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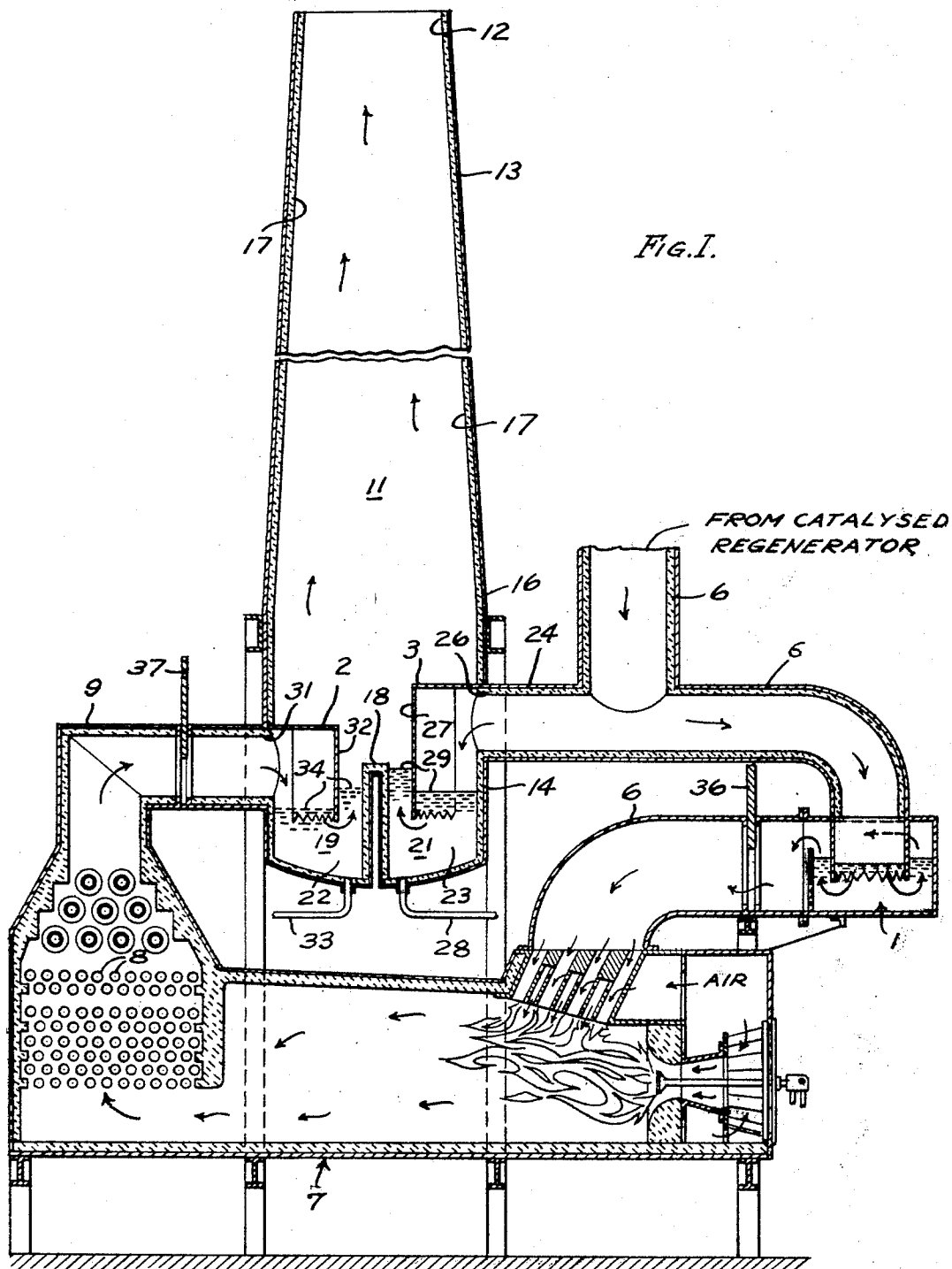
P. VON WIESENTHAL

