A summation of the results obtained in this first stage of the investigation of the general problem is shown in Table 3 and in figures 6 and 7

TABLE 3.—*Summary of results of oil-cracking experiments, showing effect of varying temperatures and pressures and of admixtures of hydrogen on gas formation. (See Tables 1 and 2.)*

[All results based on 400 c. c. of oil and calculated to 0° C. and 760 mm. pressure.]

Furnace conditions.		Reaction products.							Hydrogen admixed.	Hydrogen shrinkage.
Temperature.	Pressure per square inch.	Gas.	Carbon.	Tar.	Illuminants.	Methane (CH_4).	Ethane (C_2H_6).	Hydrogen (H_2).		
° C.	*Pounds.*	*Liters.*	*Grams.*	*C. c.*	*Liters.*	*Liters.*	*Liters.*	*Liters.*	*Liters.*	*Liters.*
ATMOSPHERIC-PRESSURE GROUP.										
650	15.0	135	3	163	58.8	45.5	13.8	12.1	.....	.....
750	15.0	206	18	80	63.0	84.5	10.15	39.6	.....	.....
900	15.0	382	115	11	50.0	178.1	Trace.	148.2	.....	.....
HIGH-PRESSURE GROUP.										
650	45.0	145	8	133	44.3	65.2	16.7	13.1	.....	.....
750	45.0	194	26	87	30.1	110.0	11.8	33.9	.....	.....
900	45.0	310	165	9	15.5	128.9	None.	155.0	.....	.....
LOW-PRESSURE GROUP.										
750	0.75	146	1	153	82.0	.....	.....	18.3	.....	.....
850	.75	211	3	100	115.5	43.2	7.16	32.9	.....	.....
900	.75	234	3	60	122.0	56.0	3.00	40.0	.....	.....
950	.75	235	12	58	110.0	63.4	Trace.	48.8	.....	.....
ADMIXED-GAS GROUP.										
750	15.0	.....	.....	.....	70.6	125.0	15.4	308.0	358	50
800	15.0	.....	.....	.....	83.2	116.0	18.0	335.0	412	77
750	1.0	.....	.....	.....	112.0	52.0	9.5	381.0	400	19
810	1.0	.....	.....	.....	140.0	86.5	.....	378.0	413	35
860	1.0	.....	.....	.....	133.0	99.5	.....	350.0	388	38
900	1.0	.....	.....	.....	120.0	92.0	.....	272.0	292	20
950	1.0	.....	.....	.....	113.0	95.0	.....	348.0	382	34

This work, dealing with the field of oil-gas production, constituted a first step of the study of the cracking reactions for the production of gas, gasoline, aromatic hydrocarbons, and other products. Acknowledgment is due to Prof. Milton C. Whitaker, of Columbia University, for his active cooperation and assistance in the study of the broad problem. The original plan was that Professor Whitaker and one of the authors should continue joint work in this field, but the employment of the latter by the Bureau of Mines rendered the fulfillment of this plan impossible. To Prof. Whitaker, however, credit should be given for his active interest in the present researches and his recognition of the commercial importance of the results obtained.

MANNER OF APPROACHING SOLUTION OF CRACKING PROBLEM IN LABORATORY EXPERIMENT.

The nature of the problem has already been indicated. It was at once foreseen, however, that mechanical difficulties would be encountered if experiments were attempted along conventional lines. The disadvantages of all methods involving the heating of liquid and

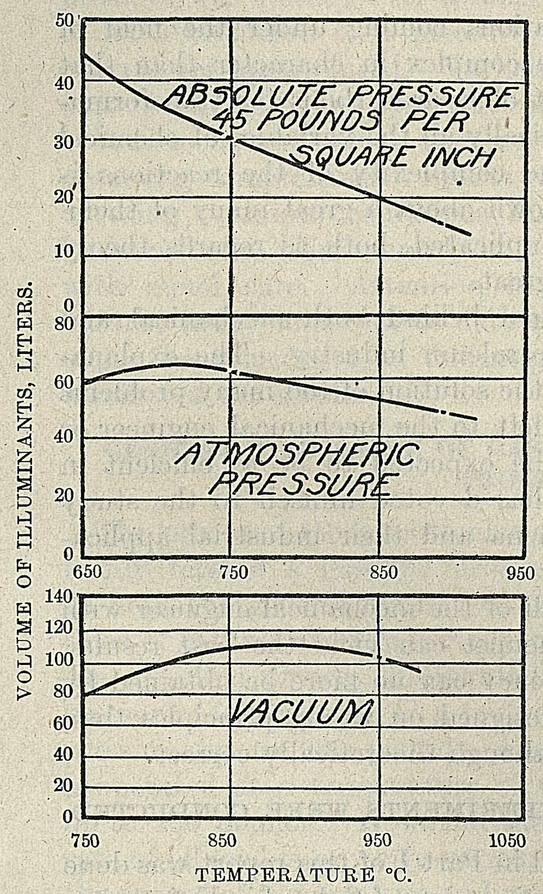

FIGURE 6.—Curves showing effects of temperature and pressure on volume of illuminants in oil-gas cracking process.

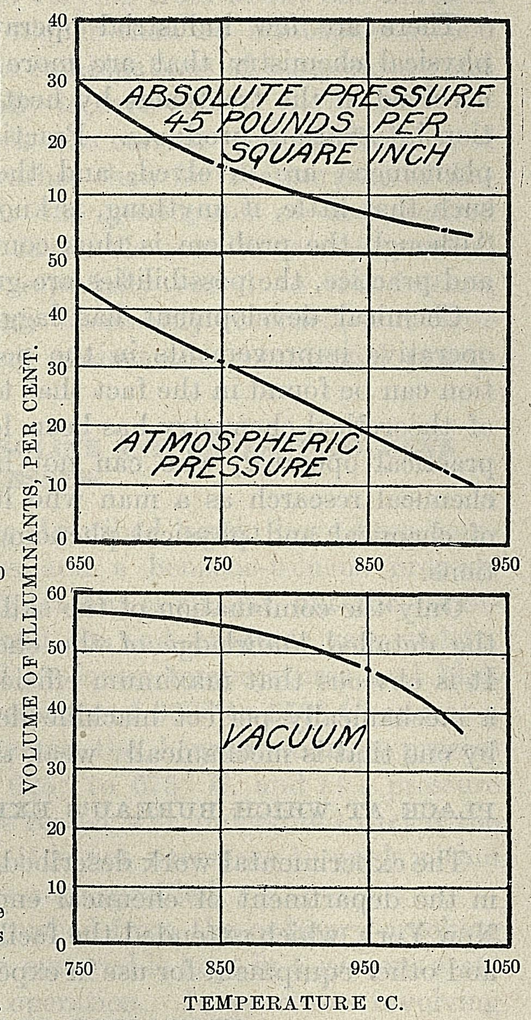

FIGURE 7.—Curves showing effects of temperature and pressure on proportions of illuminants in oil-gas cracking process.

vapor simultaneously are evident. The interdependence of temperature and pressure limits the conditions under which reactions may be studied, and in addition attempts to heat considerable quantities of liquid involve a large element of danger. It soon appeared, however, that all these disadvantages could be obviated by eliminating the liquid phase from the cracking system, and that no new difficulties would be introduced by the elimination. The method of procedure developed is absolutely flexible with regard to the variation of experimental conditions and permits work with a