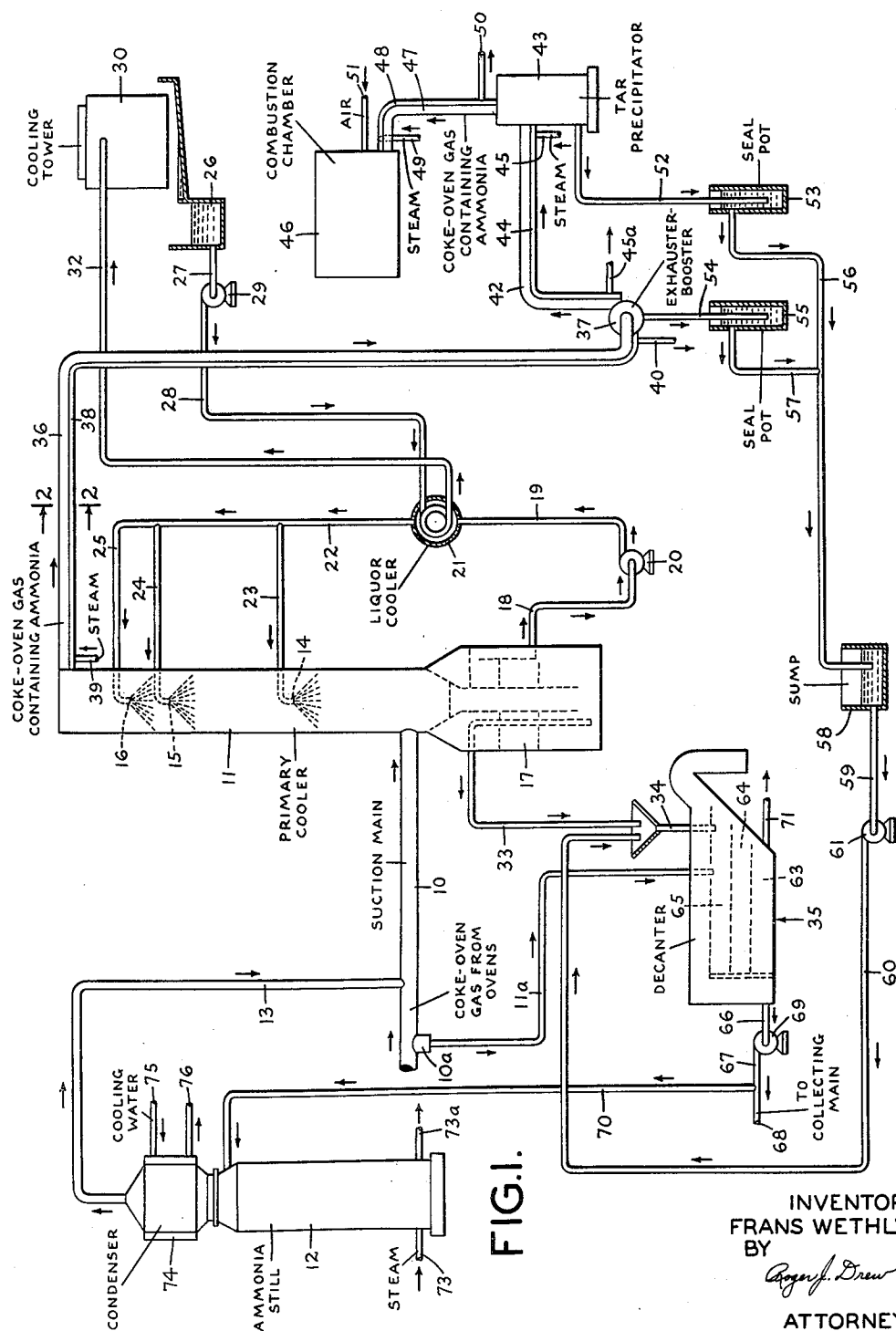


F. WETHLY
METHOD FOR PROCESSING, DISTRIBUTION AND
COMBUSTION OF COKE-OVEN GAS
CONTAINING AMMONIA

3 Sheets-Sheet 1

Filed May 6, 1959



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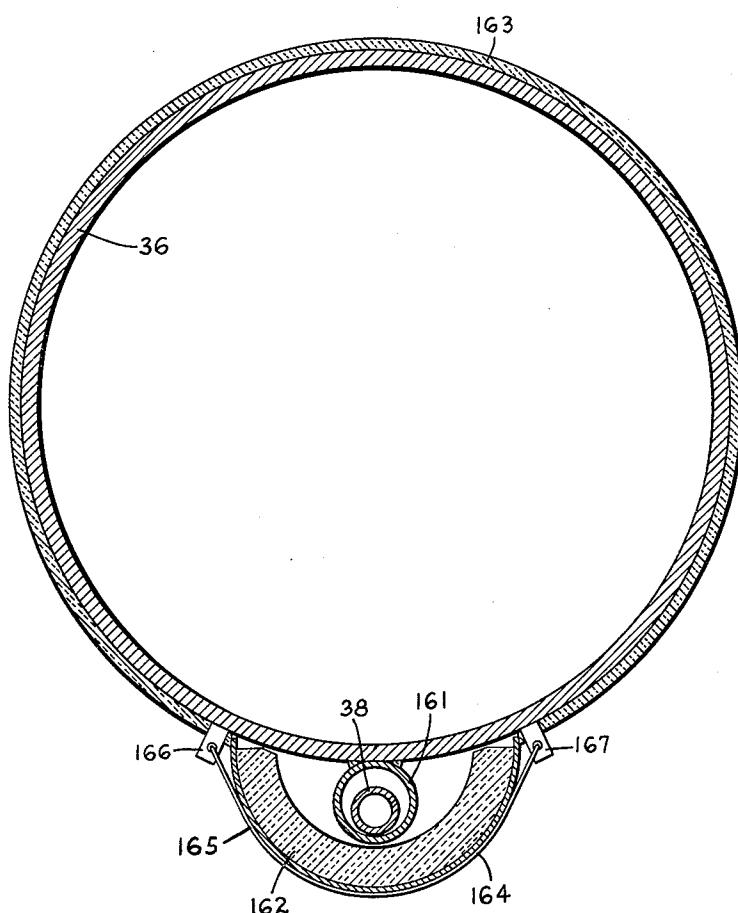
