

COAL GASIFICATION - SELECTED ABSTRACTS AND TITLES

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FOREWORD

Recent "energy crises", concerns over secure future supplies of gaseous and liquid fuels, and greater recognition of the abundance of coal in North America are serving to direct increasing attention to the gasification of coal. Technology for producing a variety of fuel gases as well as feedstock for petrochemical operations, including production of synthetic liquid hydrocarbons, is for the most part well established through commercial coal gasification schemes in other countries. Indeed, the events of the past three or four years are now beginning to make similar schemes economically feasible in Canada and the United States.

Real difficulties are, however, commonly experienced in gaining access to much of the voluminous scientific and technical literature on coal gasification - especially material published before 1971. This material is not usually encompassed by currently active information services. We have therefore thought it timely to compile a collection of abstracts covering the period to 1970, and present it with the hope that it will assist individuals and agencies with active or developing interests in coal gasification.

The work is divided into three volumes. Volume 1 deals with gasification of unmined coal, i.e. in situ gasification. Volume 2 contains abstracts of literature pertaining to gasification of mined coal. Volume 3 concerns itself with gasification of peat, lignite and carbonaceous solids not classifiable as coals.

We are indebted to Dr. N. Berkowitz, Head of the Fuel Sciences Division of the Alberta Research Council, for his advice and encouragement throughout the preparation of this work.

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VOLUME 3

GASIFICATION OF PEAT, LIGNITE AND SIMILIAR CARBONACEOUS MATERIALS

0001

THE WESTWALDER LIGNITES AND THEIR USES FOR GASIFICATION

H. Raupp

J. Gasbel, 51, 401 (1908)Chem. Zentr., 11, 650 (1908)

The author describes the use of lignites as gasification fuels and shows that 100 kg. of this material yield 28.10 cu. m. gas, 45.78 kg. coke, 9.06 kg. tar and 0.20 kg. ammonia. The gas contains very little hydrogen sulphide, but owing to the carbon dioxide content, has only a low calorific value. The author states that it is not the purpose to have the lignite take the place of the usual coal but believes that lignite may be mixed with coal (up to a certain percentage) without lowering the quality of the gas produced.

0002

PRODUCTION OF GAS AND AMMONIA FROM MOIST PEAT

A. H. Lynn

British Patent, 17,074, July 22, 1909

Producing gas and ammonia from moist peat is accomplished by burning a portion of the moist peat, or of the gas produced from it, and utilizing the heat thus generated to superheat the blast of air and steam supplied to a producer fed with the moist peat.

0003

INVESTIGATIONS OF LIGNITE COAL RELATIVE TO THE PRODUCTION OF GAS AND BRIQUETS

E. J. Babcock

Univ. of North Dakota, School of Mines and Experimental Station, Report, 1910

The occurrence, supply, character, methods of using and comparative efficiency of North Dakota lignites are discussed and illustrated descriptions of an experimental gas and briquetting plant are given. Yields of about 9,000 cu. ft. of purified gas of approximately 500 B.t.u. were obtained with 20-40 pounds of tar and 14.5-15 pounds of ammonium sulphate. The briquets obtained were harder than standard bituminous coal and had a calorific value of 11500-12000 B.t.u. per pound.

0004

PRODUCTION OF PEAT GAS

J. D. Oligny

United States Patent, 977,469, December 6, 1910

The invention describes making peat gas by crushing natural moist peat while sprinkling it with petroleum oil to produce a pulpy mass and subjecting it to intense heat. Air is injected by forced draft to mingle with the gas from the peat during the coking, and the air-laden gas is passed through liquid tar. The by-products are withdrawn by condensation and the gas is collected.

0005

LIGNITE AS A SOURCE FOR GAS SUPPLY

Anon

Braunkohle, March 17, 1911

Progressive Age, 28, 482 (1911)

The use of lignite for generation of gas for power purposes is discussed. Suction gas plants are especially suitable and the generated gas has about the same calorific value as coke producer gas.

0006

DRYING PEAT FOR USE IN A PRODUCER GAS INSTALLATION

D. Civita

British Patent, 17,436, July 31, 1911

The invention describes the drying of peat for use in a producer gas installation by subjecting it, after a partial drying by pressure, or by comminution and storage, to a current of hot gases, which may be obtained by combustion of the producer gas, and are mixed with air. The freshly dug peat is broken in a Kraus machine, partly dried and spread in lumps about the size of a fist on wire-gauze trays in trucks. These trucks are passed through brickwork tunnels of cross-section slightly larger than that of the trucks, and are treated at one end of the chamber or tunnel with a mixture of hot air and products of combustion at a temperature of about 1050°.

