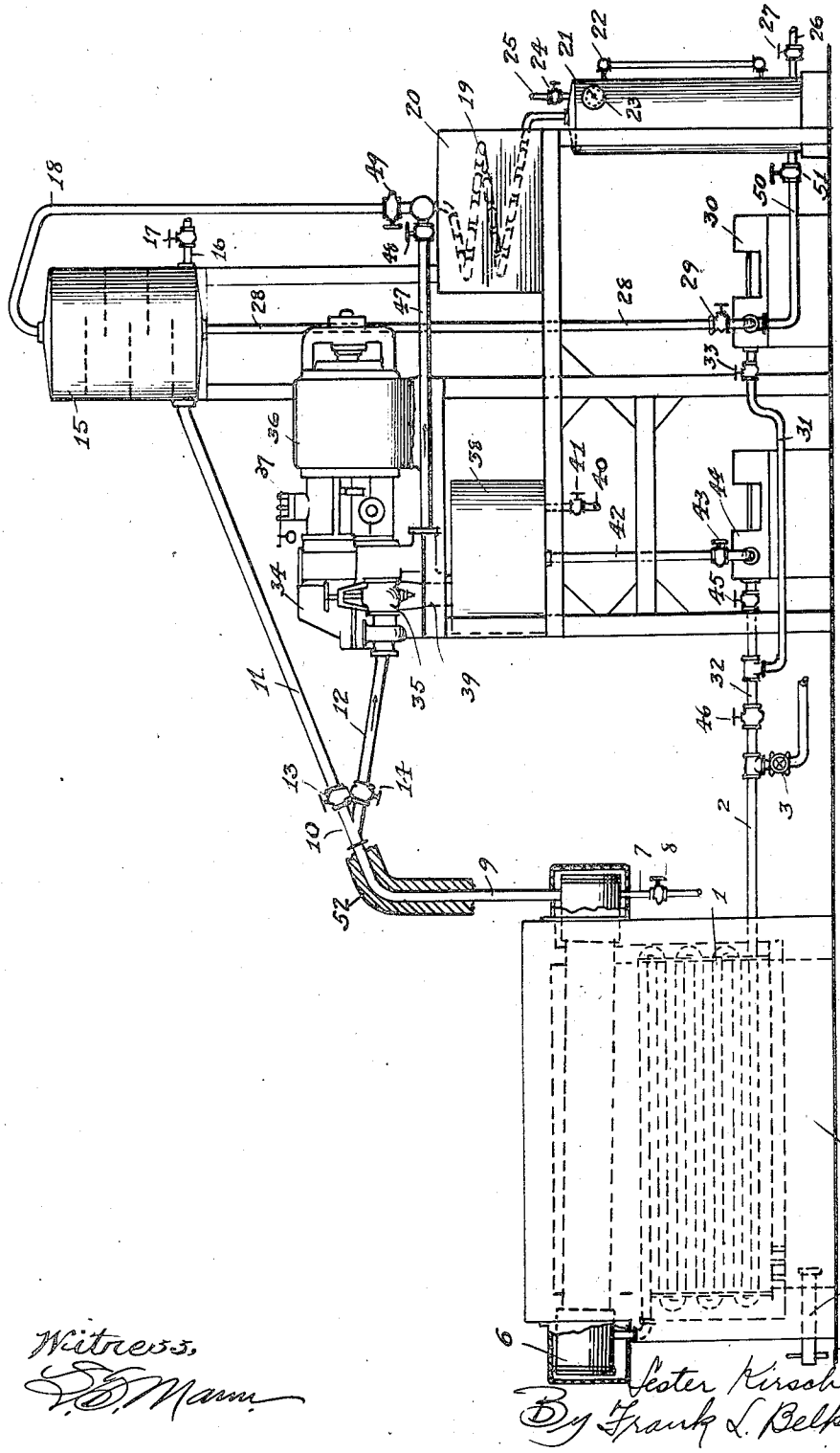
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APPARATUS AND PROCESS OF GENERATING POWER

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APPARATUS AND PROCESS OF GENERATING POWER

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My invention relates to an apparatus and a process for generating power and refers more particularly to a means of using the energy generated in an oil still while cracking hydrocarbons or the like.