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3 Sheets-Sheet 2

FIG. 2.



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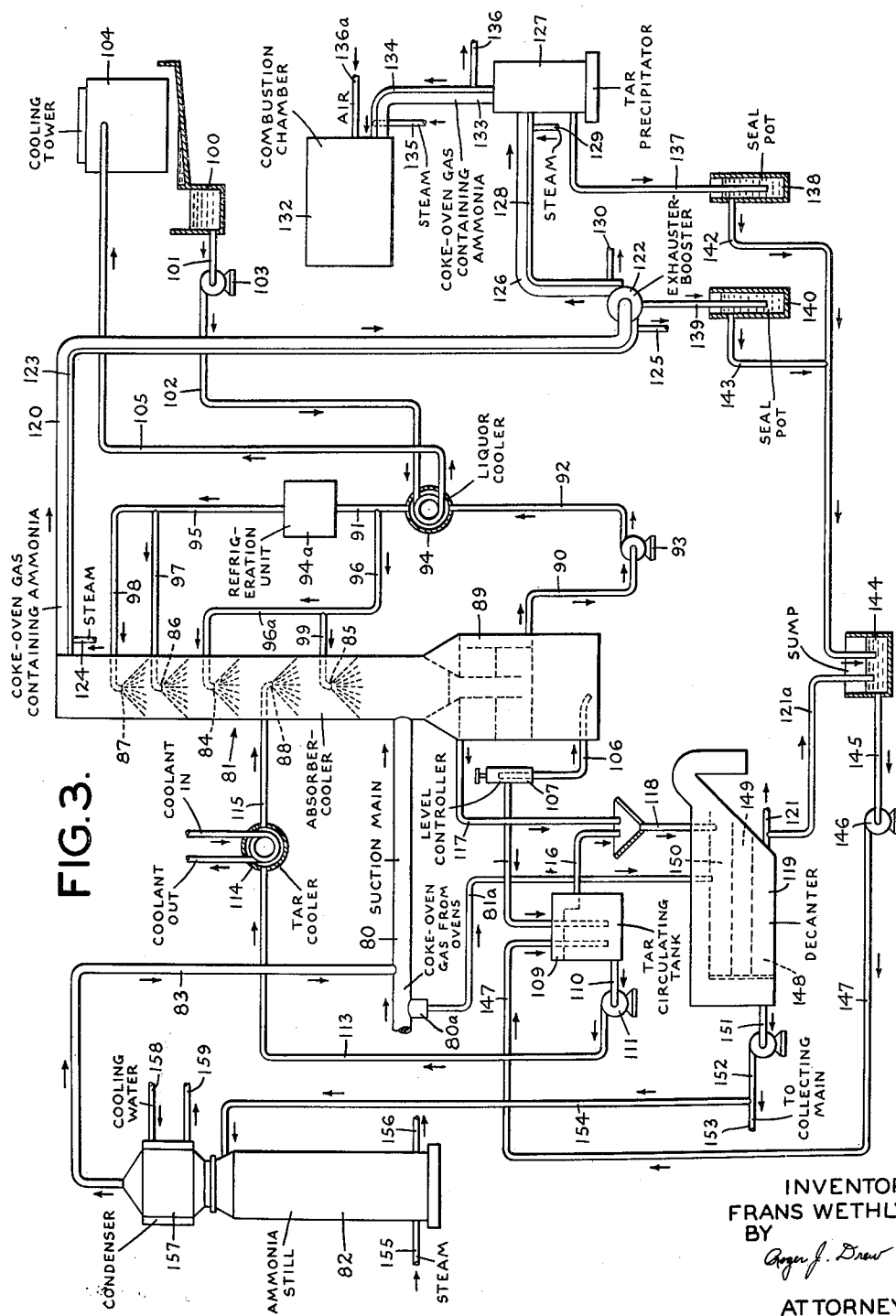
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METHOD FOR PROCESSING, DISTRIBUTION AND COMBUSTION OF COKE-OVEN GAS CONTAINING AMMONIA

