

[54] **SUPPLEMENTARY AIR CASCADE
EVAPORATION**

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B01d 47/00, F22d 1/00

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162/30; 122/7 C; 159/16 A, 4 VM

[56]

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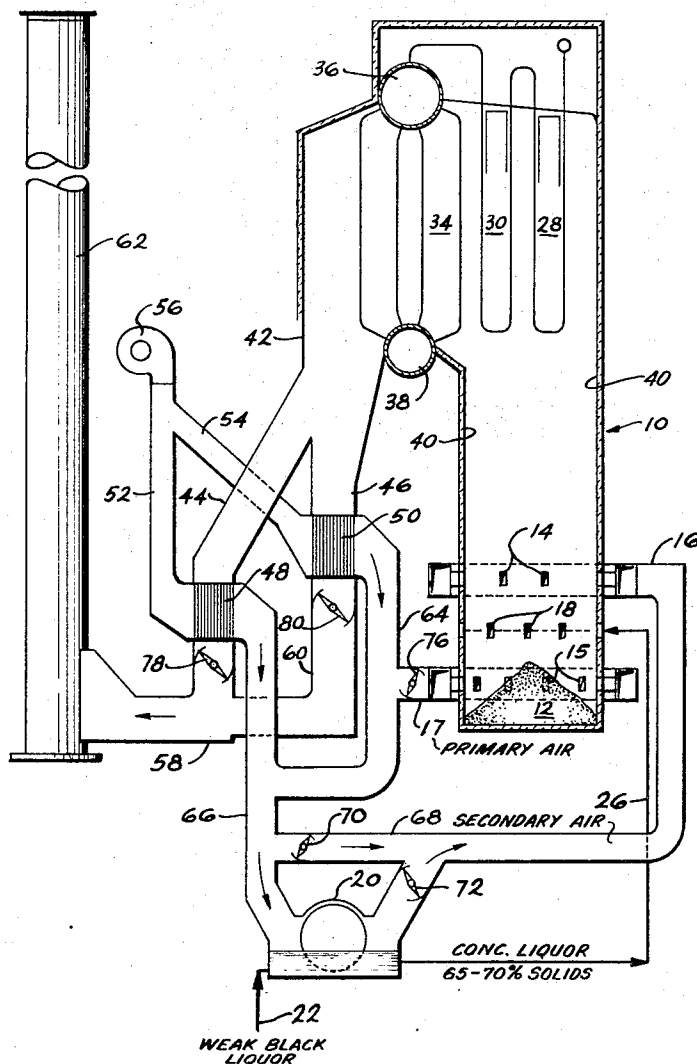
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[57]

