A more recent process invented by Greenstreet [a] proposes to atomize crude oil with steam, to pass the mixture of oil and steam through a coil of pipes maintained at a temperature above 538° C. to ignite a part of the product, and then to condense the remainder.

Sabatier,[b] one of the most noted inventors in the hydrocarbon field, has recently brought forth a new process for the production of light hydrocarbons, involving the use of catalytic material. The oil is first vaporized and the vapors directed against platinum wires rendered incandescent by electric current and brought to a bright red heat. Hydrogenation of the unsaturated hydrocarbon is accomplished by passing the vapors through a spiral of nickel or other suitable catalytic material heated to 200° to 350° C. by an electric current.

Several processes have been devised for facilitating the cracking reaction at atmospheric pressure by adding aluminum chloride to the oils to be treated.

The first process of this nature seems to have been that of Friedel and Crafts.[c] From 5 to 20 per cent of anhydrous aluminum chloride is added to the hydrocarbon material and the mixture heated in a still or other large retort to a temperature varying from 100° to 600° C. The process was designed to produce burning oils, lubricating oils, etc., from heavier hydrocarbons. Gasoline, of course, was not in demand at that time, so that the adaptability of the process for gasoline production was not mentioned, although clearly, in the light of later knowledge, the process is equally suitable for this purpose.

Gray,[d] an American inventor, has patented a similar process with the addition of a mechanical stirrer which keeps the aluminum chloride in suspension in the hydrocarbon material and prevents its being overheated. The mixture is heated to a temperature not higher than 163° to 177° C. Usually 5 to 10 per cent of anhydrous aluminum chloride or other metallic chloride is used.

The more recently patented process of McAfee [e] proposes the use of the same percentage admixture of aluminum chloride as specified by Gray, and approximately the same temperatures (149° to 177° C.). No mechanical stirrer is used. A new feature is the use of a separate chamber between the still and the first condenser, for the separation and recovery of the aluminum chloride.

Although these are by no means all the patented cracking processes, they sufficiently illustrate the development of the art for processes operated at atmospheric pressure. Other patents are mentioned in the bibliography at the end of this bulletin.

[a] Greenstreet, C. J., U. S. Patent 1110923, Sept. 15, 1914; French Patent 446475, July 24, 1912.
[b] Sabatier, Paul, and Mailhe, Alphonse, U. S. Patent 1124333, Jan. 12, 1915.
[c] Friedel, Charles, and Crafts, J. M., English Patent 4769, Dec. 15, 1877.
[d] Gray, G. W., English Patents 17838 and 17839, Aug. 5, 1913.
[e] McAfee, A. McD., U. S. Patent 1127465, Feb. 9, 1915.

CRACKING UNDER PRESSURE.

In order to point out the various lines along which efforts have been made to develop cracking processes, as well as to more clearly differentiate from prior conceptions the processes discussed in this report, a brief review of the patents granted for processes involving cracking under pressure is given. The improvements in the art are naturally protected by patents, so that the patent literature contains the record of the most recent and important developments. The patented processes covering the utilization of cracking under pressure for the production of burning or illuminating oils have already received attention.

The danger incident to the subjection of large volumes of liquid to high temperatures and pressures has led many investigators to adopt the use of tubes in lieu of stills or similar large retorts. The most striking feature, therefore, of the development of the cracking art is the increasing number of patents involving the employment of small pipes or tubes. A number of recent investigators have called attention to the improved results obtained by condensation under pressure, among these being Hall,[a] Brooks, Bacon, and others,[b] and Humphreys.[c] All the more recent patents seem to involve the use of pressure condensation as a means of obtaining increased yields.

The best known and most successful process employing the use of a large retort or still for the cracking of heavier hydrocarbons is that patented by Burton.[d] The process is expressly stated to be limited to petroleum distillates with a boiling point of 500° F. (260° C.) or above. The initial material is placed in the still and subjected to a temperature of 650° F. (343° C.) to 800° F. (426° C.) and a pressure of 4 to 5 atmospheres. The vapors are condensed under pressure in an ordinary type of condenser.

A further proposed modification [e] of this process involves the addition of inclined conduits—pipes 12 inches in diameter and 40 feet in length—passing from the still to the condenser. The object of the inclined conduits is to permit the condensation of the heavier fractions of the distillate, which automatically return to the still for further exposure to the cracking temperature, the heavier fractions being thus subjected to the repeated action of the pressure and temperature in the still.

[a] Hall, W. E., Address delivered to Institution of Petroleum Technologists, London, Feb. 18, 1915; abstracted in Petroleum World, vol. 12, Mar., 1915, p. 137.
[b] Brooks, B. T., Bacon, R. F., and others, The preparation of gasoline and kerosene from heavier hydrocarbons: Jour. Ind. and Eng. Chem., vol. 7, Mar., 1915, p. 180.
[c] Humphreys, R. E., U. S. Patent 1119700, Dec. 1, 1914.
[d] Burton, W. M., U. S. Patents 1049667, Jan. 7, 1913; 1105961, Aug. 4, 1914. See also Clark, E. M., U. S. Patent 1132163, Mar. 16, 1915.
[e] See Humphreys, R. E., U. S. Patent 1119700, Dec. 1, 1914.