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This invention relates to the processing, distribution and combustion of coke-oven gas containing ammonia. More especially the invention is directed to a method for processing, distribution and combustion of coke-oven gas containing ammonia, cyanide and sulfur compounds and aromatic hydrocarbons wherein the coke-oven gas is transmitted through a corrodible pipe line or pipe lines without corroding the same and without forming deposits therein.

In the current art, under the conventional method, coke-oven gas is drawn from the coke-oven battery into a primary cooler wherein it is cooled to a certain set temperature that has been found suitable for the process, which is about 100° F. The gas is drawn from the primary cooler by a gas exhauster and passed through a tar extractor wherein most of the remaining tar is separated and removed from the gas. The gas is then passed into a vessel or installation, generally known as the saturator, wherein the gas is washed with sulfuric acid solution to remove the ammonia and produce ammonium sulfate, the gas picking up heat and moisture in the process. Thereafter the gas has to be passed through final gas coolers wherein its temperature is reduced to about 80° F. and most of the naphthalene is separated therefrom. The gas is then passed through light oil scrubbers wherein the residual naphthalene, and light oil are removed. Following the above train of apparatus the treated gas is conducted through a main into a gas holder, a portion of the gas being usually taken off for fuel to underfire coke ovens and the remaining gas being drawn off by a gas booster and discharged into a mill gas distribution system.

Washing the coke-oven gas in the saturator to remove the ammonia has been deemed necessary in the past prior to handling and transmitting the gas through metallic pipes or pipe lines, inasmuch as the ammonia compounds in the gas corrode the metallic transmission pipe lines, and promote formation of deposits. Recently the price of ammonium sulfate has dropped appreciably and the cost of removing ammonia from the gas exceeds the value of the ammonium sulfate. Consequently it is currently undesirable from a commercial or economic standpoint to remove the ammonia from the gas.

Formation of material deposits of naphthalene and tar has a tendency to occur in the gas transmission pipe-lines and handling equipment of the prior and current art, subsequent to the primary cooler. Such deposits are undesirable because they block or obstruct flow of gas through the pipelines.

It is an object of this invention to provide a method for processing, distribution and combustion of coke-oven gas containing ammonia, cyanide and sulfur compounds, water vapor and light oil compounds, such coke-oven gas being transmitted through a corrodible pipe line or pipe lines without corroding the same and without forming deposits therein.

Another object is to provide a method for processing, distribution and combustion of coke-oven gas containing ammonia, cyanide and sulfur compounds, water vapor, tar, naphthalene, and light oil compounds, which method is characterized by simplicity and economy by virtue of eliminating or not requiring the ammonia saturator, the naphthalene scrubber or final cooler, and the light oil scrubber.

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A further object is to provide a method for processing, distribution, and combustion of coke-oven gas containing ammonia, cyanide and sulfur compounds, water vapor, and light oil compounds wherein a considerably increased heating or calorific value is realized from the gas from the hydrogen liberated by thermal decomposition of the ammonia during the combustion, and from the additional hydrocarbons that are retained in the gas.

Additional objects and advantages will be apparent as the invention is hereafter described in detail.

It has now been found that by sub-cooling coke-oven gas containing ammonia, cyanide and sulfur compounds, tar, naphthalene, and light oil compounds to a temperature below 95° F., preferably below 75° F. to effect liquefaction and separation of a predominant portion of the tar and naphthalene from the gas, then transmitting the thus treated gas containing ammonia, cyanide and sulfur compounds and light oil compounds through a corrodible pipe line or pipe lines, and heating the cooled coke-oven gas at a temperature above 100° F., preferably about 120° F.-200° F. and maintaining the gas at a temperature above 100° F., preferably about 120° F.-200° F. during its transmission through the pipe line, the ammonia saturator can be omitted or eliminated, and the coke-oven gas containing ammonia, and cyanide and sulfur compounds can be transmitted through the corrodible pipe line or pipe lines without corroding the pipe line and without forming deposits therein. Further, the naphthalene scrubber or final cooler and the light oil scrubber can be eliminated in addition to the ammonia saturator, each of these prior art installations costing a considerable sum to install. Moreover, a considerably increased heating or calorific value is realized from the gas from the hydrogen resulting from the thermal decomposition of the ammonia, during the combustion of the gas at the end of the transmission, and from the additional products that are retained in the gas, such as the light oil compounds and residual naphthalene which may be present in small amount. By the term "light oil compounds" used herein is meant the compounds comprising primarily benzol, toluol and xylol normally present in crude coke-oven light oil obtained as a product from the destructive distillation of coal.