3,433,218

OFF GAS FIRING SYSTEM

Filed July 3, 1964

Sheet 1 of 2



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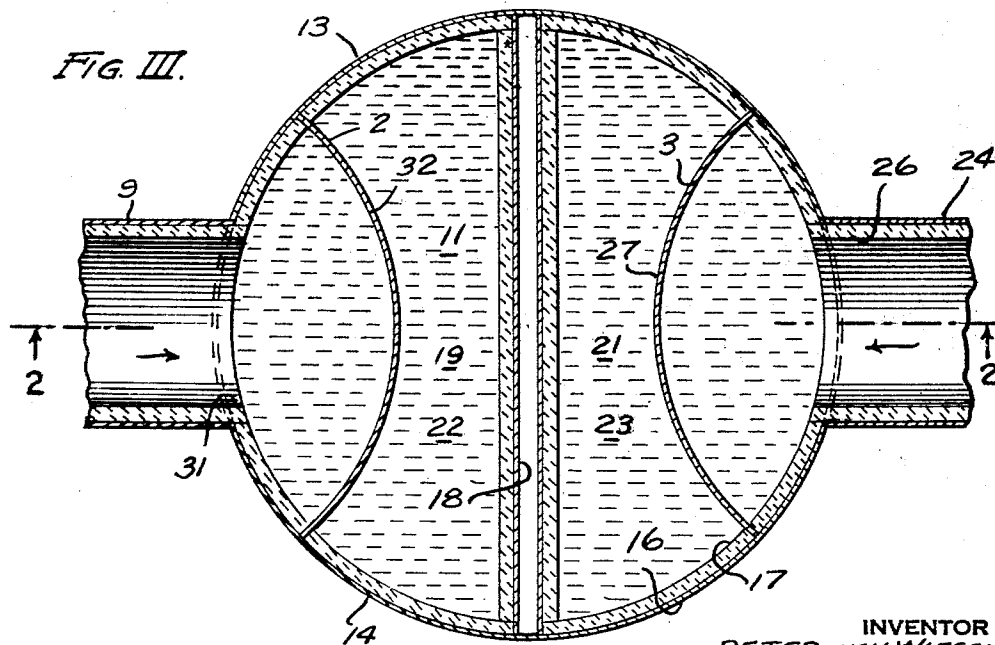
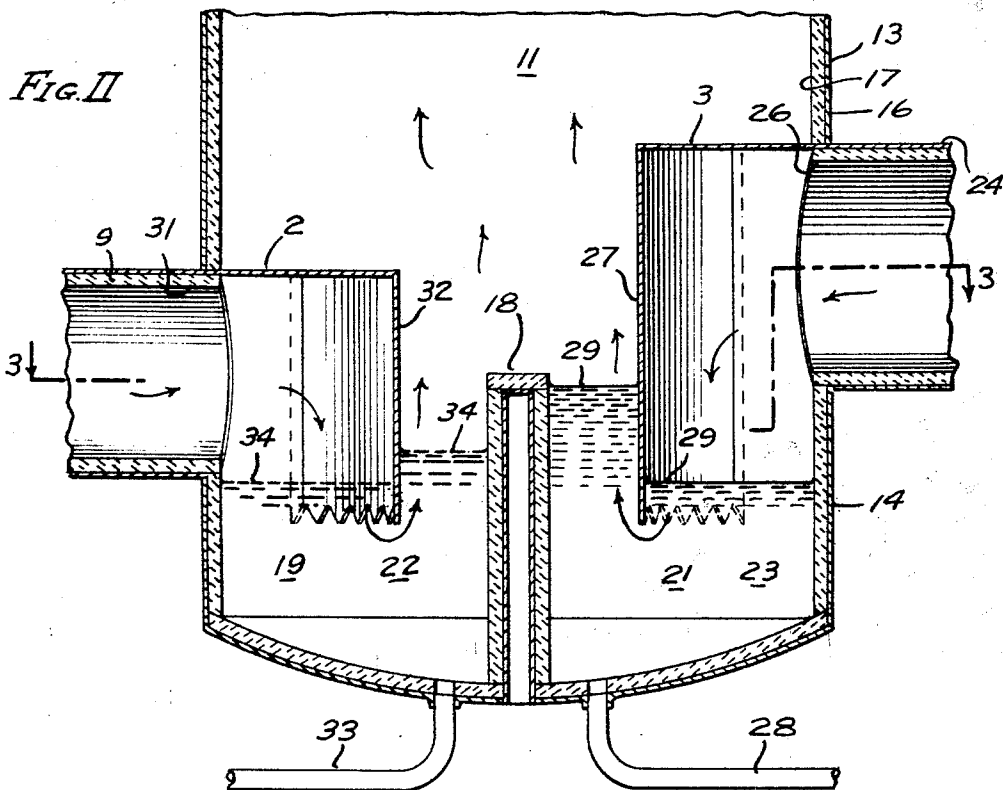
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Sheet 2 of 2