ABSTRACT

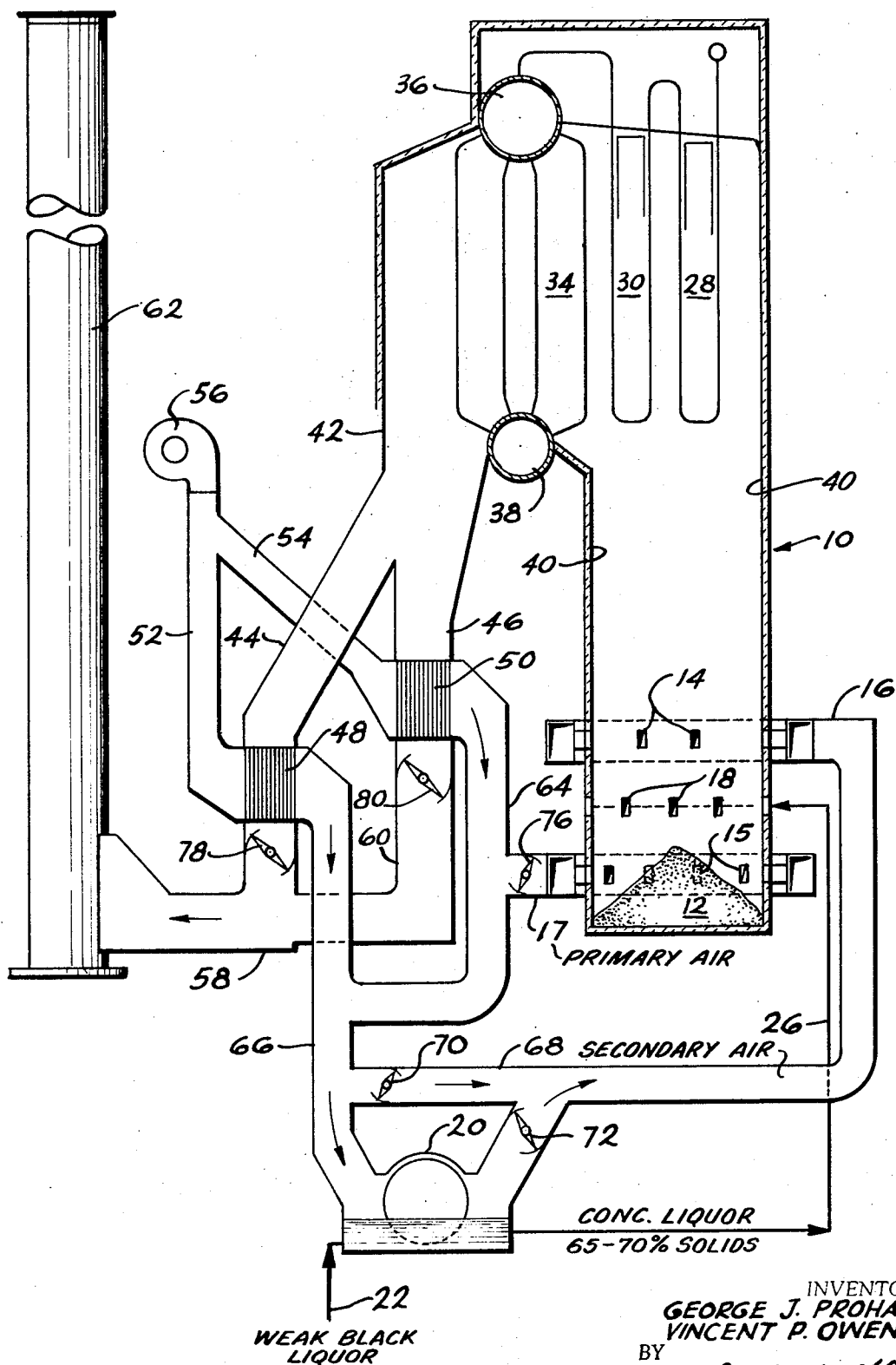
A chemical recovery unit in which black liquor from a pulping process is burned including a direct contact evaporator for concentrating the black liquor prior to its introduction into a furnace. Preheated air is used as the heating medium in the direct contact evaporator. The moisture laden air leaving the evaporator is used as secondary combustion air in the furnace.

2 Claims, 1 Drawing Figure



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SUPPLEMENTARY AIR CASCADE EVAPORATION**BACKGROUND OF THE INVENTION**

In burning black liquor in chemical recovery furnaces, it is desirable to maintain the solids content of the black liquor within the range of 65-70 percent in order to make it more easily burned and to better complete the oxidation of malodorous sulphur compound to further their conversion to recoverable salts. Many methods of concentrating the black liquor prior to its introduction into the furnace have been used in the past.

One method has been to use the combustion gases exiting from the furnace to preheat combustion air. This preheated air is then passed through a contact evaporator to evaporate moisture from the black liquor, prior to its introduction into the furnace for supporting combustion. This system achieves the high density black liquor desired, and also prevents the production of malodorous sulphur gases such as hydrogen sulphide, dimethyl sulphide, methyl mercaptan, etc., found in the exhaust gases of some furnaces. However, because of the large amount of moisture evaporated from the black liquor and carried into the furnace along with the preheated air, there can be problems with combustion or flame stability. Since loss of combustion within the furnace can be hazardous and costly, loss of combustion should be avoided if at all possible.

SUMMARY OF THE INVENTION

The chemical recovery unit of the invention uses a direct contact evaporator for concentrating the black liquor prior to its introduction into a furnace. Air is preheated by the exhaust gases leaving the furnace. One portion of the preheated air is used for evaporating moisture from the black liquor in the direct contact evaporator, and is thereafter introduced into the furnace to be used as secondary combustion air. A second portion of the air flows from the air preheater directly to the furnace and is used as primary combustion air. This moisture-free portion of the air insures flame stability, virtually eliminating the possibility of loss combustion within the furnace because of its relatively high temperature.