Cooling of the coke-oven gas to below the temperatures disclosed prior to heating and maintaining it during its transmission above the temperatures disclosed results in an improved cleaning of the gas in the primary cooler or absorber-cooler, by reason of a predominant portion of the tar and naphthalene being condensed or liquefied and separated therein from the gas. Formation of deposits of naphthalene and tar in the gas transmission lines with attendant obstructing and blocking of the same is thereby avoided. The cooled coke-oven gas should be heated and maintained at a temperature above 100° F. during its transmission through the pipe line. While temperatures above 200° F. can be employed, little, if any, benefit is attained thereby and, hence, 200° F. is a preferred upper limit from a practical standpoint. Temperature of about 120° F. is a preferred lower limit to additionally guard against corroding and blocking the transmission pipe line or lines. The coke-oven gas is maintained at the temperatures stated during its transmission through the pipe line or pipe lines by preferably a metallic steam tracer line maintained closely adjacent the transmission pipe line and extending substantially the entire length of the pipe line, heat from steam passing through the steam tracer line being transferred through the walls of the steam tracer line and gas transmission pipe line respectively and thence to the coke-oven gas.

Ammonia obtained from an external source or elsewhere in the coke plant, e.g. from the ammonia still can be added to the coke-oven gas containing ammonia as a

normal constituent, if desired, prior to its transmission through the pipe line. Such ammonia addition has the dual function of (1) convenient disposal of any unwanted ammonia and, (2) imparting a further increased heating value to the gas during its combustion due to increased quantities of hydrogen liberated by thermal decomposition of the increased quantities of ammonia.

In the drawings:

FIG. 1 is a flow sheet of one embodiment of the invention.

FIG. 2 is a section taken on line 2—2 of FIG. 1.

FIG. 3 is a flow sheet of another embodiment of the invention.

In accordance with the FIG. 1 flow sheet, coke-oven gas drawn from a coke-oven battery flows within suction main 10 into the lower portion of primary cooler 11. The gas enters primary cooler 11 at typical temperature of about 175° F.—180° F. Flushing liquor has been previously sprayed into the gas in the collecting main to cool the gas and condense a portion of the pitch and tar therefrom, the aqueous flushing liquor serving also to wash the tar along suction main 10 to draw off pot 10a whence the liquor and tar are drained through line 11a to the flushing liquor decanter. As shown, ammonia vapors from ammonia still 12 containing typically about 20% by volume of ammonia with the balance mostly water vapor are added to the coke-oven gas, in main 10 through line 13.

The gas passes upwardly in primary cooler 11 in intimate countercurrent contact with aqueous liquor which contains small amounts of ammonia compounds and tar in addition to water, the aqueous liquor being introduced in cooler 11 as superposed conical sprays from spray heads 14, 15 and 16. The aqueous liquor passes downwardly in cooler 11 to wash and further cool the gas to effect liquefaction and separation of a major portion of the tar and naphthalene from the gas and to condense water vapor. A separation of the aqueous liquor and wet liquid tar containing naphthalene dissolved therein is made in decanter 17 in the lower portion of primary cooler 11. Aqueous liquor is continuously withdrawn at typical temperature of about 150°–160° F. from the lower portion of primary cooler 11 through line 18 and pumped via line 19 by pump 20 to circulating liquor cooler 21 wherein it is cooled to temperature substantially below 95° F., typically to between about 90° F. and 70° F., by indirect heat exchange with liquid coolant, for recirculation via line 22 and lines 23, 24 and 25 respectively back to spray heads 14, 15 and 16 respectively. Liquid coolant, e.g. cold water is pumped to liquor cooler 21 from container 26 through lines 27 and 28 by means of pump 29, the liquid being returned from cooler 21 to cooling tower 30 for re-cooling via line 32. The liquid coolant is passed from cooling tower 30 to container 26 by gravity flow. Wet tar and aqueous condensate passes from the base of primary cooler 11 through line 33 and joins tar from the exhauster and precipitator in downcomer 34 for passage to tar and liquor decanter 35.

Coke-oven gas at temperature of typically between about 95° F. and 75° F. containing typically, by volume and measured at standard conditions about 1.3% of ammonia, 0.2% of hydrogen cyanide, 0.6% of hydrogen sulfide, 3% to 6% of water vapor, 1.0% of light oil compounds and not in excess of about .01% to .03% of combined tar and naphthalene is withdrawn from the upper portion of primary cooler 11 through line 36 by exhauster-booster 37 where further removal of tar may be effected. The coke oven gas is heated and maintained at temperature above 100° F., preferably about 120° F.—200° F. during its transmission through substantially the entire length of metallic pipe line 36, typically of steel by transfer of heat from steam passing through metallic steam tracer line 38 also typically of steel, maintained closely adjacent transmission pipe line 36. Such closely adjacent relationship of steam line 38 with transmission pipe line