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3,433,218
OFF GAS FIRING SYSTEM
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2 Claims

ABSTRACT OF THE DISCLOSURE

A stack and seal pot arrangement for use with a CO-fired furnace and especially suited to vent either combustion gases when the furnace is in operation or CO when the furnace is shut down. Two wells are formed in the lower portion of the stack, one connected in flow series between the CO-fired unit and the stack and the other between the supply of off gas and the stack. Levels of water are maintained in each of the wells and each well has a shroud projecting downward therein so that heads of water can be maintained thereacross to serve as seals against passage of either combustion gases or vented off gas through their respective wells for exit via the stack.

This disclosure relates to firing carbon monoxide in lean concentrations occurring in off gas from hydrocarbon catalytic cracking units. The invention contemplates a stack and seal pot arrangement especially suited to this service.

Commercial CO-firing systems must provide not only for the condition when off gas is being fired but also for the condition when the CO-firing unit is out of service for maintenance. In the former condition off gas is fed to the CO-firing unit and combustion products are vented to the atmosphere via a stack. The latter conditions calls for bypassing the CO-firing unit by delivering the off gas directly to the stack. The present advance accommodates both of these conditions in a particularly facile manner by integrating seal pot construction with fabrication of the stacks lower portion. More particularly wells are provided in the lower portion of the stack and a level of water is maintained in each well. Associated with each of the wells is a shroud which conducts gas below the level of the water so that a head of water can be maintained across the two sides of the shroud. This head of water serves as a seal against passage of the gas under the shroud.

The present arrangement offers increased safety, ruggedness, and economy over comparable systems. CO-firing systems are characterized by high temperatures and velocities as well as wide swings in operating conditions. Seal pots receive especially sore abuse. Here the seal pots are brought into the formidable structural arrangement found at the lower portion of a stack. Housing the seal pots within the stack adds an extra measure of safety in the event of CO leakage. Further the compatibility of stack and seal pot structures also give rise to savings.

These and other features will appear more fully from the accompanying drawing wherein:

FIGURE I is a schematic illustration of the off gas firing system here contemplated.

FIGURE II is an enlarged elevation view in section of the lower portion of the stack, and taken along line 2-2 of FIGURE III.

FIGURE III is taken along line 3-3 of FIGURE II.

In principal, the firing arrangement set forth herein is not unlike those in common use throughout the petroleum refining industry. During normal operation feed 1 and exhaust 2 seal pots are open and bypass seal pot 3 is closed so that off gas from catalyst regenerator (not

shown) is conducted via feed duct 6 to CO-firing unit 7 wherein it is burned. Usually air and auxiliary fuel are introduced to the burning off gas. Heat is recovered from the products of CO combustion by means of non-contact heat exchange with a process stream in tube coil 8. Products of combustion exit CO-firing unit 7 via exhaust duct 9. These products pass through exhaust seal pot 2 and leave via interior 11 and top opening 12 of stack 13.

When CO-firing unit 7 is out of service feed 1 and exhaust 2 seal pots are closed to prevent off gas from entering CO-firing unit 7 either through feed duct 6 or through exhaust duct 9. Bypass seal pot 3 is open so that off gas is shunted to the atmosphere via bypass duct 24, interior 11 and top opening 12 of stack 13.

Exhaust 2 and bypass 3 seal pots are formed integrally with lower portion 14 of stack 13. Shell 16 lined with refractory 17 cooperates with wall 18 to define exhaust well 19 and bypass well 21 each open to flow communication with top opening 12 via interior 11. Each of the wells 19 and 21 are suitable for retaining pools of water 22 and 23 therein.