Among its salient objects are to provide interposed in the vapor line of a cracking still, a turbine, rotary motor or other type of motive power which may be adapted to efficiently requisition the power generated in the body of the oil by the heat applied to the cracking tubes and at the same time transferring said power into tangible work which may be employed in the operation of machinery; to provide a suitable type of motive power interposed in the vapor line of an oil still adapted to be driven by the energy contained in the gaseous oil vapors and in connection with said motive power, provision is made for collecting the expended condensate; to provide a source of motive power which is adapted to extract the energy from the body of the oil in a cracking process and one which, while having a dephlegmatory effect, combines a means of utilizing the heat energy given off during this dephlegmation; to provide a source of motive power which utilizes power heretofore wasted, and one which can be effectively controlled to perform useful work and in general to provide an improved type of apparatus of the character referred to.

The drawing shows a diagrammatic side elevation of an oil cracking system with the power generator inserted in the vapor line.

The drawing depicts an oil still in which the raw oil is introduced into the cracking tubes 1 through the charging pipe 2, the latter being controlled by valve 3. The cracking tubes are mounted above the furnace 4 which is heated, preferably by a burner 5. The oil vapors pass from the cracking tubes into the vapor tubes 6, which are mounted above the cracking tubes and are provided with the residuum drawoff pipe 7, controlled by valve 8. The residuum drawn off from the vapor tubes may be piped to any suitable tank or collector (not shown). The oil vapors from the vapor tubes proceed through the pipe 9 to the Y connection 10, where the vapor pipe divides into two separate lines 11 and 12, the valves 13 and 14 being interposed in each of these lines.

When the cracking process is started, it is desirable to direct the oil vapors through the line 11 to the dephlegmator 15 which has a drawoff pipe 16 controlled by valve 17. This is accomplished by closing the valve 14 and opening the valve 13 which causes the vapors to pass through the dephlegmator out through the gooseneck 18 to the coil 19 and water condenser 20. From the water condenser, the distillate is collected in the receiver 21 which is fitted with the common type of liquid gauge 22, and pressure gauge 23. The receiver is also equipped with a pressure valve 24 in the outlet pipe 25 and a drawoff pipe 26 at the bottom of the receiver, controlled by a valve 27. From the bottom of the dephlegmator is a line 28 controlled by a valve 29 which directs the distillate which collects in the bottom of the dephlegmator to a pump 30, where it is forced through the pipe 31 back into a pipe 32, which is connected to the cracking tubes through the charging pipe 2. A valve 33 is inserted in the line 31 to regulate the flow of the returning distillate.

When the volume of the oil vapors has increased to an extent that their energy may be used in generating power, the valve 13 is closed; the valve 14 opened. This causes the oil vapors to proceed through the pipe 12 to a turbine 34 into which the amount of oil vapor allowed to enter is controlled by means of a throttle valve 35. I have stipulated here a turbine because this type of machine is adapted to efficient operation with a gaseous vapor. I do not, however, wish to limit myself to this type of motive power as a rotary engine or any type of machine that may be operated by a gaseous vapor may be employed to convert the energy in this vapor into a tangible power.

This turbine, as shown in the drawing, is represented as the usual type of steam turbine directly connected to a generator 36. The details of this turbine at this time are omitted, although it is appreciated that the construction as shown may necessarily be

somewhat altered to conform with the peculiar characteristics of the vapor used as power. A common type of safety valve is mounted upon the turbine at 37. As the heated oil vapors expend their energy in driving the turbine, there will necessarily take place a considerable amount of condensation and in view of this, I have provided directly below the turbine a collecting tank 38, which is connected therewith by means of the pipe 39. The distillate collected in this tank may be drawn off through the pipe 40 controlled by a valve 41 or directed back into the system through the pipe 42 regulated by valve 43 which leads to a pump 44, said pump forcing the distillate back into the charging pipe 2 through the pipe line 32. The valve 45 is inserted in the line 32 and may be used to regulate the amount of distillate charged back into this system and will necessarily be closed when the distillate is being charged into the system through the pump 30. The valve 46 also inserted in the line 32 cuts out all means of recharging the distillate into the raw oil.

