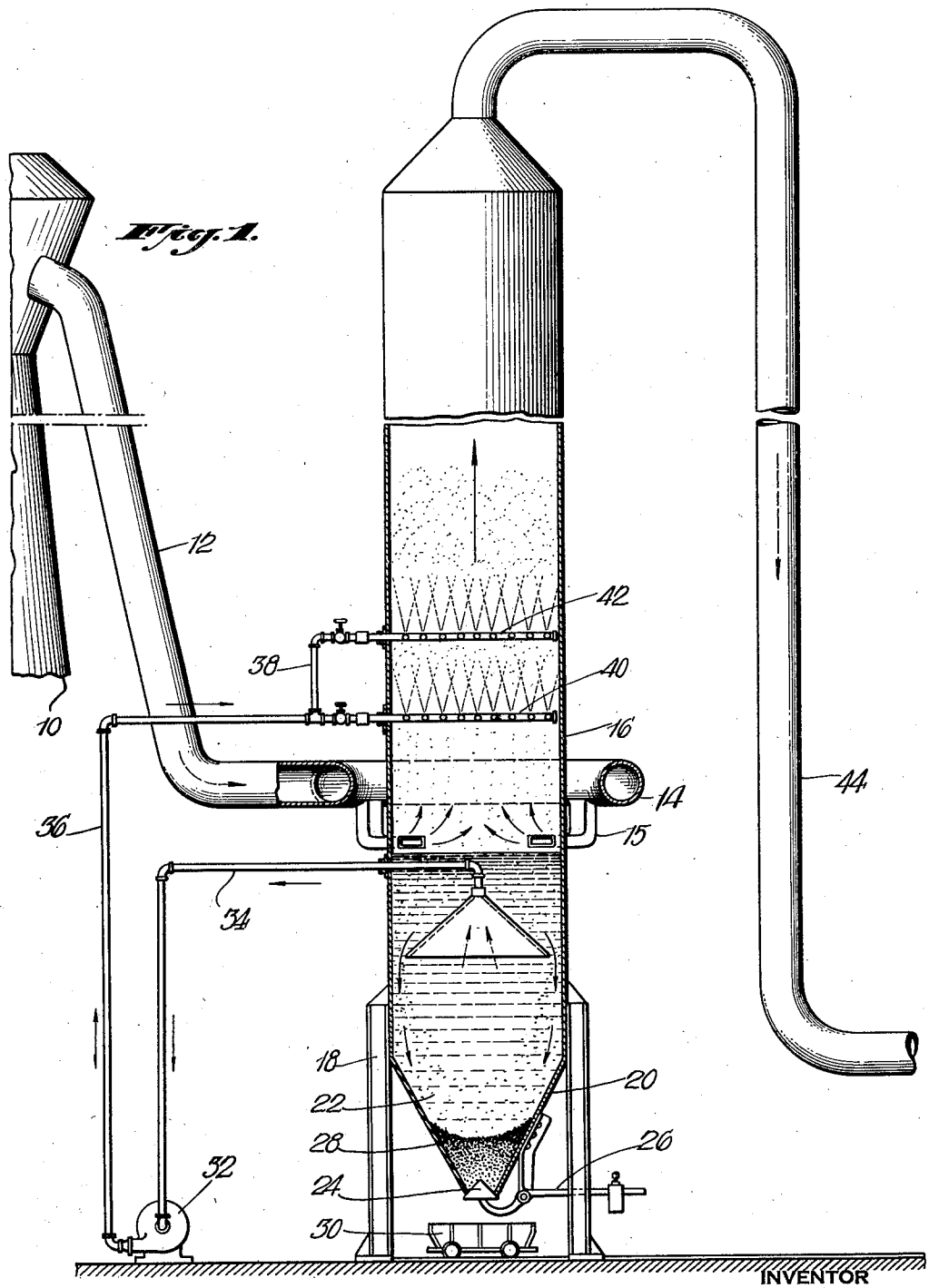
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METHOD OF CLEANING GAS

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Fig. 1.



INVENTOR
ARTHUR B. HASWELL.
BY
ATTORNEYS

Sept. 10, 1935. A. B. HASWELL 2,014,044

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Fig. 2.

