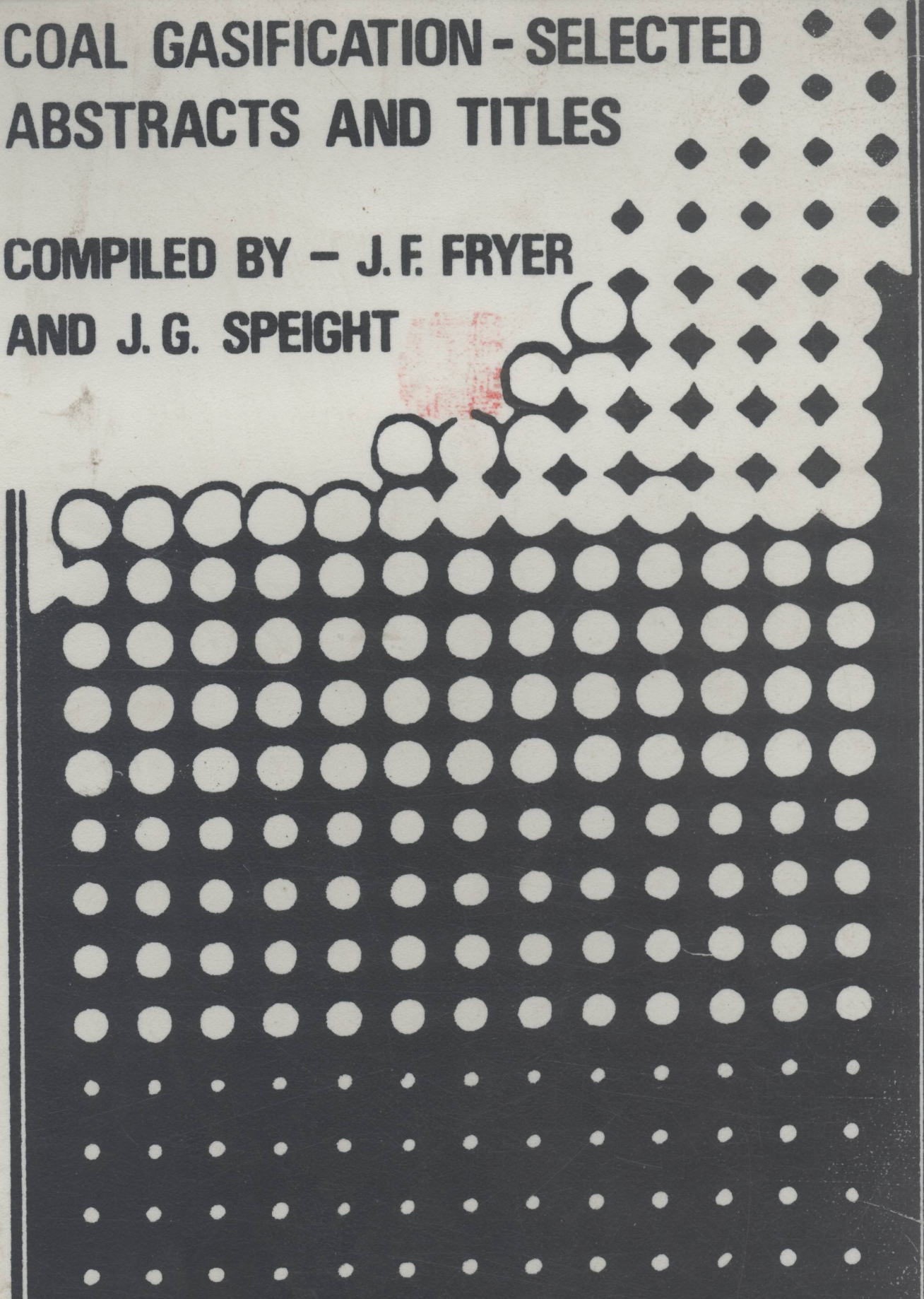
COAL GASIFICATION - SELECTED ABSTRACTS AND TITLES

COMPILED BY – J. F. FRYER
AND J. G. SPEIGHT



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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.

J. F. Fryer
J. G. Speight
Fuel Sciences Division
Alberta Research Council
Edmonton, Alberta, Canada

VOLUME I

GASIFICATION OF UNMINED COAL

0001

METHOD OF UTILIZING BURIED COAL
A. G. Betts
United States Patent, 947,608, January 25, 1910

The patent deals with gas production from unmined coal by conducting air into the remaining coal, after mining out part of a seam, and collecting the gases resulting from oxidation of the coal.