36, illustrative of the relationship of the coke-oven gas transmission lines and steam tracer lines in the embodiments of FIGS. 1 and 3, is more clearly shown in FIG. 2. As shown in FIG. 2, steam tracer line 38 is positioned or located within tracer line guide 161 of steel, guide 161 being secured to gas transmission pipe line 36 by welding. Wrapping 162 of heat insulating material, e.g. asbestos is provided for steam line 38 and covering 163 of heat insulating material is provided for transmission pipe line 36. Stainless steel jacket 164 is provided over insulating covering 162 and stainless steel wire 165 serves to support jacket 164 and hence heat insulating material 162, wire 165 being anchored or secured through openings in studs 166 and 167 welded to transmission pipe line 36. The steam, which is introduced into steam line 38 through line 39 and condensate of which is discharged through line 40, is at a typical pressure when introduced into the steam line at about 150 p.s.i.g. Such heating of the coke-oven gas serves to prevent corrosion of metallic gas transmission pipe line 36 and formation of deposits therein. Further, such heating of the coke-oven gas by means of the steam line serves to maintain the wall of metallic gas transmission pipe line 36 at the elevated temperature desired for the coke-oven gas during its transmission thereby preventing cooling of the gas below 100° F. when contacting or striking the inner surface of the pipe line wall with attendant corroding of such wall.

Exhauster-booster 37, which is a large centrifugal blower running at high speed, removes a portion of the remaining tar from the gas by centrifugal force. Coke-oven gas still containing a small amount of the tar and naphthalene originally present as well as the ammonia, hydrogen cyanide, hydrogen sulfide, water vapor and light oil compounds is discharged by exhauster-booster 37 through metallic pipe line 42, typically of steel and passed to detarrer or electrical tar precipitator 43 wherein any residual tar is removed. The coke-oven gas is maintained at the elevated temperatures disclosed during its transmission through substantially the entire length of pipe line 42 by heating by transfer of heat from steam having the typical pressure disclosed passing through metallic steam tracer line 44, the steam being introduced therein through line 45 and steam condensate discharged through line 45a. Steam tracer line 44, also typically of steel is maintained closely adjacent gas transmission pipe line 42 as described.

The tar-free gas is discharged from precipitator 43 and conducted directly to combustion chamber 46 via metallic pipe line 47 typically of steel having metallic steam tracer line 48 also typically of steel maintained closely adjacent substantially its entire length. The ammonia-containing gas which also contains hydrogen cyanide, hydrogen sulfide, water vapor, light oil compounds, and a small amount of residual naphthalene is maintained at the elevated temperature stated during transmission through pipe line 47 by transfer of heat from steam passing through steam line 48, the steam having the typical pressure disclosed when introduced into steam line 48 through line 49. Steam condensate is discharged from steam line 48 through line 50. The gas is burned in combustion chamber 46 which can be a boiler house, coke-oven heating flue, heating furnace, etc., oxygen-containing gas, e.g. air, oxygen-enriched air, etc., being introduced therein through line 51 for the combustion. The ammonia is thermally decomposed during the combustion in combustion chamber 46 to liberate hydrogen and nitrogen, an increased heating value being realized from the gas by reason of the considerable heating value of the liberated hydrogen from the ammonia, as well as of the additional hydrocarbons that were retained in the gas.

Liquid tar is withdrawn from the lower portion of precipitator 43 through line 52 and passed to seal pot 53 (providing a liquid seal) and introduced beneath the surface of liquid tar therein. Liquid tar is also withdrawn

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from exhauster 37 through line 54 and passed to seal pot 55 and also introduced beneath the surface of liquid tar therein. The liquid tar is withdrawn from seal pots 53 and 55 through lines 56 and 57 respectively, the tar stream flowing through line 57 joining the tar stream in line 56 and the combined streams flowing to sump 58. Liquid tar is withdrawn from sump 58 through line 59 and pumped through line 60 by means of pump 61 to downcomer 34 wherein it joins the wet tar from primary cooler 11. The tar passes via downcomer 34 to tar and liquor decanter 35 wherein the contents stratify into superposed layers of tar 63, tar-water emulsion 64 and aqueous or ammonia liquor 65. Tar is withdrawn from decanter 35 through line 71. Aqueous liquor is decanted and pumped from decanter 35 by pump 69 through lines 66 and 67, most of the liquor being pumped via line 68 to the collecting main to flush and cool the hot coke-oven gas in the collecting main. A small portion of the aqueous or ammonia liquor is pumped through line 70 to ammonia still 12 wherein it is mixed with lime and steam distilled in known manner, steam being introduced in still 12 through line 73 and liquor stripped of its ammonia content being discharged through line 73a. Cooling water is introduced in reflux condenser 74 at the top of the ammonia still through line 75 and withdrawn through line 76, such cooling water serving to condense a portion of the ammonia-containing vapors as reflux thereby increasing concentration of ammonia in the vapors leaving the still. Ammonia vapors leave still 12 through line 13 for addition to the coke oven gas in suction main 10 as described.

