

Lignite coal is used varying in price from \$1.50 per ton to \$2.30 delivered, the proximate analysis being: Moisture, 18.1 per cent.; volatile, 33.3 per cent.; fixed carbon, 41.3 per cent.; ash, 7.3 per cent.; calorific value per pound as fired, 9,160 B.t.u.

The gas generated contains a net heat value of 115 to 120 B.t.u. per cu. ft. To assist the producer operators, a recording gas calorimeter is connected to the gas main.

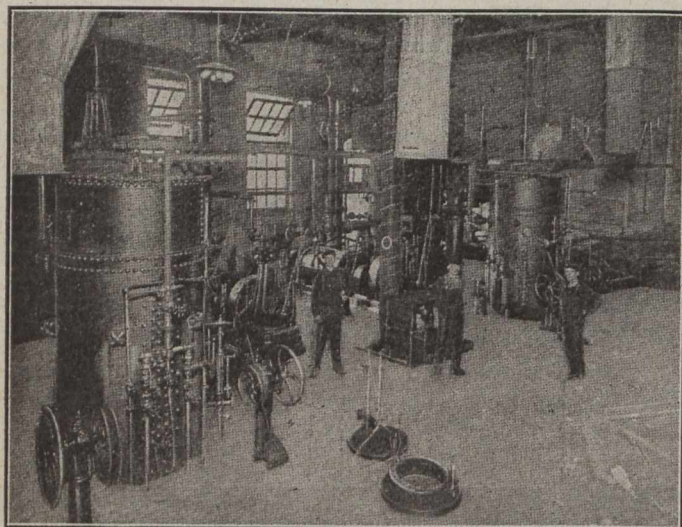


Fig. 2.—View of Gas-producer Room.

The gas contains no tar, is practically free from dust, and is delivered to the engine at 3 in. water pressure.

It was found that owing to the high piston speed a cylinder oil having a higher viscosity than that used on

the piston rods gave the best results. Tests of the oil gave the following readings:—

	Flash Point.	Fire Point.	Viscosity (Saybolt).	Specific Gravity, Baume.
Heavy cylinder oil	485 deg.	545 deg.	206 @ 210	21.9
Light piston-rod oil ....	415 deg.	463 deg.	56 @ 210	25.7

The operating force consists of two engine operators, three producer operators and three producer cleaners and coal handlers, all on 8-hour shifts.

During the first two years it was impossible to get more than half-load out of the engine and considerable trouble was experienced with scored cylinders and pistons. It was finally decided to re-bore the cylinders, put in hard-metal liners and fix the plant up in the best possible condition, also to purchase an additional set of gas producers of larger capacity than the first set installed. After the plant was again put in service, a close watch was kept on its operation and costs and its troubles and defects were gradually overcome.

Daily report sheets are kept of the producer and engine operation, and an hourly kilowatt reading is taken. The actual operation and maintenance costs for the past two years were as given in the accompanying table.

## BEHIND THE GERMAN TRENCHES.

SCARCELY any German or Austrian technical journals are now allowed to enter Switzerland or any other neutral country, despite their being severely censored before going to press. Needless to say, no publications are more strictly watched than those dealing with engineering. Nevertheless, the Swiss correspondent of *The Engineer*, of London, Eng., has been able to obtain some news both from Germany and also from Austria concerning what is being done or contemplated there in engineering circles.

The most important project, he reports, the realization of which seems now certain, is the construction within a short time of a waterway, navigable for vessels of considerable size and tonnage, from the Danube to the Main and the Rhine. Once this was accomplished there would inevitably arise the questions of the necessity of a connection with the Elbe or the Weser, of making the Danube navigable as far as Ulm, and then connecting with the Lake of Constance, as far as which the Rhine would be canalized. One of the great objects of the Germans in carrying out this project would be, as they frankly admit, to become more independent of England as regards communications, and to divert the great stream of traffic eastwards. Moreover, the Danube-Main-Rhine canal would further that much-caressed idea, "Central Europe," the union of the Central European States, industrially, politically, and economically.

Apparently Bavaria also, whether with or without prisoners of war labor it is impossible to ascertain, has so far advanced in the utilization of her various lakes and other water-power that she hopes at the end of the indefinite period known as "within measurable distance of the conclusion of peace," all the sources of water-power in the kingdom will be available for the generation of electricity. The Rhine-Danube canal, however, is an undertaking of such magnitude as to throw entirely into the shade the utilization of Bavarian water-power for

## Operating Costs, January 1, 1914, to December 31, 1915.

	Jan. 1, 1914, to Dec. 31, 1914.		Jan. 1, 1915, to Dec. 31, 1915.	
	Total Costs.	Cost per Kw.-Hr., C.	Total Costs.	Cost per Kw.-Hr., C.
Coal and coke .....	\$11,019.76	0.328	\$ 9,312.32	0.299
Coal and coke handling, firing, cleaning producers .....	1,683.31	0.050	2,524.28	0.081
Firing producers' wages .....	2,553.23	0.076	1,229.93	0.039
Stores, waste, oil, etc. ....	1,237.54	0.074	2,302.21	0.074
Water for engine and producers .....	321.51	0.010	295.01	0.009
Engine-room wages .....	7,525.43	0.224	6,129.81	0.199
Salaries and administration .....	1,795.35	0.052	1,243.71	0.040
Insurance .....	57.40	0.002	.....	.....
Debenture interest and sinking fund.	17,535.47	0.523	17,582.23	0.568
Cleaning producers. ....	1,237.54	0.037	891.68	0.028
Repairs and maintenance:				
Buildings. ....	207.64	0.006	410.13	0.013
Gas engine and auxiliaries. ....	7,661.55	0.229	2,475.73	0.079
Producers .....	2,347.29	0.070	2,317.65	0.074
Generator, switchboard and lighting	222.31	0.007	316.41	0.010
	\$56,628.09	1.688	\$47,031.10	1.513
Hours operated .....	5,408.00	....	4,911.35	....
Kilowatt-hours generated .....	33,545.70	....	31,058.00	....
Pounds of coal .....	100,850.05	....	87,474.95	....
Pounds of coal per kilowatt-hour ....	3.06	....	2.81	....