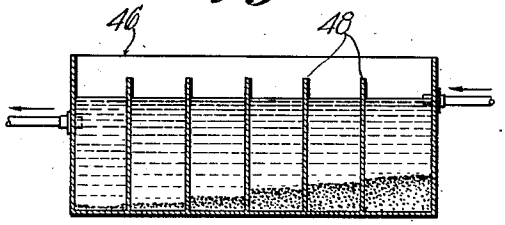


Fig. 3.

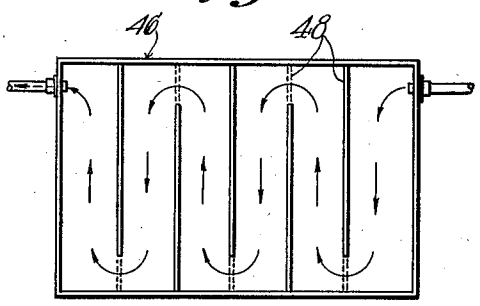
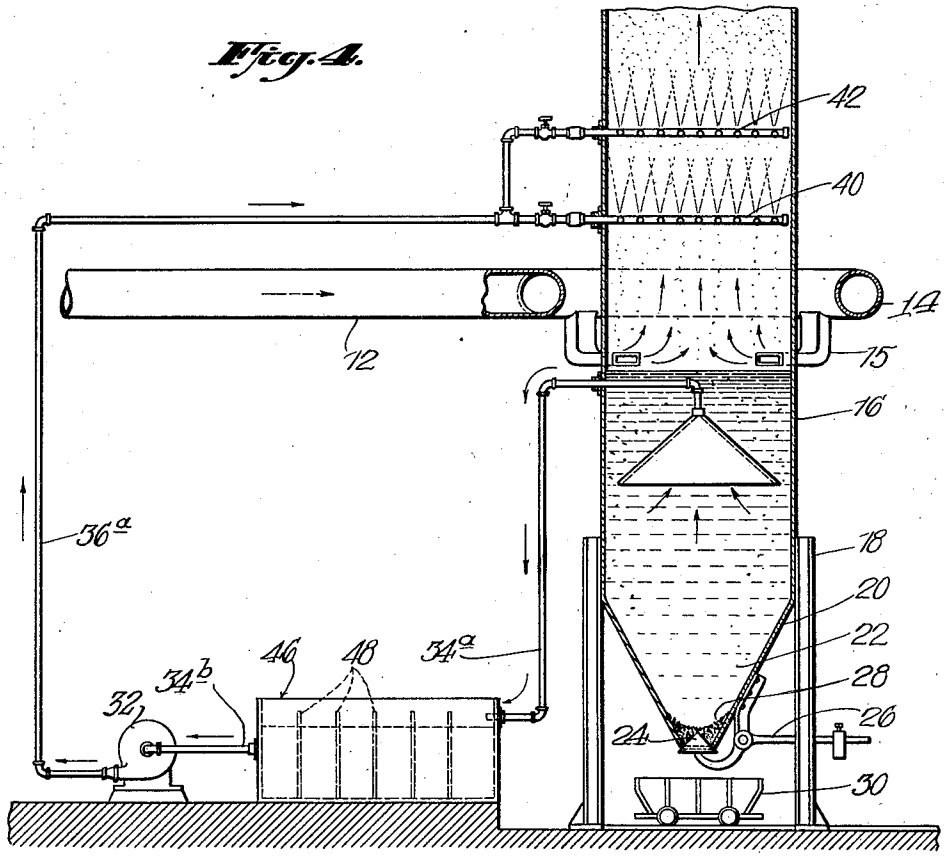


Fig. 4.



INVENTOR
ARTHUR B. HASWELL.
BY
Wilmer & Rauber
ATTORNEYS

Patented Sept. 10, 1935 2,014,044

UNITED STATES PATENT OFFICE

2,014,044

METHOD OF CLEANING GAS

Arthur B. Haswell, Birmingham, Ala.