Bypass seal pot 3 is closed during normal operation. When open this seal pot allows off gas to bypass CO-firing unit 7 by flowing via bypass duct 24, through bypass port 26, under bypass shroud 27 and into interior 11 for exit via top opening 12 of stack 13. During normal operation of the system water admitted via line 28 forms bypass pool 23 defining level 29 which forms a liquid seal against the flow of gases under bypass shroud 27 from bypass duct 24.

Considering exhaust seal pot 2 in detail, flow through exhaust duct 9 can be either from CO-firing unit 7 through exhaust port 31 under exhaust shroud 32 through interior 11 and out top opening 12 of stack 13 or conversely from interior 11 of stack 13 under exhaust shroud 32 through exhaust duct 9 back to CO-firing unit 7. Exhaust seal pot 2 is usually called upon during periods when CO-firing unit 7 is out of service to prevent back flow of off gas from interior 11 of stack 13 to CO-firing unit 7. Toward this objective water is introduced via line 33 to maintain level 34 shown as a dashed line.

Off gas generally comes from catalyst regenerators at temperatures from 800° to 1100° F. Further, carbon monoxide is quite lethal. So when CO-firing unit 7 is to be entered for repair work, it is necessary that both feed duct 6 and exhaust duct 9 be positively closed. Positive closure is accomplished by means of feed 36 and exhaust 37 guillotine dampers. Feed 1 and exhaust 2 seal pots must generally be closed in order for feed 36 and exhaust 37 guillotine dampers to be moved to their closed positions.

It will be apparent to those skilled in CO-firing systems that wide deviations can be made in the details of this disclosure without departing from the main theme of invention as set forth in the claims.

What is claimed is:

1. A system for firing off gas from the catalyst regenerator of a hydrocarbon catalytic cracking unit and comprising in combination

a feed duct which connects in flow series with the catalyst regenerator to receive the off gas therefrom, a CO-firing unit,

the feed duct connected in flow series with the CO-firing unit to deliver the off gas thereto,

means operatively associated with the CO-firing unit for recovering heat from combustion products generated therein,

a feed seal means operatively connected in the feed duct to accomplish shutting off flow of the off gas to the CO-firing unit when the CO-firing unit is not in service,

and to allow passage of the off gas from the catalyst regenerator to the CO-firing unit when the CO-firing unit is in service,
 a stack with a top opening for venting gases to the atmosphere,
 an exhaust duct connecting the CO-firing unit to the stack for exhausting the combustion products there-
 to,
 an exhaust seal means operatively connected in the exhaust duct to accomplish shutting off back flow of gases from the stack to the CO-firing unit when the CO-firing unit is not in service and to allow passage of combustion products from the CO-firing unit to the stack when the CO-firing unit is in service,
 a bypass duct connecting the feed duct upstream of the feed seal means with the stack,
 a bypass seal means operatively connected in the bypass duct for allowing the bypassing of off gas to the stack when the CO-firing unit is not in service and to prevent passage of the off gas from the catalyst regenerator directly to the stack when the CO-firing unit is in service,
 the stack having a shell with a lower portion,
 a wall connected across the lower portion of the shell to define an exhaust well and a bypass well each open to flow communication with the top opening and each suitable for retaining a pool of water therein,
 the lower portion of the shell defining an exhaust port through which it communicates in flow series with the exhaust duct to receive combustion products therefrom,
 the exhaust seal means including means for introducing water into the exhaust well,
 an exhaust shroud connected to the shell about the ex-

haust port and having an exhaust lower extent which projects below the exhaust port so that when the level of water in the exhaust well is above the exhaust lower extent a head of water may be maintained across the exhaust shroud,
 the lower portion of the shell defining a bypass port through which it communicates in flow series with the bypass duct to receive off gas therefrom,
 the bypass seal means including means for introducing water into the bypass well,
 a bypass shroud connected to the shell about the bypass port and having a bypass lower extent which projects below the bypass port so that when the level of water in the bypass well is above the bypass lower extent a head of water may be maintained across the bypass shroud.
 2. The system of claim 1 with
 a feed guillotine damper operatively connected to the feed duct downstream of the bypass duct for positively closing the feed duct,
 and an exhaust guillotine damper operatively connected to the exhaust duct for positive closure thereof.

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JOSEPH SCOVRONEK, *Primary Examiner.*

U.S. Cl. X.R.

23-277; 431-5