0007

PROCESS FOR UTILIZING PEAT FOR THE PRODUCTION OF AMMONIA AND FUEL
 N. Testrup, T. Rigby and O. Soderlund
 British Patent, 17,610, August 3, 1911

A process for utilizing peat for the production of ammonia and fuel consists in subjecting the peat to "wet carbonization", removing the bulk of its accompanying liquid matter by internally transmitted pressure, as in a filter press, and then removing more water by externally applied pressure. This further quantity of water may alternatively be removed by a waste-heat drying method employing hot products of combustion from the apparatus employed in the process. The peat thus partly dried is used in gas producers adapted for ammonia recovery, such as will supply the fuel needs of the process.

0008

LIGNITE AS FUEL FOR GAS PRODUCERS
 G. W. Muench
 Power, 38, 366 (1912)

The results of analyses of the fuel and gas are reported. Producers were successfully operated with lignite fuel which varied in heat value from 6000 to 10000 B.t.u. per pound.

0009

GASIFICATION OF PEAT
 A. Wihtol
 Feuerungstechnik, 1, 124 (1912)

The several processes of gasifying peat are reviewed.

0010

GASIFICATION OF WET PEAT IN THE "GLEICHSTROMGENERATOR"
 A. Wihtol
 Feuerungstechnik, 1, 374 (1912)

The author gives some considerations governing the design and operation of gas producers using peat as fuel, and particulars regarding the operation of two "Gleichstrom" producers (in which the gas and fuel travel in the same direction, these being particularly suitable for peat), the one operating on peat containing 45.54% water and the other using peat with 23.8% water. For each case, analyses of the gas obtained and balance sheets of the operations are given. These balance sheets show that the peat with 45.54% water gave a power gas containing about 50%

oxidized carbon as carbon dioxide. An efficiency of 74.5% was calculated and the efficiency actually obtained was 75%. The peat with 23.8% water produced a gas containing 44% of the oxidized carbon as carbon dioxide and calculations indicated the efficiency to be 82.3%, compared with 80.9% actually obtained.

0011

PREPARING PEAT

Wet Carbonizing Ltd.

British Patent, 18,030, May 10, 1913

In processes for heating peat, with or without the use of acids or other auxiliary means, and subsequently removing water, the latter operation is effected in filter presses at temperatures of 60° and over, and part of the hot effluent is mixed with raw peat, from which some of the natural water may be first removed by draining, air-drying or pressing. The percentages of water before and after addition of the effluent may be 85 to 94-95%, respectively. A suitable apparatus is described.

0012

PROCESS OF PRODUCING GAS FROM BITUMINOUS FUEL

O. C. Berry

United States Patent, 1,116,216, November 3, 1914

A process for manufacturing producer gas from bituminous fuel is outlined, which consists in maintaining, in that part of the producer immediately above the highest point passed through by the finished gas, in the recirculating type of producer, a temperature sufficient to distill all of the tarry vapors from the fuel. This is accomplished by drawing a sufficiently large portion of the hot finished producer gas from below up through the body of fuel, while heat is conducted or radiated to this part. The gas is then returned, along with the distilled tarry vapors and unmixed with air, into the producer immediately below, or in the combustion of the fuel column

0013

GASIFYING PEAT

T. Rigby

British Patent, 16,918, July 16, 1914

In gasifying mixtures containing or consisting of peat in different conditions, the moisture content of the mixture is maintained approximately constant by controlling the proportions of the constituents of the mixture.

0014

GAS FROM PEAT

G. A. Brender and A. Brandis

J. Gas Lighting, 132, 94 (1915)

Experiments were made upon two sorts of peat (heavy lumps and small lumps) in a horizontal retort. The gas had gross calorific value of only 366 B.t.u. Roughly 17,500 cu. ft. of such gas were produced per metric tons of peat as well as 0.402 tons of wet coke of poor quality. It was found that the most practical way of carbonizing peat was to mix it with 80-90% English gas coal. This increased the yield of gas from 10,000 cu. ft. per ton for 100% coal to 12,700 cu. ft. for 80% coal and 20%peat. The quality of the coke was fairly good in this case, and the calorific value of the gas was hardly affected.