Application May 18, 1934, Serial No. 726,404

7 Claims. (Cl. 75—17)

This invention relates to an improved method for treating gas and aims to provide for the conservation of the sensible heat of such gas. The invention will be apparent from the following detailed disclosures when read in connection with the accompanying drawings and will be defined with particularity in the appended claims. The invention is exemplified by the steps of the process in the following specification and by the apparatus shown in the drawings for performing such steps.

In the drawings—

Fig. 1 is illustrative of suitable apparatus for practicing the invention, the view being partly in elevation and partly in vertical section; Figs. 2, 3 and 4 represent apparatus to be used in a slightly modified manner of practicing the invention.

Heretofore, blast furnace and other dust laden gases have been cleaned in many different ways. There is a main general line of distinction between known methods, namely, the dry methods and the wet methods. Dry methods involve the use of centrifugal force and electrical precipitation and the passing of dust laden gases at slow velocities to extremely large gas containers, in order that the dust may settle by gravity at the bottom thereof.

Many of the wet methods utilize water as the washing medium and various expedients have been utilized for bringing the dust laden gases into intimate contact with water so as to precipitate the dust. Where water is the washing medium, the same must obviously be kept below a temperature of 212 degrees F., at which temperature it vaporizes. The ejected flue gases from blast furnaces are generally of a temperature approximating 400 degrees F. When such highly heated gases are brought into intimate contact with water, which essentially must be below 212 degrees F., it is clear that the gases must give up part of their sensible heat to the water. Or, if the water used is maintained at a temperature approximating its boiling point the heat from the dust laden gases will vaporize it. This is undesirable and for this reason cold or cool water is usually supplied in the necessary amounts by means of equipment designed to bring the hot gases into intimate contact with the washing water, care being taken to provide a sufficient volume of water for any given temperature, so as to keep the heat absorbed from the hot dust laden gases from raising the temperature of the water to 212 degrees F. The hot water resulting from prior practice is usually discharged and fresh cool or cold water is continuously supplied to replace the ejected hot water. The outgoing hot water thus carries away a large percentage of the sensible heat.

My invention aims to overcome the shortcomings of the prior practice and to conserve the sensible heat in the hot gases. To these ends, I use a liquid other than water whose boiling or vaporizing point is above the temperature of the dust laden gas to be cleaned. It is apparent that such high boiling point liquid, if recirculated will not take away the sensible heat from the gases other than that amount of sensible heat required to initially raise the temperature of the body of liquid used for the wet washing.

The invention, while not limited thereto, is particularly well suited for use in cleaning blast furnace gases. Such gas on ejection from the furnace has a temperature in the neighborhood of 400 degrees F., and I have discovered that it can be effectively cleaned without an appreciable loss of sensible heat by subjecting the gas to the washing action of finely divided jets or sprays of fuel oil, whose boiling point is approximately 570 degrees F. Such fuel oil can be readily and economically secured and the difference between its boiling point and the normal temperature of the effluent gases from a blast furnace are such that the washing oil will not be vaporized and there will be little or no oil loss, hence the same can be recirculated repeatedly, the precipitated dust being periodically withdrawn as a sludge. Such sludge is useful in the process because upon withdrawal it is in excellent condition for recharging into the blast furnace.

The entrained oil and coke dust are recovered as fuel in the blast furnace and the ore dust will have the same value as the ore normally charged to the furnace. It is understood that the coke dust and ore dust just referred to are the dust particles removed by the oil spray.

Referring to the drawings which illustrate by way of example my gas cleaning method, 10 conventionally represents a blast furnace having a downtake 12 through which the dust laden gases are ejected. These gases are led to an annular pipe 14 which surrounds the cylindrical washer or tower 16 supported by suitable columns, or other structural members 18. The dirty gas flows from the pipe 14 by way of tuyères 15 to the washer 16. The lower part of the washer, as indicated at 20, is of substantially conical form and provides a chamber 22, in which the oil and dust particles separate as will hereinafter appear. A bell 24 carried on a

pivotally mounted lever 26 is provided to control the discharge of the oil and dust sludge 28, which precipitates in the bottom of the chamber 22. This sludge can be conveniently caught in a car 30 adapted to be conveyed by suitable means not shown to the skip car by means of which the charge is introduced into the blast furnace.