Referring to the flow sheet of FIG. 3, coke-oven gas is drawn through suction main 80 to the lower portion of absorber-cooler 81. Flushing liquor has been previously sprayed into the gas in the collecting main to cool the gas and condense a portion of the pitch and tar therefrom, the aqueous flushing liquor serving also to wash the tar along suction main 80 to draw off pot 80a from where the liquor and tar are drained through line 81a to the flushing liquor decanter. The gas enters absorber-cooler 81 at typical temperature of about 175° F.-180° F. As shown, ammonia vapor from ammonia still 82 containing ammonia and water vapor is added to the coke-oven gas in main 80 through line 83.

The gas passes upwardly within absorber-cooler 81 in intimate countercurrent contact with aqueous liquor and tar passing downwardly therein, aqueous liquor being introduced as conical sprays from spray heads 84, 85, 86 and 87 and tar as a conical spray from spray head 88. The aqueous liquor and tar pass downwardly in absorber-cooler 81 to cool and wash the gas to condense a predominant portion of the tar and naphthalene and water vapor from the gas and to absorb naphthalene from the gas by the tar. Stratification occurs in decanter 89 in the lower portion of absorber-cooler 81 resulting in formation of a lower layer of liquid tar containing naphthalene dissolved therein and an upper layer of aqueous liquor on the tar layer. Aqueous liquor is continuously withdrawn at typical temperature of about 150° F.-160° F. from absorber-cooler 81 through line 90 and pumped through line 92 by pump 93 first to circulating liquor cooler 94, and then a portion of the liquor is pumped to refrigeration unit 94a via line 91 for further cooling. Liquor is cooled in cooler 94 to a temperature substantially below 95° F., typically to between about 90° F. and 70° F. and further cooled in refrigeration unit 94a to a temperature below 70° F., typically to between about 70° F. and 50° F. The liquor portion not passed to refrigeration unit 94a is discharged from line 91 through line 96 and passed via lines 96a and 99 to spray heads 84 and 85 respectively. The portion of liquor passed to refrigeration unit 94a is discharged therefrom through line 95 and passed via lines 97 and 98 to spray heads 86 and 87 respectively. Liquid coolant, e.g. cold water is pumped to liquor cooler 94 from container 100

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through lines 101 and 102 by pump 103, the liquid coolant being returned to cooling tower 104 for re-cooling via line 105. Liquid coolant is passed to container 100 by gravity flow from tower 104. Wet tar is continuously withdrawn from decanter 89 in the base of absorber-cooler 81 through line 106 equipped with conventional level controller 107, and passed through line 108 to tar circulating tank 109. Aqueous condensate also overflows from decanter 89 through line 117 and is passed to downcomer 118 where it joins the tar passing from the circulating tank 109 through line 116, through downcomer 118 to tar and liquor decanter 119. A portion of the tar, which may contain a small amount of aqueous liquor, is withdrawn from circulating tank 109 at a typical temperature of about 140° F.-150° F. through line 110 and pumped by pump 111 through line 113 to tar cooler 114 wherein it is cooled by indirect heat exchange with liquid coolant, e.g. cooling water to a typical temperature of about 120° F.-130° F. Cooled tar is then discharged through line 115 to spray head 88 for scrubbing the coke-oven gas as described. A portion of the tar and aqueous liquor is also withdrawn from upper portion of tank 109 through line 116 and passed to downpipe 118 for passage to the tar and liquor decanter as described.

Coke-oven gas at a temperature of typically between about 75° F. and 60° F. containing typically, by volume, about 1.3% of ammonia, 0.2% of hydrogen cyanide, 0.6% of hydrogen sulfide, 2% to 3% of water vapor, 1.0% of light oil compounds and not in excess of about 0.005% to 0.01% of combined tar and naphthalene is withdrawn from upper portion of absorber-cooler 81 through line 120 by exhauster-booster 122 where further removal of tar may be effected. The gas is maintained at temperature of above 100° F., preferably about 120° F.-200° F. during its transmission through substantially the entire length of metallic pipe line 120 by transfer of heat from steam passing through metallic steam tracer line 123. Steam line 123 is maintained closely adjacent substantially the entire length of gas transmission pipe line 120 as described. The steam is introduced to steam line 123 through line 124 and steam condensate discharged through line 125, the steam having a typical pressure at the time of its introduction into steam line 123 of about 150 p.s.i.g. Maintenance of the coke-oven gas at the temperature disclosed during its transmission through pipe line 120 serves to prevent corrosion of metallic gas transmission pipe line 120 and the formation of deposits therein. Such heating of the coke-oven gas also serves to maintain the wall of metallic transmission pipe line 120 at the elevated temperature desired for the coke-oven gas being transmitted thereby preventing cooling of the gas below 100° F. when contacting the inner surface of the pipe line wall with attendant corroding of such wall.

