directly proportional to pressure. It appears, therefore, that increased pressure may be favorable to a point where the reaction proceeds with sufficient rapidity to attain a state of equilibrium. Increase in pressure above this point will tend to shift the equilibrium unfavorably if the reaction is one that is accompanied by increase of volume. It would seem to follow, therefore, that for each temperature there is some optimum pressure if the rate of feed is constant. For the lower temperatures, this pressure will be high; for high temperatures, it may be low.

### OBJECT OF HIGH PRESSURES.

The purpose of employing high pressure in the vapor phase is independent of any influence that the high pressure may have on the boiling points of hydrocarbons cracked. The process is not one of distillation, and boiling points are of no importance in the actual course of the reaction, as may be appreciated by considering the type reaction:

$$xA = yB - zC$$

$$\text{Constant} = \frac{(\text{Concentration B})^y\ (\text{concentration C})^z}{(\text{concentration A})^x}$$

in which $x$A represents the high boiling hydrocarbons to be converted into lower boiling hydrocarbons, $y$B represents the lower boiling gasoline hydrocarbons, and $z$C represents hydrogen and the noncondensable hydrocarbons, such as methane ($CH_4$), ethane ($C_2H_6$), ethylene ($C_2H_4$), etc. Because of the tendency toward equilibrium in the system, it is evident that if the end products represented by $z$C are kept in the sphere of reaction the tendency is for $x$A hydrocarbons, representing the raw hydrocarbon material used, to form $y$B hydrocarbons (lower boiling hydrocarbons) in order to satisfy equilibrium. The greater the concentration of $z$C, the more pronounced will be the tendency of $x$A to form $y$B, and not $z$C.

In the conventional cracking processes $z$C constituents, being of lighter weight than the liquids, constantly pass up and out of the sphere of reaction, whereas an important feature of the present processes is the retention of the $z$C constituents in the sphere of reaction through control of the discharge of the evolved gases. If small narrow tubes are used, such as those mentioned previously in the review of the cracking processes, the end products represented by $z$C are necessarily swept out of the reaction chamber, as they can not be held therein. In processes of this character there is, necessarily, a great waste of valuable hydrocarbon material, as the tendency of all the hydrocarbon constituents present in the system to go into equilibrium causes a considerable part of the hydrocarbons to be continuously decomposed into end products. This decomposition is increased in proportion to increase of temperature.