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PROCESS FOR THE RECOVERY OF HYDROCARBONS

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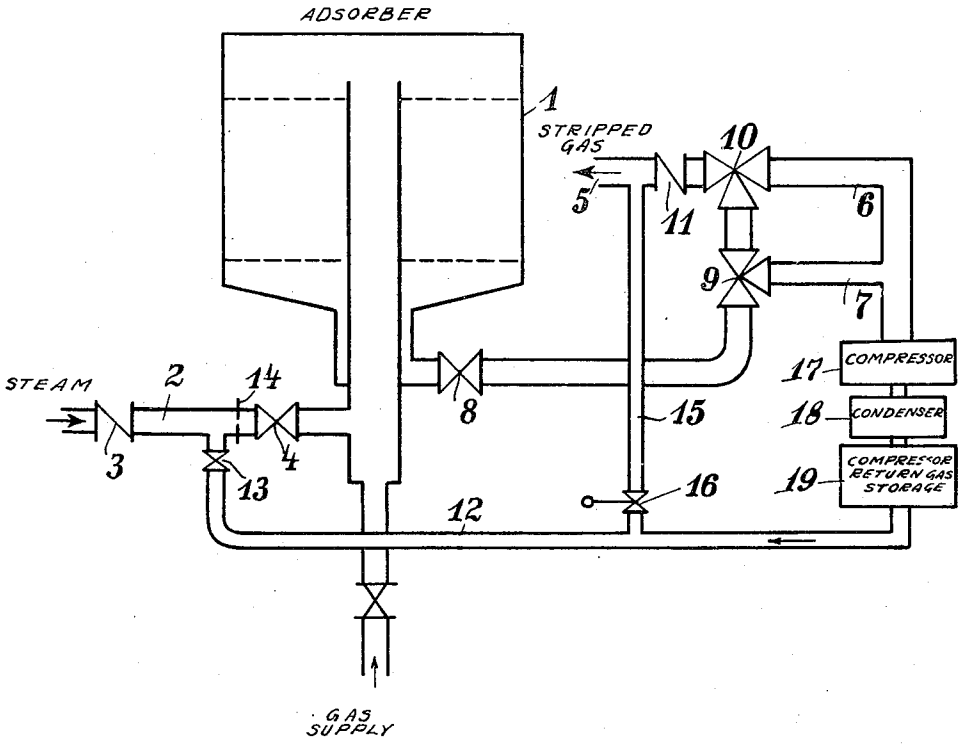

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PROCESS FOR THE RECOVERY OF HYDROCARBONS

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2 Claims. (Cl. 183—4)

In the operation of adsorption plants, which are operated with active carbon, for the recovery of gaseous hydrocarbons of the C_2, C_3 and C_4 groups, a loss of hydrocarbon occurs, in the compression and liquefaction of the concentrated hydrocarbon mixtures issuing from the adsorption plant, owing to the fact that, depending on the equilibrium vapour pressure, the non-liquefiable inert gases passing out of the compressor entrain hydrocarbons. In order to recover the latter, these gas mixtures passing out of the compressor, which are under pressure and contain up to 30% of hydrocarbons, are returned for further adsorption to the adsorption plant. This has hitherto been effected either by mixing the compressor gases directly with the gases to be subjected to adsorption or by blowing them in concentrated form into the adsorbers before the desorption operation. For reasons of convenience in the latter operation, the gases were passed in the opposite direction to that of the gases in the charging operation.

This operation requires very considerable attention and can be employed only under certain conditions.

According to the present invention, however, the recovery of the hydrocarbon content of the compressor gases is substantially simplified by passing the compressor recycle gases into the adsorbers with the desorption agent, for example hot steam, in the same path and in the same direction. While the steam condenses on the cold adsorptive medium and a certain time is required to heat up the adsorber, the adsorptive medium is able to effect a separation of the undesirable inert gases from the hydrocarbons. This separation, which means a difference in the times at which the inert gases and the hydrocarbons pass out of the adsorber, is utilized by providing two efflux paths from the adsorber, which are opened up one after the other. On the introduction of the steam and compressor return gas, the path through which the gases freed from the hydrocarbons can flow off is opened up and thereupon, after closure of the first path, the second path is opened up through which the desorbed hydrocarbons pass out of the adsorber and to the compression. The period after which the second path is opened up is dependent on the speed at which the amount of steam needed for the desorption is introduced into the adsorber. The time is of the order of magnitude of 30 to 40% of the total time required for the complete desorption of the hydrocarbons.