0002

SUBTERRANEAN GASIFICATION OF LIGNITES
L. Lanza
Rass. Min. 56 (1922)

An artificial subterranean system of galleries was constructed on an experimental scale, whereby the calorific value of the gases conducted through the system could be measured. The air was maintained at various temperatures and the relative rapidity and extent of combustion was measured for various coals. The results led to a classification in three groups: (1) anthracite and lithanthrax, which require relatively high temperatures for distillation and consequent combustion and which form a dense surface ash approximately 2 mm. thick, impeding further combustion; (2) lignites high in ash, which on drying form cracks which admit air, causing combustion to a depth of 2-20 mm. depending on the velocity of the air (if the velocity is high, the cinders fall and permit continued and progressive combustion); (3) purer lignites of lower ash from which, owing to their structure, the ash is easily detached and forms a maximum depth of 2-3 mm.

0003

GASIFICATION OF CARBONACEOUS FUELS IN SITU
H. Heinrich and B. Forgacs
Hungarian Patent, 104,289, March 26, 1930

Tunnels are filled with refractory rocks and air is led to the solid fuel layers by means of the tunnels. The gases produced are led away by similar channels.

0004

DISTILLING AND GASIFYING UNMINED COAL
L. C. Karrick
British Patent, 368,326, November 28, 1930

Hot fuel gases are passed through tunnels containing the broken unmined coal, oil shale, etc., followed by gases of an oxidizing nature so that product gases are obtained from which oils are recovered as well as producer and water gas.

0005

IMPROVEMENTS IN DISTILLING AND GASIFYING CARBONACEOUS MATERIALS UNDERGROUND
L. C. Karrick
British Patent, 368,326, February 29, 1932

A process for distilling and gasifying carbonaceous materials underground is described which consists of driving a tunnel or shaft through the carbonaceous body, disrupting carbonaceous material from the sides and roof so that the enlarged tunnel or shaft so formed is substantially full of broken material, and then passing hot gases through the broken mass and collecting the gaseous products.

0006

UNDERGROUND GASIFICATION OF SOLID CARBONACEOUS DEPOSITS
L. C. Karrick
United States Patent, 1,913,395, June 13, 1933

Various details are specified for forming passageways into which hot gases may be injected to facilitate destructive distillation and gasification.

0007

SUBTERRANEAN GASIFICATION OF COAL
V. Alekseev
Ugol Vostoka (Eastern Coal) 4, (11-12) 28 (1934)

An analysis of the production of gas in the Leninsk mine is presented. Only about 15% of the coal was distilled, 85% being lost by leaving some of the tar and all the coke in the mine. It is recommended to apply the process in Prokop'evsk, where the coal is poorer in by-products and the deposits are more favorably located for such experiments.

0008

SUBTERRANEAN GASIFICATION OF COAL
Anon
Ugol' Vostoka (Eastern Coal) 4 (7) 2 (1934)

A gas of up to 3500 calories per cu. m. and containing 60% combustible matter was obtained by burning out the unmined coal in the pit in a process based on the principle of a gas producer in Leninsk (Siberia).

0009

SUBTERRANEAN GASIFICATION OF COAL
R. Eikhe
Ugol' Vostoka (Eastern Coal) 4 (7) 3 (1934)

The coal deposit in Leninsk was ignited on the 4th of June, gas was obtained the 17th and a 2000-calorie gas was generated August 3rd.

0010

RELATION OF UNDERGROUND COAL-MINE FIRES TO UNDERGROUND GASIFICATION OF COAL
F. M. Ivanov
Podzemnaya Gazifikatziya Uglei No. 1 36 (1934)

An investigation of causes of coal-mine fires and chemical analysis of gases produced in the combustion of coal under these conditions have an important bearing on the problem of underground gasification of coal.

0011

RESULTS OF LATEST EXPERIMENTS (ON UNDERGROUND GASIFICATION OF COAL) AT THE LISICHANSK MINE
I. P. Kirichenko
Podzemnaya Gazifikatziya Uglei, No. 2, 10 (1934)

Producer gas similar to Mond gas, and containing carbon dioxide 11.4, carbon monoxide 13.9, methane 4.7, acetylene 0.3, hydrogen 21.0 and nitrogen 48%, was produced from underground burning of coal by means of air forced into the coal bed through a pipe.

0012

FIRST RESULTS IN THE FIELD OF UNDERGROUND GASIFICATION
I. P. Kirichenko
Ugol, No. 101, 90 (1934)

Preliminary experiments in underground gasification of coal by forcing air and steam through the mine workings gave poor results due primarily to nonhermetic passages. The gas produced underground, analyzed through drill holes, contained 27-7% hydrogen and 10-3% carbon monoxide, but the gas from the main outlet contained much less, because of dilution with air.

