

# PRACTICAL HEAT

## PART II

TERRELL CROFT, EDITOR

CONSULTING ENGINEER. DIRECTING ENGINEER, TERRELL CROFT ENGINEERING CO.  
MEMBER OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.  
MEMBER OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.  
MEMBER OF THE AMERICAN SOCIETY FOR TESTING MATERIALS.  
MEMBER OF THE ILLUMINATING ENGINEERING SOCIETY.

FIRST EDITION  
SIXTH IMPRESSION

McGRAW-HILL BOOK COMPANY, INC.  
NEW YORK: 370 SEVENTH AVENUE  
LONDON: 6 & 8 BOUVERIE ST., E. C. 4

NOTE.—AN UPDRAFT SUCTION PRODUCER-GAS POWER PLANT is illustrated in Fig. 461. The coal is fed into the top of the generator, *G*. Air which was heated in the preheater, *P*, enters the generator at its bottom. When this air comes in contact with the lower part of the fuel bed, carbon dioxide (Sec. 465) is formed. The burning of the coal to carbon dioxide supplies sufficient heat to keep the process going. As the carbon dioxide rises through the fuel bed it is reduced to carbon monoxide, which is, ordinarily, the principal combustible constituent of producer gas. Sometimes water is admitted to the generator, which, when contacting with the carbon at temperatures above 1,600° F. forms hydrogen gas and carbon monoxide ( $H_2O + C = H_2 + CO$ ). This water, which is supplied in the form of steam, also tends to prevent clinkering. The gases which are thus formed in the generator, *G*, pass into the preheater, *P*. The hot gases give up a part of their heat in preheating the air which is supplied to *G*.

From the preheater, the gases pass through the boiler, *B*, where the steam which is admitted to the generator is formed. From *B*, the gases are piped to the scrubber, *S*. The scrubber contains wet coke. As the gases pass through the scrubber, the dust, ammonia, and tarry volatile substances are removed. A storage tank or receiver, *R*, receives the gases which come from the scrubber. The purpose of the receiver, *R*, is to prevent a sudden rush of gas through the apparatus when the gas engine, *E*, is sucking a charge, and a sudden halting of the gas flow after the admission valve is closed. The producer gas is drawn from *R* into

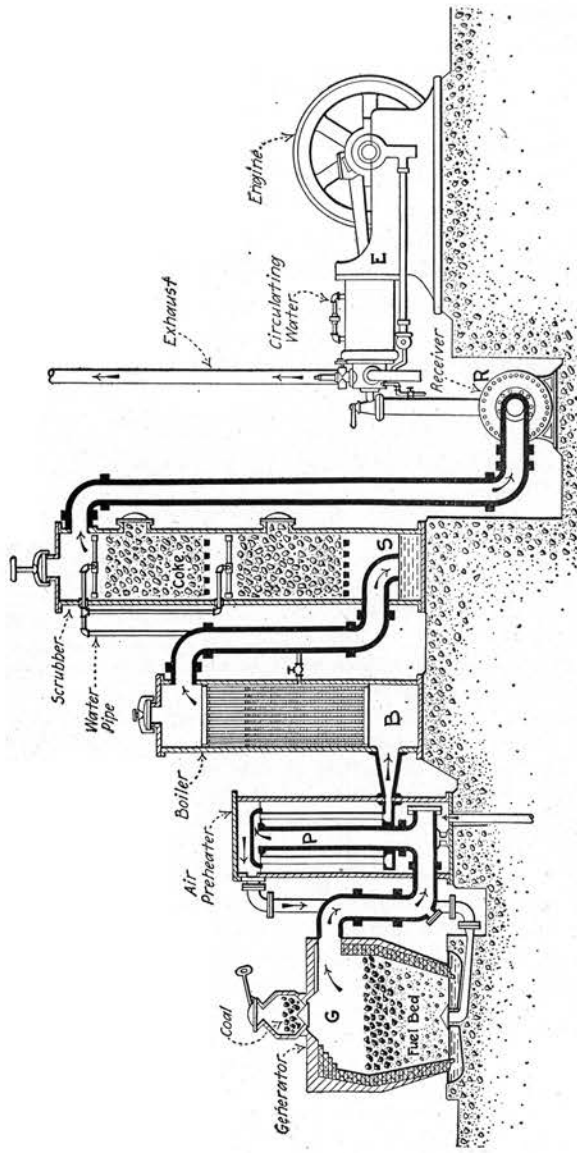


Fig. 461.—Sectional view of a typical updraft suction-producer gas-power plant

the engine, *E*, wherein it is mixed with air, and burned. The heat thus given up drives the engine (Sec. 530). The burned gases are exhausted into the atmosphere through the engine exhaust. A heat-balance chart for a producer-gas power plant is shown in Fig. 462.

