TABLE 69.—*Gasoline formed from cracking a distillate fuel oil in a single-tube furnace (tube 8 inches in diameter and 10 feet long) at a constant pressure of 250 pounds per square inch, with varying temperatures and rates of oil feed.*[a]

Temperature, °C.	Rate of oil feed, gallons per hour.	Percentage of oil recovered.	Gasoline.		
			Percentage in recovered oil.	Percentage on basis of original oil.	Specific gravity.
575	12	75	30.0	22.5	....
575	15	79	25.1	19.8	....
600	12	71	31.3	22.2	0.76
625	12	77	40.0	30.8	.72
625	16	75	38.5	28.9	.75
650	12	74	36.3	26.8	.75
650	15	88	20.0	17.6	....
700	15	80	30.5	26.0	.78

[a] Results low owing to insufficient condensation.

DISTILLATION ANALYSIS OF ORIGINAL OIL USED.

[Specific gravity, 0.915 (23° B.); first drop at 300° C.]

Temperature of cut.	Distillation product.		
	Volume.	Proportion of original oil.	Specific gravity.
°C.	*C. c.*	*Per cent.*	
350	85	42	0.85
400	80	40	(*b*)

[b] Jelly-like.

CONCLUSIONS AS TO RESULTS OF TESTS.

In considering the figures assembled in the foregoing tables, it must be remembered that efficient condensation was lacking. The work was carried on during intervals when benzene-toluene experiments were being conducted with equipment erected to obtain indications as to benzene-toluene reactions, and not to determine maximum yields. Accordingly the condensing facilities were of the crudest type. The results can be considered only as suggestive of what can be accomplished under proper conditions. Viewed in this light they are of a distinctly favorable character, and justify optimistic belief in the large-scale commercial possibilities of the process.

GASOLINE PROCESS COMPARED WITH BENZENE-TOLUENE PROCESS.

In comparison with the benzene-toluene process, the gasoline process is simple in character. This may be more readily perceived by considering the order of hydrocarbon reactions as given below. The relative order is not only based on theory, but is in accordance with the evidence gained as the result of extended series of tests.

ORDER OF HYDROCARBON REACTIONS.

Heavy petroleum hydrocarbons $\rightleftharpoons$ Light petroleum hydrocarbons (saturated and unsaturated).

$\downharpoonleft\upharpoonright$

Cymene, etc.

$\downharpoonleft\upharpoonright$

Xylene,

$\downharpoonleft\upharpoonright$

Toluene,

$\downharpoonleft\upharpoonright$

Benzene,

$\downharpoonleft\upharpoonright$

Naphthalene, Diphenyl, etc.

$\downharpoonleft\upharpoonright$

Anthracene, etc.

$\downharpoonleft\upharpoonright$ $\downharpoonleft\upharpoonright$

Carbon. Gas.

The conversion from heavy hydrocarbons into lighter hydrocarbons involves only one step, and is easy of accomplishment, whereas the conversion into the lower boiling aromatic hydrocarbons requires that the heavier hydrocarbon molecules undergo a much more extensive series of changes before the desired products are obtained. This difference will indicate why the mechanical difficulties experienced in the first stages of development of the benzene-toluene process are nonexistent so far as the gasoline process is concerned. The lower temperatures necessary and the greatly decreased quantity of carbon produced eliminate serious trouble from overheating and clogging in gasoline manufacture.

Because of the greater ease with which gasoline can be made the installation used for benzene-toluene production will have double the capacity when used for conversion of heavy oil into gasoline. The duration of the gasoline reaction is less than half that required for the benzene-toluene reaction if the same size and length of tubes be used. It is manifest, therefore, that by introducing twice the volume of oil to be converted, the effect will be the same as decreasing the time factor by one-half.

The installation if used solely for gasoline production can be materially changed in many respects. The expensive carbon receptacles can be done away with, and the height of the furnaces above the ground materially reduced, thus lowering the cost of furnace construction. With the knowledge that has been gained of the nature