0013

REPORT ON THE WORK WITH MULTIPLE SYSTEMS OF BORE HOLES (IN UNDERGROUND GASIFICATION) AT AN ANTHRACITE MINE
A. S. Kuznetzov
Podzemnaya Gazifikatziya Uglei No. 2, 24 (1934)

Introduction of air into the drift through a multiple system of iron-lined holes, permits better control of the process, smoother operation and more uniform gas composition than the use of single bore holes.

0014

THE OXYGEN PROBLEM (IN FUEL GASIFICATION)
N. I. Sazonov, V. V. Pomerantzev and S. N. Suirkin
Khimstrol 6, 565 (1934)

German installations for gasification of brown coal with steam, with oxygen at atmospheric pressure and under pressure are discussed with a view of utilizing soft-coal deposits in the vicinty of Moscow.

0015

PRELIMINARY REPORT OF THE FIRST EXPERIMENTS AND AN OUTLINE OF PROBLEMS IN CONNECTION WITH UNDERGROUND GASIFICATION OF COAL
G. T. Strokov
Podzemnaya Gazifikatziya Uglei No. 1, 8 (1934)

Report of preliminary experiments carried out at Lisichansk, Shakhtinsk and other mines in 1933 on gasification of coal in lump form and in the form of unbroken blocks, by means of an air blow. The gas had a heat value of 1300-1700 kg. calories per cu. m. and was similar in composition to Mond gas. The problem of underground gasification of coal in general is discussed.

0016

A CRITICAL REVIEW OF METHODS OF UNDERGROUND GASIFICATION OF COAL
D. G. Tzeltlin
Podzemnaya Gazifikatziya Uglei No. 1, 14 (1934)

Methods relating to the underground gasification of coal are reviewed critically.

0017

PRINCIPAL ELEMENTS IN THE METHOD OF ZHURAVLEV (FOR UNDERGROUND GASIFICATION OF COAL)
N.A. Zhuravlev
Podzemnaya Gazifikatziya Uglei No. 1, 31 (1934)

The method consists in arranging the preliminary construction, preparatory to underground gasification of coal, not in the coal bed itself, but below and above it.

0018

METHOD OF UNDERGROUND GASIFICATION OF COAL BY MEANS OF PIT HOLES
S. I. Buyalov
Podzemnaya Gazifikatziya Uglei No. 2, 3 (1935)

The plan used to bore holes into the coal formation is presented and its effects on gas production are discussed.

0019

UNDERGROUND GASIFICATION OF COAL BY MEANS OF DOUBLE PIT-HOLES
S. I. Buyalov
Podzemnaya Gazifikatziya Uglei No. 4, 14 (1935)

A discussion of underground gasification of coal.

0020

MORE ABOUT UNDERGROUND GASIFICATION OF COAL BY MEANS OF BORE-HOLES
S. I. Buyalov
Podzemnaya Gazifkatziya Uglei No. 6, 2 (1935)

A discussion of the techniques involved in underground gasification of coal.

0021

SYNTHESIS OF LIQUID FUEL FROM GASES OBTAINED IN UNDERGROUND GASIFICATION OF COAL
B. Dolgov
Podzemnaya Gazifikatziya Uglei No. 5, 10 (1935)

A review of the conversion of coal gas to liquid fuels.

0022

SYNTHESIS OF LIQUID FUEL FROM GASES OBTAINED IN UNDERGROUND GASIFICATION OF COAL
B. Dolgov
Podzemnaya Gazifikatziya Uglei No. 6, 10 (1935)

A review of the methods used to generate gas and other fuels by the burning of coal in situ.

0023

ELECTRO-HYDROGENATION OF COAL UNDER CONDITIONS OF UNDERGROUND GASIFICATION
V. V. Filatov
Podzemnaya Gazifikatziya Uglei No. 2, 22 (1935)

A discussion of Bergius method, involving production of hydrogen and hydrogenation of coal, under conditions of underground operation.

0024

SUBTERRANEAN GASIFICATION OF COAL
B. F. Grindler
Ugol' Vostoka (Eastern Coal) 5, (1) 14 (1935)

0025

THE SECOND CYCLE OF EXPERIMENTS FOR THE SUBTERRANEAN GASIFICATION OF COAL IN THE KUZNETZK BASIN
B. F. Grindler
Ugol' Vostoka (Eastern Coal) 5, (5) 11 (1935)

It is intended to admit air to the ignited coal deposit through a number of tubes one at a time. Thus point of admission of air will change with the movement of the burning area, so as to eliminate dilution of the gas with air. To assure a uniform heating value the gas from the mine should pass through a gas tank after passing through a condensation equipment for the removal of tar and heavy hydrocarbons. Detailed calculations are presented.