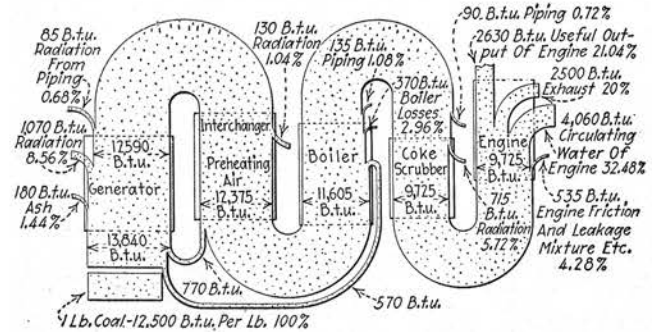


Fig. 462.—Heat balance diagram of a typical producer-gas power plant. The percentage values are given in terms of the total heat energy liberated by the combustion of 1 lb. of coal.

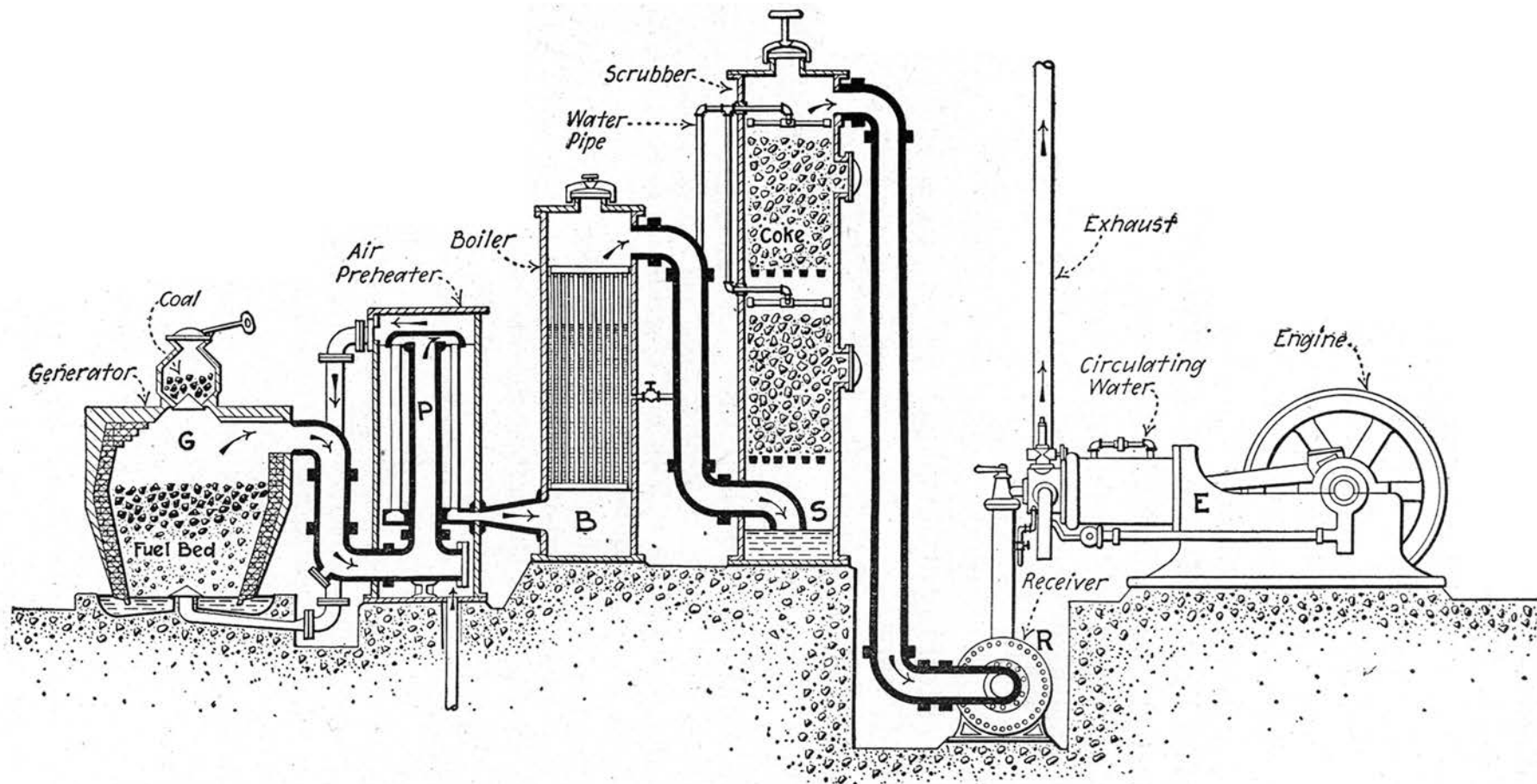