0015

TREATING PEAT

E. A. Patterson

British Patent, 12,003, August 19, 1915

Peat is prepared for use as fuel or for destructive distillation by removing part of the water by heat, pressure, or other means, neutralizing the contained acids by the addition of alkaline material, disintegrating the product, and adding 1-3% of an alkali metal silicate, and finally molding and drying the material.

0016

OBTAINING GAS AND BY-PRODUCTS FROM PEAT

T. Rigby

United States Patent, 1,143,319, June 15, 1915

Primary distillation and decarbonization are carried out in separate, successive steps, the gases from the former being passed through a condensing coil for recovery of waxy substances produced by the distillation while the gases from the decarbonization of the solid residue are separately treated for the recovery of ammonia.

0017

GAS PRODUCER TESTS WITH CANADIAN LIGNITE

Anon

Bull. Imp. Inst., 14, 119 (1916)

Tests were carried out on six samples of lignite and in every case it was found that they were suitable for gas production. In some cases enough nitrogen was present to make its recovery as ammonia profitable. It was found that the lignites required a specially large combustion chamber and brick ignition arch, arranged so as to burn the large proportion of volatile matter present.

0018

TREATING PEAT

Wet Carbonizing Limited

Dutch Patent, 1,716, November 15, 1916

The pulp obtained from the wet carbonization of peat is dehydrated in two stages. In the first stage it is treated as a slurry, and in the second stage it is treated as a solid.

0019

CARBONIZING PEAT, ETC.

C. Whitfield

British Patent, 106,121, May 6, 1916

An apparatus is described for carbonizing peat, sewage sludge, seaweed, sawdust, and the like. The equipment is of the type in which the material is passed down through a carbonizing chamber from tray to tray while being heated by direct contact with combustion products which are passed through the chamber. The gaseous products may be used as gaseous fuel and a suitable plant is specified.

0020

SARDINIAN LIGNITES IN GAS MANUFACTURE

A. Pacchioni

Bull. Assoc. Ital. Ind. Gas e Acqu; Gas J., 137, 467 (1917)

The composition of gas from Caput-Acquas lignite is given as carbon dioxide (nil), carbon monoxide (14.8), hydrogen (31.7), methane (42.4) and nitrogen (2.9%); while the yield of benzene and its homologues is 2 gallons per ton. The sulphur content of these lignites is high (8.23%) and special methods must be used in distillation to purify the gas.

0021

GAS FROM PEAT, BROWN COAL OR WOOD

C. O. Rasmussen

Danish Patent, 22,292, July 23, 1917

Gas is passed through closed retorts along with materials consisting mostly of carbon, heated to incandescence, together with water vapor mixed with hydrocarbons or fuel oil, and the final product is mixed with coal gas.

0022

GAS FROM PEAT, BROWN COAL OR WOOD

C. O. Rasmussen

Danish Patent, 22,582, November 12, 1917

The gaseous products of distillation are passed over incandescent coal, with the resulting reduction and decomposition of the contained water.

0023

GAS AND FERTILIZER FROM LIGNITE AND PHOSPHATE ROCK

A. F. Delacourt

United States Patent, 1,269,795, June 18, 1918

A combustible gas and a residue suitable for use as a fertilizer are formed by heating together a mixture of lignite and phosphate rock in such proportions that the ash of the lignite will form a slag with the phosphate rock which will fix most of the sulphur dioxide produced.

0024

GASIFICATION OF LIGNITES

J. B. C. Kershaw

Gas J., 143, 439 (1918)Engineer, 126, 133 (1918)

Writing on the subject of the use of lignites, bagasse, and wood waste for power generation and other purposes, the author states that lignite suitable for low-temperature distillation is characterized by a high content of bituminous matter. In the absence of this bitumen, the fuel is not adapted for the retort process, and is only suitable for direct burning. The two classes of lignite can be roughly distinguished by observing closely the changes that occur on heating, and by comparing the specific gravities of the samples. Lignites suitable for subjection to the retort process melt or soften before ignition and burn with a smoky flame. In Germany, the distillation of lignite is carried on at Halle and Messel in vertical retorts. In the upper part of the retort, the lignite is dried and part of the steam produced is reintroduced into the retort further down so as to keep the temperature at the required low limit. At Denver, in a plant erected for the production of briquets and by-products from the Colorado lignites, the retorts are 36 ft. long, 9 ft. high, and 1.1/2 ft. wide. The charging period is 2.1/2 hours and the temperature limit is 500°. The average yield is 10,000 cu. ft. of gas, 13 gallons tar oils, and 2 1/2 lbs. ammonium sulphate per ton. The gas is used for heating the retorts, as well as for steam generation. The author notes that many lignites are too poor in their content of bituminous matter to render distillation profitable, and this accounts for some of the past failures that have occurred with plants erected for this purpose. Lignites of this type, however, are quite suitable for gasification, without attempting to recover the tar or ammonia. In New Zealand, the use of lignite producer gas for power production is common, the natural moisture content rendering it possible to work the producers without steam. Producers of this type, in which the upper part is used as a gas-retort and the lower part as an ordinary producer, have been employed with success in Germany and Austria for peat and lignite gasification.

