TABLE 6. TYPICAL GAS ANALYSES
Constituents of Gas—Percent by Volume

No.	Type	Source	CO_2	O_2	N_2	CO	H_2	CH_4	C_2H_6	C_2H_4	C_4H_{10}		Specific Gravity[a]	Btu per Cu Ft[a] Gross	Net
1	Natural gas	Typical	..	..	0.8	..	..	83.4	15.8	..	0.5	..	0.61	1129	1021
2	Propane	Commercial (natural gas)	..	..	..	..	..	..	2.2	97.3	0.8	C_3H_8 24.3	1.55	2558	2358
3	Propane	Commercial (refinery gas)	..	..	..	..	..	..	2.0	72.9	94.0[b]		1.77	2504	2316
4	Butane	Commercial (natural gas)	..	..	..	..	..	..	..	6.0	66.7[b]	C_4H_8 28.3	2.04	3210	2961
5	Butane	Commercial (refinery gas)	..	..	..	..	..	..	..	5.0	17.2	Air 82.8	2.00	3184	2935
6	Butane-air		..	..	..	..	..	..	..	..	..		1.16	550	516
								(Illuminants)							
7	Reformed natural	Straight shot generator	2.1	0.3	1.5	13.6	48.3	33.0	..	..	1.2	..	0.41	559	497
8	Refinery oil	Vapor phase crack	0.2	0.2	0.5	1.2	13.1	23.3	21.9	..	39.6	..	0.89	1475	1351
9	Oil gas	Portland, Ore.	1.2	0.5	2.4	7.7	54.2	30.1	..	..	3.9	..	0.37	570	510
10	Coal gas	Contin. Vert.	3.0	0.2	4.4	10.9	54.5	24.2	..	..	2.8	..	0.42	532	477
11	Coke oven gas	By-product	2.0	0.03	4.8	5.5	51.9	32.3	..	..	3.2	..	0.40	569	509
12	Producer gas	Bituminous	4.5	0.6	50.9	27.0	14.0	3.0	..	..	..	..	0.86	163	153
13	Blast furnace gas		11.5	..	60.0	27.5	1.0	..	..	..	..	..	1.02	92	92
14	Blue gas	Bituminous	5.5	0.9	27.6	28	32.5	4.6	..	..	0.7	..	0.70	260	239
15	Carburetted water gas	Heavy oil with blow run	6.0	0.9	12.4	26.8	32.2	13.5	..	..	8.2	..	0.66	530	451
16	Carburetted water gas	High Btu	0.7	0.3	5.8	11.7	28.0	36.1	..	..	17.4	..	0.63	840	770
17	Mixed Gas	Natural, Blue, Producer, Reformed Natural	3.9	0.1	15.5	10.3	17.8	46.9	5.4	0.1	..	..	0.63	650	586
18	Mixed Gas	Coal, Natural	1.1	0.4	6.6	4.0	35.8	45.7	4.6	..	Ill.	..	0.46	700	627
19	Mixed Gas	Natural, Coke Oven	1.0	0.2	5.5	2.0	20.9	66.6	2.6	..	1.8 Ill.	..	0.52	802	721
20	Sewage Gas	Decatur, Ill.	22.0	..	6.0	..	2.0	68.0	..	..	1.2 ..	..	0.79	690	621

This table abstracted from *Gaseous Fuels, American Gas Association*, and from *A.G.A. Laboratories* Data.
[a] At 60F and 30 in. mercury, absolute pressure.

foot of gas saturated with water vapor and measured at 60 F and 30 in. of mercury, with air at the same temperature and pressure. Products of combustion are cooled to the initial temperature of the gas and air and the water formed by combustion of free and combined hydrogen is condensed to the liquid state.

Classification of Gases

Representative properties of gaseous fuels commonly employed for domestic heating processes are shown in Table 6.

Natural gas contains from 55 to 98 percent methane with various percentages of higher hydrocarbons, chiefly ethane. In addition to these components, small quantities of non-combustible gases such as carbon dioxide, nitrogen, and helium are sometimes present. Percentages of the different components vary with the area from which natural gas is withdrawn. They may even vary slightly from any given well during its lifetime but these variations are inconsequential insofar as the utilization of the gas is concerned. Heating values of natural gases vary from 900 to 1400 Btu per cu ft but the usual range for use is from 1000 to 1050 Btu (gross) per cu ft. A typical analysis is given in Table 6.

Manufactured gases commonly produced are listed in Table 6. Gross, or higher, calorific values of typical send-out gases made from these manufactured gases generally range from 500 to 600 Btu per cu ft. Due largely to the greatly increased demand for city gases the tendency during recent years has been to increase rather than to decrease heat content of manufactured gases, thus making it possible to serve more customers through the existing distribution system.

Mixed gases are a result of increased distribution of natural gas, through transcontinental transmission lines, into areas having existing manufactured gas facilities. In such instances some gas companies supply a 600 to 800 Btu mixture (See Table 6). In some territories these mixtures are distributed as an intermediate step in changing over from manufactured gas to natural gas. Although the burden of adjusting installed heating and air conditioning equipment and supplying new orifices and burner equipment is generally assumed by the gas companies when the gas is changed, it is advisable to consult the local gas company to insure that equipment is provided with proper orifices and burners when installed.

Most states enforce legislation through their public service commissions to require delivery of a gas of specified average or minimum heating value within their respective limits. Any given heating value within reason fortunately may be maintained and yet permit considerable latitude in the composition of the gas distributed. Hence the constituents of city gases are not necessarily the same in different districts nor even at successive stations in the same district. In every community, however, the objective is to maintain variations in composition and gas pressure within limits which will provide satisfactory operation and performance of all common types of gas burning equipment.

Liquefied petroleum gases, such as propane and butane or mixtures thereof have calorific values ranging from 2500 to 3200 Btu per cu ft. These fuels are often supplied as liquids under pressure in tanks or bottles. In such cases the liquid evaporates when pressure is relieved, the heat necessary for vaporization being obtained from the surrounding air or ground. As butane boils at 32 F some provision is necessary, for maintaining the gas above this temperature or for lowering the partial pressure by dilution