are condensed and collected in a suitable receptacle, the rate of flow from the reaction or cracking zone being regulated by the pressure-release valve.

In the conduct of the experiments here described 400 to 600 grams of oil were run through the furnace. After the completion of the run the quantity of resulting oil was determined, and the deposited carbon was scraped out of the furnace and weighed. The evolved gas was collected in a gas holder and its volume measured and recorded. Samples of evolved gases were removed from the gas holder and analyzed.

DISTILLATIONS MADE.

Distillations of the recovered oils were made in 250-c. c. flasks. The neck of each was five-eighths of an inch in diameter and 6 inches long, and fitted with a 5-inch column of aluminum beads which produced a still head of the Hempel type. Charges of 200 grams were distilled, and cuts made at temperatures of 150° C. and higher at intervals of 50° C. The type of apparatus used is more fully described in a recent publication by two of the authors.[a]

DETERMINATION OF SPECIFIC GRAVITY AND VISCOSITY.

Specific gravities of the original oils and distillation cuts of recovered oils were determined by means of a Westphal balance with a plummet of 1 c. c. displacement, or else with Drushel-type pycnometers.[b]

Viscosities for original and recovered oils were measured by the Engler viscosimeter, and the results expressed in Engler degrees, which represent the ratios between the rates of flow of oils and of water.

Coincident with the conversion experiments a study was made of the relations among the physical constants of the petroleum used. The results of these studies have been already presented.[c]

MAIN FEATURES OF EXPERIMENTS.

The main features of the experiments may be summarized as follows:

"Run" or Major Experiment.

1. Cracking of 400 to 600 grams of oil in furnace at regulated temperature and pressure.
2. Determination of quantities of oil, gas, and carbon resulting.

Supplementary Determinations.

1. Distillation of (*a*) uncracked oil, and (*b*) cracked oil.
2. Determination of specific gravities of uncracked oil, cracked oil, and individual distillation cuts.

[a] Rittman, W. F., and Dean, E. W., Analytical distillation of petroleum: Jour. Ind. and Eng. Chem., vol. 7, March and September, 1915, p. 185–195, 754–760.
[b] Rittman, W. F., and Dean, E. W., Loc. cit.
[c] Rittman, W. F., and Egloff, Gustav, Relations among the physical constants of petroleum distillates: Jour. Ind. and Eng. Chem., vol. 7, July, 1915, p. 578, 582.

3. Determination of viscosity and refractive index.
4. Chemical tests of distillates.
5. Analyses of evolved gases.

RESULTS OF EXPERIMENTS.

The results of the experiments conducted are given in Tables 5, 6, 7, 8, and 9. Because of the great variety of data presented, the results for each individual oil have been incorporated in separate tables.

Most attention was given the three United States oils, namely, a Pennsylvania refined burning oil, representing the paraffin oils of the Appalachian oil fields, an Oklahoma fuel oil, representing the mixed-base oils of the Mid-Continent field, and a Kern River crude oil, typifying the oils of asphaltic base obtained from California. Sufficient data were obtained for the Mexican and Russian oils to show that in spite of differences in physical properties and chemical constitution results of the same general character could be obtained as with petroleum from the United States. All of the oils tested were suitable for experimental purposes by reason of their freedom from low-boiling hydrocarbons.

The data reported here are only those that were generally available for all the oils used, and consequently do not show the entire range of temperatures and pressures embraced by the experiments, although they cover a wide range and embrace the conditions of commercial importance in the cracking reaction. Lower temperatures than those shown will not produce a decomposition rapid enough to be commercially feasible, whereas the extreme high temperatures produced a maximum of ultimate end products, namely, carbon and fixed gases. The range of pressures used was as great as can be managed in an apparatus of ordinary construction, in conjunction with high temperatures, whether in small or large scale operations. Tables 5 to 9 follow.