0025

WOOD AND PEAT FOR GAS MAKING

E. Ott

Gas World, 68, 41 (1918)

Wood and peat, after partial drying, will yield a gas of 336-416 B.t.u., or after removing the carbon dioxide, 450-560 B.t.u. The high carbon dioxide content is the result of oxygen contained in the fuel, but high temperature carbonization tends to minimize its formation. To improve the product for the consumer, a rich gas might be added; coal gas and oil being scarce, acetylene seems the most practical. About 15 volumes to 100 of poor gas would be sufficient, and the spent carbide from the acetylene production would easily form a source of milk of lime to remove carbon dioxide from the poor gas. Without enrichment wood- or peat-gas may be burned with little or no primary air. Wood-gas liquors contain practically no ammonia but approximately 1% acetic acid; peat usually gives an alkaline liquor. Tars from both contain from 30 to 50% of water, are poor in benzene and toluene, but rich in Phenols. Wood tars tend to produce stoppages; the heavier woods work best.

0026

MANUFACTURE OF GAS FROM WOOD AND PEAT

E. Ott

Het Gas, 38, 103 (1918)

Wood and peat differ from coal and crude oil in the high moisture content (in peat sometimes as high as 90%), and for making gas, they should be at least as dry as ordinary air (about 20% moisture). Consisting mostly of cellulose and lignite, wood and peat have a high oxygen content and low calorific value. Most of the oxygen is expelled as carbon dioxide and carbon monoxide, so that the gas contains 20 to 30% of each of these constituents, but it contains only about 15% methane and 5% heavy hydrocarbons. However, better results can be obtained simply by distilling well dried material in horizontal or inclined in retorts not more than half filled. If each charge is drenched with tar from preceding charges, the yield of hydrocarbons is somewhat increased.

0027

RETORTING UNDER PRESSURE PROMISES A MEANS OF UTILIZING LIGNITE FOR GAS MAKING

F. Schoch

Am. Gas Eng. J., 109, 102 (1918)Gas World, 69, 115 (1918)

When subjected to heat in the ordinary coke-oven procedure lignite yields a gas of only about 300 B.t.u. per cu. ft.; application of pressure, however, should give a gas of higher calorific value. This is readily seen from the reaction of carbon and hydrogen to form methane. Another factor that affects the formation of hydrocarbons is the relation between the time required for the reaction and the rate at which each portion of coal is heated in the retort. If the coal is heated rapidly throughout, it will undergo reactions which it could not undergo if heated slowly, because the coal yields many substances capable of reacting at high temperatures, which however, with slow heating, will have been removed before the desired high temperatures are reached. A third formation factor is the passage of gaseous products through hot layers of coal of different composition from the layers in which they were formed. The author believes that this action ought to be brought into play more extensively, for instance, by a long-continued dropping-back of condensed products upon the hot mass from which it was formed. An electrically heated autoclave and gasometer have been designed with which it is proposed to gasify samples of lignite coal at temperatures of from 300 to 1000°, and pressures of from 100 to 300 lbs. The experimental apparatus and its operation are described in detail.