0026

SECOND SERIES OF EXPERIMENTS ON UNDERGROUND GASIFICATION OF COAL AT KUBAS
B. F. Grindler
Podzemnaya Gazifikatziya Uglei No. 4, 3 (1935)

The experience gained in a previous test on underground gasification of coal which lasted for six months, served as a basis for another test. The difficulties encountered in the first test, particularly in regard to uniformity of the gas produced, were eliminated here. Composition of the gas averaged carbon dioxide 11.10, carbon monoxide 12.80, methane and unsaturated hydrocarbons 1.80, hydrogen 17.25, hydrogen sulphide 0.30, nitrogen 55.55 and water 1.20%. It had a heat value of 1035 kg. calories per cu. m.

0027

FUNDAMENTALS INVOLVED IN THE PROJECTING OF UNDERGROUND GASIFICATION OF COAL
F. M. Ivanov
Podzemnaya Gazifikatziya Uglei No. 2, 18 (1935)

A discussion of the principles used in the underground gasification of coal.

0028

EXPERIMENTS ON A SMALL COAL PANEL AT THE LISICHANSK MINE (ON UNDERGROUND GASIFICATION)
I. P. Kirichenko
Podzemnaya Gazifikatziya Uglei No. 7-8, 3 (1935)

This is a continuation on a larger scale of previous experiments on underground gasification of of coal by the "drift-gas generator" method, consisting in forcing air and steam through bore holes into a system of drifts through the coal body. The points investigated were: (1) maximum distance between drifts, (2) effect of length of drifts on the process of gasification, (3) effect of incline of drift to coal layer, (4) effect of forcing air and steam through the same or different bore holes, and (5) effect of the regime of alternating air and steam blow on the process. Forcing the air and steam through separate bore holes gave a better control of the process. The water gas produced was of low grade having a heat value of 800-1200 kg. calories per cu. m.

0029

WATER GAS AT LISICHANSK COAL MINE. PRELIMINARY REPORT
I. P. Kirichenko
Podzemnaya Gazifikatziya Uglei No. 9, 34 (1935)

The method consists of blowing air and steam through bore-holes into drifts along the coal bed and removing the products of combustion through other bore-holes. In one experiment air alone was used. The gas had a composition of carbon dioxide 11.0, oxygen 0.2, carbon monoxide 12.0, hydrogen 12.0, methane 5.0 and nitrogen 59.8% and a heat capacity of 950 kg. calories per cu. m. In another experiment air and steam were blown alternately and the composition of the gas was carbon dioxide 23.8, oxygen 0.0, carbon monoxide 14.0, hydrogen 44.5, methane 5.8 and nitrogen 11.8%; calorific value 2075 kg. calories per cu. m.

0030

UNDERGROUND COAL GASIFICATION AT THE LISICHANSK MINE
I. P. Kirichenko and V. S. Ton
Gornyl Zhur III, (7) 10; (8) 10; (9) 5 (1935)
Chem. Zentr. 1, 2661 (1936)

The first experiment on gasification in the shaft, using a mass of coal rendered extremely fine by explosion during combustion, lasted 15 days. The gas reaching the surface through a borehole had a mean heating value of 1300 kg. calories per cu. m., which increased in individual cases to 1800 kg. calories per cu. m. The heat consumption to maintain the necessary temperature was very high owing to the thin coal vein of the experimental drift; moreover, leakage of fresh air resulted in the partial combustion of the gases formed which originally corresponded to Mond gas in composition. The second experiment using coal finely pulverized above ground and introduced into the experimental drift yielded a good quality producer gas having a mean heating value of 1100 kg. calories per cu. m., increasing in individual cases to 2000 kg. calories per cu. m. In this experiment too, trouble was caused by the entrance of fresh air. Experiments on gasification of coal through boreholes led to the development of a borehole producer process, by which a gas was produced of mean heating value of 900 kg. calories per cu. m. (sometimes reaching 1800 kg. calories per cu. m.). Cold air was used for the blast. This last process gave greatest promise of success.

0031

FURTHER EXPERIMENTS ON UNDERGROUND GASIFICATION OF MOSCOW COALS
P. T. Kilesnikov
Podzemnaya Gazifikatziya Uglei No. 1, 15 (1935)

Experiments were carried out on underground gasification of the Kruptovsk deposit, lying about 20 m. deep, by blowing air for combustion through borings into a body of coal embracing about 250 tons, and collecting the coal gas from another series of borings.