Exhauster-booster 122 removes a portion of remaining tar out of the gas throwing it out by centrifugal force. Coke-oven gas still containing possibly a small amount of the tar and naphthalene originally present and also the ammonia, hydrogen cyanide, hydrogen sulfide, water vapor and light oil compounds is discharged by exhauster-booster 122 through metallic pipe line 126 and passed to detarrer or electrical precipitator 127 wherein the residual tar is removed. Steam tracer line 128, maintained closely adjacent to gas transmission pipe line 126 for substantially its entire length, heats and maintains the gas at the temperatures disclosed, steam being introduced into steam line 128 through line 129 and steam condensate being discharged through line 130.

Tar-free gas is discharged from precipitator 127 and conducted directly to combustion chamber 132 via line 133, line 133 also having metallic steam tracer line 134 maintained closely adjacent to substantially its entire length for the purpose described. The steam is introduced to steam line 134 through line 135 and steam

condensate discharged through outlet 136. The ammonia-containing gas which also contains hydrogen cyanide, hydrogen sulfide, water vapor, light oil compounds and perhaps a small amount of residual naphthalene, is burned in the combustion chamber 132, oxygen-containing gas, e.g. air, oxygen-enriched air, etc., being introduced through line 136a for the combustion. Heat produced during combustion of the gas results in decomposition of ammonia present therein to form hydrogen and nitrogen, this hydrogen together with the additional hydrocarbons that were retained in the gas resulting in a considerably increased calorific or heating value from the gas.

Liquid tar is withdrawn from the lower portion of precipitator 127 through line 137 and passed to seal pot 138 and introduced beneath the surface of tar therein. Liquid tar is also withdrawn from exhauster 122 through line 139 and passed to seal pot 140 and introduced beneath surface of tar therein. The liquid tar is withdrawn from seal pots 138 and 140 through lines 142 and 143 respectively, liquid tar flowing through line 143 joining the liquid tar in line 142 and the combined stream passed via line 142 to sump 144. The liquid tar is withdrawn from sump 144 through line 145 and pumped by pump 146 through line 147 to tank 109 wherein it meets the wet tar from absorber-cooler 81.

The tar and aqueous liquor mixture separates in decanter 119 into superposed layers of tar 148, tar-water emulsion 149 and aqueous or ammonia liquor 150. Tar is withdrawn from decanter 119 through line 121, a portion of this tar being drawn off through line 121a to sump 144 for blending with tar in tank 109. Aqueous liquor is decanted and withdrawn from decanter 119 through line 151, most of such liquor being pumped via lines 152 and 153 to the collecting main to flush the main and cool the hot coke-oven gas. A small portion of the aqueous or ammonia liquor is pumped through line 154 to ammonia still 82 wherein it is mixed with lime and steam distilled in known manner, steam being introduced in still 82 through line 155 and liquor stripped of its ammonia being discharged through line 156. Cooling water is introduced to reflux condenser 157 at top of the ammonia still through line 158 and withdrawn through line 159 to condense a portion of the vapors thereby increasing the concentration of ammonia in vapors leaving the still. Ammonia vapors are withdrawn from still 82 through line 83 for addition to the coke-oven gas in suction main 80.

One or more reheaters, gas fired or provided with other suitable heating means, could be employed at intervals in the gas transmission system, if desired, in place of or in addition to the steam tracer line or lines, for boosting the temperature of the coke-oven gas to the temperature disclosed and maintaining the gas at such temperature by indirect heat exchange.

This invention is considerably advantageous from an economic standpoint by virtue of eliminating or avoiding the considerable cost of constructing or installing ammonia saturators, naphthalene scrubbers or final coolers and light oil scrubbers as well as the gas holder and gas boosters. These facilities increase cost of coke oven plant as much as 20%. Further, there is a large expense in the operation of these facilities, the requirements of sulfuric acid alone for ammonia recovery being considerable, a typical quantity being 40 tons per day for coke-oven plant producing gas at the rate of 40,000,000 cubic feet per day. Thus it is readily apparent that elimination of such saturator treatment of the gas (in addition to elimination of the naphthalene scrubber and light oil scrubber treatment) is economically advantageous, and especially when the market price for ammonium sulfate is at a commercially disadvantageous level.

Although certain preferred embodiments of the invention have been disclosed for purpose of illustration, it will be evident that various changes and modifications

may be made therein without departing from the scope and spirit of the invention.

What is claimed is:

1. A method for processing, distribution and combustion of coke-oven gas containing ammonia, cyanide and sulfur compounds and light oil compounds, which comprises cooling coke-oven gas containing ammonia, cyanide and sulfur compounds, tar, naphthalene and light oil compounds to a temperature below 95° F. by direct heat exchange by intimately contacting the gas with aqueous liquor devoid of a chemical which reacts with the ammonia in the gas to effect liquefaction and separation of a predominant portion of the tar and naphthalene from the gas, transmitting the thus treated coke-oven gas containing ammonia, cyanide and sulfur compounds and light oil compounds through a corrodible pipe line, heating the cooled coke-oven gas to a temperature above 100° F. and maintaining it at a temperature above 100° F. during its transmission through said pipe line thereby avoiding both corroding the pipe line and forming deposits therein, and burning at least a portion of the ammonia- and light oil compound-containing gas at the end of the transmission, hydrogen liberated by thermal decomposition of the ammonia during the burning together with the hydrocarbons retained in the the gas resulting in increased heating value from the gas.