To return to the oil vapors, after passing through the turbine, they are conducted through the outlet pipe 47 to the coil 19 and condenser 20. Two valves 48 and 49 are inserted in the lines 47 and 18 respectively, directly above the coil in the water condenser and are used to regulate and control the vapors passing through these pipes. When the vapors are passing through the dephlegmator thence into the water condenser, the valve 49 will be open and the valve 48 closed but when the vapors are passing through the turbine, the valve 48 will be open and the valve 49 closed, thereby directing the exhausted volatile gases from the turbine into the water condenser for condensation and thence to the receiver.

A pipe 50, controlled by a valve 51 connects the receiver with a pump 30 and provides a means of recharging the distillate in the receiver, back into the cracking tubes. The pressure on the system may be regulated by the valves 8, 17, 27, 41 and 24. At 52, I have shown a portion of the pipe 9 heavily lagged with insulating material. It is advisable to have the pipes throughout the system lagged in this manner, due to the loss of heat from radiation.

It will be noted that the oil vapors from the vapor tubes 6 may be directed through the system by two separate and distinct routes, first, that through the dephlegmator, condenser and receiver, and second, through the turbine, condenser and receiver. When the vapors are directed through the dephelgmator, the vapor line leading to the turbine is closed, thereby cutting out entirely this portion of the system, and on the other hand, when the volume of vapor has increased so that this source of power may be diverted into the turbine, the course of the vapors to the dephlegmator is cut off by the valve 13, and the vapors caused to travel through the second route to the turbine previously explained. Various types of turbines can be employed, but I preferably use turbines having the usual high speed jet openings for increasing the velocity of the vapors, and said jet openings causing the vapors to attain a velocity often in excess of 2500 feet per second. It is manifest that all turbines are provided with fluid jets which is an inherent characteristic of a turbine.

The electrical energy produced in the generator 36 may be utilized for operating machinery or in any way desired. It will be appreciated that there will be a substantial amount of power generated in this turbine as the vapors are at high pressure and travel at a high velocity.

The turbine, traveling at a high velocity will cause the centrifugal force, which is very considerable, to be exerted upon the distillate which may condense upon its rotating members. This centrifugal force will have a separative tendency, causing the heavier distillate to be divided from the lighter vapors. In this way, besides the condensation before mentioned, the separating out of the distillate will be materially aided by this centrifugal force.

In conclusion it may be noted that by means of this process and apparatus not only may the energy of the vapors be utilized to generate power but by the same means the vapors can be very effectively condensed. For example, if a three stage turbine be interposed in the vapor line, condensation will take place at decreasing temperatures and pressures in each stage. Also the condensate from each stage turbine may be independently trapped off and collected. By suitably regulating the valves in the still, one hundred pounds vapor pressure may be maintained in the still, and then as the gases are released through the throttle valve they come under sufficient force and velocity to generate substantial energy.

I claim as my invention:

1. A process of treating hydrocarbons, comprising passing oil in a small stream through a heating coil where it is subjected to a cracking temperature, in discharging the oil into a vapor chamber where vaporization occurs, in discharging at regulated intervals the vapors from said chamber to an engine to utilize the expansive energy of said vapors in the development of power and to effect a separation of heavier from lighter oil constituents, in discharging the heavier condensed fractions from said engine, and in discharging the uncondenser fractions for condensation and collection.

2. In oil distilling apparatus, the combination of; means for raising oil to the desired

temperature of volatilization; a separator into which the heated oil is delivered; means for regulating the discharge of oil from said separator in proportion to its entrance thereinto; means associated with the apparatus for definitely regulating the pressure within said separator; means for converting the expansive heat energy of the vapor products from said separator into mechanical energy, and means for separately exhausting the vapors and non-vaporous products from said converting means.

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