0028

PRODUCTION OF GAS FROM LIGNITE

K. Bunte

J. Gasbel., 62, 34 (1919)

The results of gas-making tests with Hungarian "Totis" lignite carried out in 1909 are described. The air-dried lignite contained 10.58% moisture, 9.88% ash, and 79.54% of combustible matter with the following composition: carbon 72.93, hydrogen 5.98, oxygen 16.27, nitrogen 1.12 and sulphur 3.70%. Each retort received a charge of 120 kg., and the distillation was continued for four hours at 1200 to 1250°F. The yield of gas per 100 kg. of lignite was 38.8 cu. m. at 1200 to 1220° and 40.0 cu. m. at 1220 to 1240°, or excluding carbon dioxide, 34.1 and 35.2 cu. m., respectively. After the usual cooling, washing and purifying, the gas obtained at 1215° had the following composition: carbon dioxide 12.6, C_2H_4 4.0, carbon monoxide 14.1 hydrogen 45.2, methane 23.5 and nitrogen 0.6%. After purification with soda-lime the yield per 100 kg. of coal was 34.3 cu. m., with specific gravity 0.460, gross calorific power 5950 calories and illuminating power 11.8. After purification the gas still contained, per 100 cu. m., 220 g. of sulphur in the form of carbon disulphide and organic compounds. Even after further purification with lime the sulphur could not be reduced below 188 g. per 100 cu. m., although wood charcoal reduced it to 40 g. On this account the gas was unsuitable for use, but it is suggested that other kinds of lignite containing less sulphur might prove satisfactory in this respect. The residue in the retort averaged 45.5 kg. from 100 kg. of lignite. It was a gray pulverulent mass which required forced draught for burning. The tar (average yield 4.64%) was fluid and had a specific gravity of 1.19. On distillation 25.9% distilled between 170 and 270° and 15.6% above 270°, while the yield of pitch was 58.5%. There was also obtained 1417 kg. of gas liquor containing 1.18% ammonia, the total yield of ammonia being 228 g. per 100 kg. of lignite; cyanogen (45 g. hydrogen cyanide per 100 kg.) was also separated. Preliminary drying would be necessary to render many kinds of lignite suitable for distillation.

0029

MANUFACTURE OF GAS FROM WOOD AND PEAT

E. Ott

Gas J., 146, 83 (1919)

Suggestions are made for raising the calorific value of the gas, which is low on account of the high percentage of carbon dioxide, from 3400 to 4000 calories per cu. m.

0030

THE GASIFICATION OF LIGNITE IN MODERN REVOLVING GRATE PRODUCERS

K. Neumann

Stahl u. Eisen, 39, 1233 (1919)

Two producers were used operating under different conditions with air-steam blast operated by a fan or injectors. The different tests are discussed in detail with tabulated results. In general the fan-driven blast seems superior to the injector method.

0031

GAS FROM BROWN COAL

K. Weichtmann

Het Gas, 39, 30 (1919)

Following the author's method, it is possible to produce a gas of the following composition: hydrogen 53.9 (% by volume), methane 12.8, heavy hydrocarbons 0.5, carbon monoxide 13.7, oxygen 0.5, carbon dioxide 7.8, nitrogen 10.8, and combustion value 3363 kg. cal. per cu. m.

0032

PRODUCER GAS FROM PEAT

Anon

Am. Gas Eng. J., 113, 225 (1920)

Tests carried out by the Norwegian Moor Company, Norway, on a peat with 1.57% ash and 21.7 to 43% moisture, indicate that it is possible to obtain in producer gas about 75% of the calorific value of the peat, a figure much in excess of what can be obtained by direct combustion on a grate. Further, in the gas engine 20-25% of the heat value of the gas is utilized as against 10-15% in a steam engine. In the gas producer tests about 31 lb. of peat were consumed per horse power hour on a light load and about 2.5 lb. per horse power hour on a full load, these figures being exclusive of the fuel used in starting up and finishing the gas producer operation and that required for running the tar separator. As steam installations with peat-fired boilers consume about 4 lb. peat with 25% moisture per horse power hour, the utilization of peat in gas producers thus offers a 33% greater economy with the greater advantage of dealing with peat with up to 40% moisture. The gas from such a peat is quite suitable for gas engines, as its thermal value is about 100 B.t.u. per cu. ft. which can be increased to 150 when the producer works at full capacity. Moist peat gives a larger yield of tar owing to the lower temperature of gasification. Comparing peat with fuel oil, comparative amounts per kilowatt hour are 5 and 0.68 lb, respectively.