BRIEF DESCRIPTION OF THE DRAWING

The FIGURE is a partial sectional side view of a chemical recovery unit incorporating the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, 10 denotes a recovery furnace having a hearth, or smelting zone 12. Air to support combustion within the furnace is introduced through primary air nozzles 15, and secondary air nozzles 14. These nozzles are supplied by ducts 16 and 17, respectively. Black liquor is sprayed into the furnace through nozzles 18. The black liquor comes from a direct contact cascade evaporator 20, which is supplied by means of inlet 22 with incoming black liquor. The concentrated black liquor is transported to the furnace through line 26.

After the black liquor is burned in the furnace, the hot combustion gases flow upwardly through the furnace, first passing over superheater sections 28 and 30,

and then flowing through the steam generating tubes 34. Water is supplied to these tubes by drum 38, and steam is removed from upper drum 36 and flows to the superheaters. Steam is also generated in tubes 40, which line the walls of the furnace. The combustion gases leave the furnace through gas pass 42, thereafter dividing into ducts 44 and 46. These ducts carry the combustion gases to air preheaters 48 and 50, where the gases pass in heat exchange relationship with air supplied by fan 56 through ducts 52 and 54. The relatively cool combustion gases leave the air preheaters by means of ducts 58 and 60, and are exhausted to atmosphere through the stack 62.

Heated air leaves the air preheaters through ducts which merge into a plenum 64. From this plenum extends duct 17, which supplies primary combustion air to the furnace. Also extending from plenum 64 is duct 66, which conveys hot air to the direct contact cascade evaporator 20. After this air passes through the evaporator, evaporating moisture from the black liquor in the process, it enters duct 16, which conveys it to the furnace to be used as secondary combustion air. Bypass duct 68 containing damper 70 is provided for supplying air to the secondary combustion air nozzles 14 without the necessity of flowing through the evaporator 20, when desired.

Dampers 72 and 76 are located in air ducts 16 and 17 so that the amount of primary and secondary air can be varied as desired. Likewise, dampers 78 and 80 are positioned in the combustion gas ducts 58 and 60 so that the amount of combustion gases flowing through the air preheaters 48 and 50 can be controlled.

The operation of the system will now be described. Moisture is evaporated from the black liquor supplied to direct contact evaporator 20. The concentrated liquor, with a solids content of 65-70 percent, is sprayed into furnace 10 through nozzles 18. The liquor in falling to the hearth or smelting zone 12 is dried and partially combusted, with some of the volatiles being driven off. The combustion of the volatiles is supported by secondary combustion air supplied through nozzles 14. The major portion of the combustion takes place in hearth 12, with primary air to support combustion being introduced into the smelt zone through nozzles 15.

The combustion gases after passing through the various heat exchangers associated with the furnace, divides, and passes through the two air preheaters 48 and 50. A portion of the air from the preheaters passes through cascade evaporator 20, evaporating moisture from the black liquor. The moisture laden air is introduced into the furnace through nozzles 14, to act as secondary combustion air. A second portion of the air from the preheaters is conveyed directly to the furnace, and introduced through nozzles 15 as primary combustion air. This dry, heated air stabilizes combustion of the black liquor, virtually eliminating the possibility of loss of flame. Bypass duct 68, and the dampers located in the various ducts, can be used to vary the proportions of the primary and secondary air.

The use of hot, dry air as primary air permits the reduction of temperature of the black liquor to the sprays 18. This is an important factor because established data proves that low liquor spray temperatures are necessary to maintain minimum levels of malodorous compounds discharged from the furnace.

While we have illustrated and described a preferred embodiment of our invention it is to be understood that such is merely illustrative and not restrictive and that variations and modifications may be made therein without departing from the spirit and scope of the invention. We, therefore, do not wish to be limited to the precise details set forth but desire to avail ourselves of such changes as fall within the purview of our invention.

What we claim is:

1. A chemical recovery unit comprising in combination a furnace in which black liquor is burned, direct contact evaporation means for evaporating moisture from the black liquor prior to its introduction into the furnace, air preheater means in which air is indirectly heated by the waste combustion gases exhausted from the furnace, first air conveying duct means connecting

the air preheater means to the direct contact evaporation means for conveying hot air thereto to evaporate and concentrate the liquor, second duct means for conveying the moisture laden relatively hot air from the evaporator means to the furnace to be used as secondary air for supporting combustion, and third air conveying duct means connecting the air preheater means to the lower portion of the furnace for conveying hot air directly thereto to be used as primary air for supporting combustion of the concentrated black liquor delivered to the furnace.

2. The combination set forth in claim 1, including fourth duct means bypassing the direct contact evaporation means, and damper means located in the second and fourth duct means.

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