A pump 32 serves to withdraw oil from the upper part of the body of oil in the washer by way of pipe 34, such oil being forced by means of pipes 36 and branch 38 to a plurality of spray pipes 40 and 42, located in the washer at a plane above the tuyères 15. Thus the dust laden gas ejected from the blast furnace through the tuyères 15, flows upwardly and is caused to comingle with the sprays of high boiling point oil, the clean hot gas being passed out through an offtake duct 44.

From the foregoing, it will be understood that, once the body of high boiling point washing oil is brought substantially to the temperature of the blast furnace gas being heated, by continually or repeatedly circulating or utilizing the same oil for the washing jets or sprays, practically no further sensible heat of the dirty gases will be lost. It will also be appreciated that by utilizing oil of a higher boiling point than the temperature of the gas being handled, the same will not be vaporized and passed off. Thus the same oil will be repeatedly used for the washing sprays.

If desired, instead of depending upon the precipitation of the dust particles or sludge in the bottom of the washer, I may provide a settling box 46, such as shown in Figs. 2 to 4 inclusive. This box will be connected with the washer tank by pipe 34^a and with pump by pipe 34^b. The pump serving to recirculate the washing oil by way of pipe 36^a to the spray pipes 40 and 42. The settling box will have a plurality of baffles 48 therein, so as to compel the effluent liquid from the washer to travel in a circuitous path, in order to facilitate the settling out of the dust particles in the separate zones defined by the baffles or weirs 48. It is contemplated that the settling box 46 may be covered with suitable insulating material so as to retain the heat in the oil or to prevent its loss of heat by radiation.

While the invention has been described with particular reference to the cleaning of blast furnace gases, it will be understood that it is not limited thereto, it being well applicable to the cleaning of other gases. It is also to be understood that, while I refer to the use of high boiling point fuel oil as a washing medium, high boiling point liquids other than oil can also be used so long as they do not vaporize at the temperature of the gas being subjected to washing treatment.

Since various modifications may be made by those skilled in the art, it is to be understood that the drawings and description are to be construed in an illustrative rather than a limiting sense and that the claims are to be interpreted as broadly as is consistent with the teachings of the prior art.

What I claim is:—

1. In the cleaning of dust laden blast furnace gas, the method which comprises subjecting such dust laden gas to the action of a spray of fuel oil whose boiling point is higher than the temperature of such gas.

2. In the cleaning of dust laden blast furnace gas, the method which comprises subjecting a supply of said gas at a temperature of approximately 400 degrees F., to the spraying action of fuel oil whose boiling point is approximately 570 degrees F., and reusing the same oil for such spraying action so as to conserve the sensible heat of the hot blast furnace gas.

3. In the cleaning of blast furnace gas, the method which comprises subjecting the dust laden gas ejected from the furnace to the action of a spray of hot oil whose boiling point is higher than the temperature of the gas.

4. In the cleaning of blast furnace gas, the method which comprises subjecting the dust laden gas ejected from the furnace to the action of a spray of hot oil whose boiling point is higher than the temperature of the gas, collecting the oil and precipitated dust resulting from said spraying and utilizing the collected oil for such spraying.

5. In the cleaning of blast furnace gas, the method which comprises subjecting dust laden gas ejected from a blast furnace to the action of a spray of hot oil whose boiling point is higher than the temperature of such gas, collecting the oil and precipitated dust resulting from such spraying and recirculating part of the collected oil to produce said oil spray.

6. In the cleaning of blast furnace gas, the method which comprises subjecting dust laden gas ejected from a blast furnace to the action of a spray of hot oil whose boiling point is higher than the temperature of such gas, collecting the oil and precipitated dust resulting from such spraying and recirculating part of the collected oil to produce said oil spray and utilizing the sludge of precipitated dust as part of the blast furnace charge.

7. In the cleaning of blast furnace gas, the method which comprises subjecting dust laden gas ejected from a blast furnace to the action of of a spray of hot oil whose boiling point is higher than the temperature of such gas, collecting the oil and precipitated dust resulting from such spraying and recirculating part of the collected oil to produce said oil spray, periodically withdrawing the precipitated dust sludge and charging it to a blast furnace.

ARTHUR B. HASWELL.