2. A method for processing, distribution and combustion of coke-oven gas containing ammonia, cyanide and sulfur compounds, water vapor and light oil compounds which comprises cooling coke-oven gas containing ammonia, cyanide and sulfur compounds, water vapor, tar, naphthalene and light oil compounds to a temperature below 75° F. by direct heat exchange by intimately contacting the gas with aqueous liquor devoid of a chemical which reacts with the ammonia in the gas to effect liquefaction and separation of a predominant portion of the tar and naphthalene from the gas, transmitting the thus treated coke-oven gas containing ammonia, cyanide and sulfur compounds, water vapor and light oil compounds through a corrodible pipe line, heating the cooled coke-oven gas to a temperature of about 120° F.-200° F. and maintaining said gas at a temperature of about 120° F.-200° F. during its transmission through said pipe line thereby avoiding both corroding the pipe line and forming deposits therein, and burning at least a portion of the ammonia- and light oil compound-containing gas at the end of the transmission, hydrogen liberated by thermal decomposition of the ammonia during the burning together with the hydrocarbons retained in the gas resulting in increased heating value from the gas.

3. The method of claim 2 wherein the cooled coke-oven gas is heated and maintained at a temperature of about 120° F.-200° F. during its transmission through the pipe line by passing steam through a heat conductive enclosed passageway maintained closely adjacent substantially the entire length of the pipe line, heat from steam passing through the enclosed passageway being transferred through the walls of the enclosed passageway and the coke-oven gas transmission pipe line respectively and thence to the coke-oven gas.

4. A method for processing, distribution and combustion of coke-oven gas containing ammonia, cyanide and sulfur compounds, water vapor and light oil compounds, which comprises adding ammonia to coke-oven gas containing ammonia, cyanide and sulfur compounds, water vapor, tar, naphthalene and light oil compounds, cooling the resulting gas of increased ammonia content to a temperature below 75° F. by direct heat exchange by intimately countercurrently contacting the gas with aqueous liquor devoid of a chemical which reacts with the ammonia in the gas to effect liquefaction and separation of a predominant portion of the tar and naphthalene from the gas, transmitting the thus treated coke-oven gas of increased ammonia content also containing cyanide and sulfur compounds, water vapor, light oil compounds

and not in excess of about 0.01% of combined tar and naphthalene through a corrodible metallic pipe line, heating the cooled gas to a temperature of about 120° F.-200° F. and maintaining it at a temperature of about 120° F.-200° F. during its transmission through said pipe line thereby avoiding both corroding the pipe line and forming deposits therein, and burning the light oil compound-containing gas of increased ammonia content as fuel at the end of the transmission, hydrogen liberated by thermal decomposition of the ammonia during the burning together with the hydrocarbons retained in the gas resulting in increased heating value from the gas.

5. A method for processing, distribution and combustion of coke-oven gas containing ammonia, hydrogen cyanide, hydrogen sulfide, water vapor and light oil compounds, which comprises introducing coke-oven gas containing ammonia, hydrogen sulfide, hydrogen cyanide, water vapor, tar, naphthalene and light oil compounds into a lower portion of a primary cooler, passing the gas upwardly within said primary cooler in intimate countercurrent contact with sprays of cooled aqueous liquor devoid of a chemical which reacts with the ammonia in the gas introduced at an upper portion of the column and passing downwardly therein to cool the gas to a temperature below 95° F. to effect liquefaction and separation of a predominant portion of the tar and naphthalene from the gas, stratifying the mixture of aqueous liquor and tar containing naphthalene in the lower portion of the primary cooler into a lower layer

of liquid tar containing naphthalene and an upper layer of aqueous liquor, continuously withdrawing aqueous liquor at elevated temperature from said upper layer of liquor and returning the same, after cooling, to the upper portion of the primary cooler, continuously introducing the cooled recycled liquor as a plurality of spaced sprays in the upper portion of said cooler, withdrawing tar containing naphthalene from the lower tar layer, withdrawing from an upper portion of the primary cooler coke-oven gas at temperature below 95° F. containing ammonia, hydrogen cyanide, hydrogen sulfide, water vapor, light oil compounds and not in excess of about 0.03% of combined tar and naphthalene, transmitting the withdrawn gas through a corrodible metallic pipe line, heating the cooled gas to a temperature of about 120° F.-200° F. and maintaining it at a temperature of about 120° F.-200° F. during its transmission through said pipe line thereby avoiding both corroding the pipe line and forming deposits therein, and burning the ammonia- and light oil compound-containing gas as fuel at the end of the transmission, hydrogen liberated by thermal decomposition of the ammonia during the burning together with the additional hydrocarbons retained in the gas resulting in increased heating value from the gas.

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