0033

PEAT AND WOOD FOR GAS MAKING

Anon

Gas J., 151, 341 (1920)

As regards percentage composition, peat gas and coal gas compare, respectively, as follows: carbon dioxide 20.77, 1.6; carbon monoxide 20.08, 9.6; benzene 0.34, 1.4; ethylene 0.95, 3.3; hydrogen 48.81, 49.6; nitrogen 1.02, 3.8; oxygen 0.5, 0; and calorific value 2500 kg. calories per cu. m., 4700 kg. calories per cu. m. Peat containing 40% of moisture, distilled at a high temperature, gives 17-20% of coke containing 30% ash. At one plant equal amounts of gas were obtained from equal weights of sawdust and coal; and, even allowing for the greater value of the by-products from coal gas, the wood gas showed a considerable saving per ton of material. Wood gas cannot be used alone in France, however, as the carbon monoxide content in gas has been fixed at 15%. It may be removed by lime either in scrubbers or purifiers but with a considerable increase in costs. Care must be taken also to mix wood gas with coal gas so that ammonia in the latter will neutralize the acetic acid in the former and form ammonium acetate. It has also been found that carbon dioxide in the wood gas forms ammonium carbonate with the ammonia in the coal gas, which compound produces a whitish deposit in heating apparatus and destroys the polish in lighting appliances and heating coils by oxidation.

0034

GASIFICATION OF LIGNITE AND WOOD

R. Geipert

J. Gasbel., 63, 792 (1920)

Comparisons are made between gas-coal, lignite and wood for the purpose of showing their relative worth for gasification purposes.

0035

WAR OPERATIONS AT ZURICH GAS WORKS

E. Ott

J. Gasbel., 62, 785 (1920)

The attempt to gasify peat was unsuccessful and was abandoned. Even good peat with as low as 5% ash and 40% moisture yielded a maximum of 25% gas, the heating value of which was under 3000 kg. calories, the carbon dioxide content about 25% by volume and the specific gravity 0.8. The yield of coke suitable for making briquets was about 25%, of tar 2% and ammonia 0.3%. Fuel requirements were about three times as high as for coking of coal. In ordinary retorts, in order to prevent explosions and to attain sufficiently high temperatures, coke was mixed with the peat in the proportion of about one part of peat to one or two parts coke. The removal of the carbon dioxide from the gas was too expensive; therefore it was allowed to remain and the gas enriched with acetylene.

0036

GASIFICATION OF LIGNITE AND LIGNITE-COAL MIXTURES

A. Viehoff and E. Czako

J. Gasbel., 63, 379 (1920)

Four lignites (Luckenau, Muchelin, Friedrich and Alexandria) were subjected to tests in retorts similarly to methods reported for gas-coal. The water content was about 50%, and this had a tendency to remove from the retorts the coating of graphite left from former coal gasification and to cause leakage so that it was necessary at intervals to coke a charge of coal to restore the graphite or to cement the retorts. About six hours was necessary to coke a charge of 100 kg. as compared with five hours for Saar coal. Characteristic features of lignite were shown by the continued high flow of gas over a long period and even an increase at the beginning of the second half of the coking period followed by a gradual reduction, and the almost immediate generation of a high percentage of hydrogen, sulphide, ammonia and carbon dioxide, followed by a rapid fall. The coke residue was of a fine, granular nature and had a heating value of 5856 calories. Mixtures of Ruhr coal with 20-50% of lignite were coked under the same conditions. The coke yield decreased with increased of lignite from 63% with 20% of lignite to 53.5% with 40%. Of these amounts from 20 to 50% passed through the coke fork. There was very little cohesion between the coke from the lignite and that from the coal, the quality being slightly better when sifted nut coal was used in the mixture instead of run-of-mine. The lignite portion of the coke was very inflammable and care had to be taken or it burst into flame unless thoroughly extinguished.

0037

LIGNITE FOR GAS MAKING

W. D. Wilcox

Gas Record, 18 (4), 11 (1920)

Lignite deposits in the United States are much more extensive and of considerably greater tonnage than bituminous coals. The great drawback to their carbonization is their high moisture content with the consequent lowering of temperature in the retorts and the generation of substantial amounts of carbon dioxide. It can be predried economically by utilizing the waste flue gases from the retorts and then carbonizing like bituminous coal, a gas of about 550 B.t.u. being obtained. The author has devised a method for making gas from lignite whereby the moisture and combined oxygen are used as vehicles for the conversion of the carbonaceous matter into gas. The apparatus is described in detail and produces a gas mixture with a calorific value of from 400 to 450 B.t.u. per cu. ft. One ton of North Dakota lignite will produce under such operations from 20,000 to 28,000 cu. ft. of gas and Wyoming sub-bituminous coal 35,000 to 38,000 cu. ft. The labor cost is thought to be much less than with the usual type of gas plant.