FIG. 461.—Sectional view of a typical updraft suction-producer gas-power plant

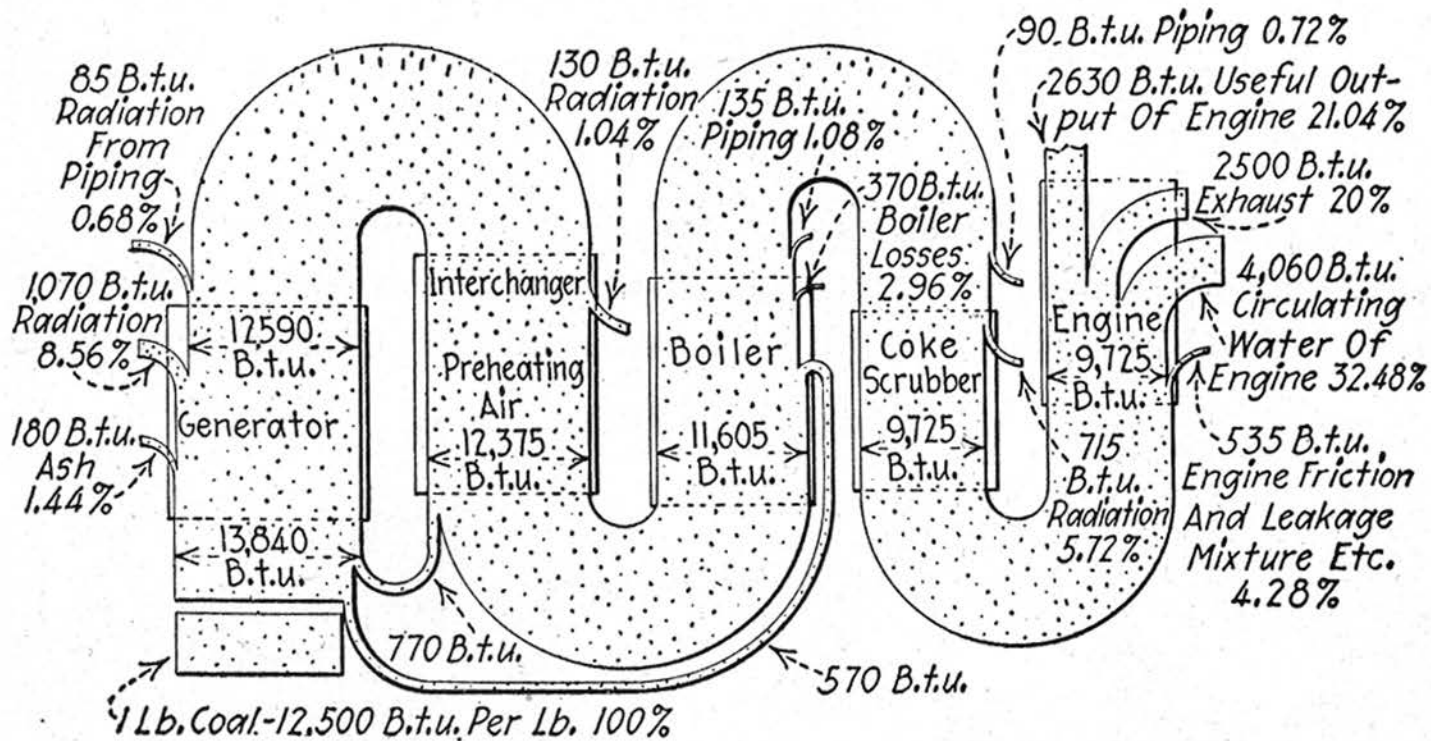


FIG. 462.—Heat balance diagram of a typical producer-gas power plant. The percentage values are given in terms of the total heat energy liberated by the combustion of 1 lb. of coal.