The change-over from one efflux path to the other will preferably be made with the aid of valves, controlled by an adjustable time relay. The time relays are naturally dependent on the whole switching operation of the main plant. A further possibility is afforded by controlling the change-over by apparatus which automatically analyze the desorption fraction. The outlet pipe of the adsorber can moreover be still further sub-divided and thus a plurality of desorption fractions can be obtained. The outlet pipes can be controlled in this arrangement also by automatic switching apparatus or analyzing apparatus, as described above.

In carrying out the present process for the recovery of the hydrocarbon, it has also been found extremely advantageous to regulate the speed of the entering steam by fitting an adjustable steam diaphragm in the steam pipe at the point between the inlet of the compressor return gases into the steam pipe and the steam inlet into the adsorber. The compressor return gas, which is injected into the steam pipe at a pressure higher than the pressure in the steam pipe, must pass through the diaphragm together with the steam. Thus the amount of steam flowing to the adsorber will vary inversely with the amount of compressor return gas so that there will be ample time between the adsorption of the hydrocarbon content of the compressor return gas and the desorption of hydrocarbons from the active carbon to permit an exact adjustment of the valve controlling the separation of the hydrocarbons from the stripped compressor return gas.

In order that the invention may be more clearly understood, reference is made to the accompanying drawing, which illustrates diagrammatically and by way of example, one embodiment of apparatus suitable for carrying same into practical effect and in which:—

1 denotes the adsorber. The steam pipe 2 has the non-return flap or check valve 3 and a flow-control valve 4. The outlet pipe from the adsorber is divided into three branches. The residual or stripped gas flows out through 5, and two fractions containing recovered hydrocarbons pass out through 6 and 7. In this outlet pipe are the flow-control valves 8, 9, and 10 and the non-return flap or check valve 11. 17 is the compressor, 18 the condenser and 19 a chamber for the storage of compressor return gas. The compressor return gas is introduced into the steam pipe 2 through the pipe 12 and a valve 13. In rear of the point of introduction of the compressor return gas into the steam pipe is located the adjustable diaphragm 14. The re-

sidual gas pipe 5 and compressor return gas pipe 12 are connected by a pipe 15 in which the valve 16 is mounted, which may serve to by-pass gases from the compressor on their way to the steam pipe 2 to the residual gas outlet 5.

As will be seen from the foregoing description of the apparatus the adsorber is first charged with hydrocarbons adsorbed from a gas carrying the same and the stripped gas passes through valves 8, 9, 10 and 11 to pipe 5 and are discharged. Steam and compressor return gas are then supplied to the adsorber through pipes 2 and 12 and any unadsorbed gas passing through the adsorber is discharged as before through valves 8, 9, 10 and 11 and pipe 5. The operation is so regulated that when the mass in the adsorber becomes heated and begins to liberate adsorbed hydrocarbons the supply of compressor return has stopped and the flow of stripped gas through valves 8, 9, 10 and 11 and pipe 5 also has stopped. Valves 9 and 10 are then changed to discharge the expelled hydrocarbons through pipe 6 or 7 to the compressor 17, adsorber 18 and storage chamber 19. When the expulsion of adsorbed hydrocarbons from the adsorber is complete the mass is cooled and the described sequence of operations repeated.

I claim:

1. In a process for the recovery of hydrocarbons from a gaseous mixture containing the same and fixed gas involving passing the mixture through an adsorber for the hydrocarbons, discharging the unadsorbed fixed gas, expelling the adsorbed hydrocarbons from the adsorber by the introduction of steam, compressing and condensing hydrocarbons from the gas mixture expelled from the adsorber, and recovering hydrocarbons from the uncondensed portion of said expelled gas mixture by passing it through the adsorber, the step which consists in introducing said uncondensed portion of said expelled gas mixture into the adsorber with the steam before the beginning of the expulsion of adsorbed hydrocarbons from the adsorber.

2. Process as defined in claim 1 in which the amount of steam supplied to the adsorber with the uncondensed portion of said expelled gas mixture varies inversely with the quantity thereof.

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