0032

RESULTS OF THE THIRD EXPERIMENT (ON UNDERGROUND GASIFICATION) ON MOSCOW DISTRICT COALS
P. T. Kolesnikov
Podzemnaya Gazifikatziya Uglei No. 4, 29 (1935)

Gasification was carried out on an unbroken block of coal. The gas obtained was nonuniform in composition and had an average heat value of 1000 kg. calories per cu. m.

0033

FIRST GENERATOR GAS UNDER CONDITIONS OF UNDERGROUND GASIFICATION OF COAL
P. T. Kolesnikov
Podzemnaya Gazifikatziya Uglei No. 4, 39 (1935)

Gasification was carried out on low-grade coal containing 34.57% moisture and 28.26% ash. The resulting gas contained 6-13% carbon monoxide, 5-9% hydrogen and approximately 0.2% methane.

0034

CALCULATION OF HEAT LOSSES DUE TO HEATING A LAYER OF DAMP COAL UNDER CONDITIONS OF UNDERGROUND GASIFICATION
A. V. Luikov and V. V. Pomerantzev
Podzemnaya Gazifikatziya Uglei No. 9, 3 (1935)

Heat losses incurred during underground gasification of coal are presented and discussed.

0035

THE SECOND EXPERIMENTAL SUBTERRANEAN GASIFICATION OF COAL IN LENINSK
P. Makhin and P. Botlin
Ugol Vostoka (Eastern Coal) 5, No. 11/12, 43 (1935)

A detailed description of the operation of the subterranean gasification of unmined coal is presented. The composition of gases, which changed with the process condition, is tabulated. There was produced 2,000,000 cu. m. gas in 1.5 months.

0036

RESULTS OF EXPERIMENTS (ON UNDERGROUND GASIFICATION OF COAL) AT KRUTOV SHAFT
P. A. Manukyan
Podzemnaya Gazifikatziya Uglei No. 4, 22 (1935)

A discussion of causes underlying the failure of certain experiments on the in situ gasification of coal.

0037

THE ROLE OF ABSORPTION IN UNDERGROUND GASIFICATION OF COAL
P. A. Manukyan
Podzemnaya Gazifikatziya Uglei No. 10/11, 44 (1935)

In the Lisichansk experiments on underground gasification of coal with cold blast, there was an excessive amount of carbon dioxide in the gas produced. An attempt is made to explain this phenomenon on the basis of absorption of oxygen from the air on the coal which then burns to carbon dioxide instead of carbon monoxide.

0038

CALCULATION OF HEAT LOSSES IN UNDERGROUND GASIFICATION OF COAL
P. V. Melent'ev
Podzemnaya Gazifikatziya Uglei No. 4, 7 (1935)

The author discusses the means by which heat loss occurs during the underground gasification of coal and presents methods of calculation.

0039

CALCULATION OF HEAT LOSSES IN UNDERGROUND GASIFICATION OF COAL
P. V. Melent'ev
Podzemnaya Gazifikatziya Uglei No. 4, 7 (1935)

0040

ECONOMIC BASIS FOR UNDERGROUND GASIFICATION OF COAL BY THE ZHURAVLEV METHOD
T. V. Ovechnikov
Podzemnaya Gazifikatziya Uglei No. 2, 20 (1935)

The Zhuravlev method consists in duplicating in underground gasification the ordinary gas-generator method. The air or steam is blown from underneath the coal block, through holes in the block and the resulting gas is forced to the surface through shafts. In one experiment in the Chelyabinsk coal deposit the gas produced by this method had the following composition: carbon dioxide 9.61, carbon monoxide 22.05, methane 2.49, acetylene 0.35, hydrogen 18.15, hydrogen sulphide 0.17, nitrogen 47.00 and ammonia 0.1%; heat value of the gas is 1420 kg. calories per cu. m. The yield of dry gas is 2 cu. m. per kg. of coal.

0041

ECONOMICS OF UNDERGROUND GASIFICATION OF COALS
T. V. Ovechnikov
Podzemnaya Gazifikatziya Uglei No. 4, 34, (1935)

The economics of the generation and storage of gas produced from coal in situ are presented and discussed.

0042

SUBTERRANEAN GASIFICATION OF COAL
V. Pal'veley
Ugol Vostoka (Eastern Coal) 5 (1) 17 (1935)

0043

EXPERIMENT ON UNDERGROUND GASIFICATION OF COAL IN THE LENIN-KUZNETZK DISTRICT (KUZBAS)
I. Petrovichev
Podzemnaya Gazifikatziya Uglei No. 1, 31 (1935)

After the fire was started underground, air was blown into the coal through drifts. The chemical reactions taking place in the gasification are discussed in the light of the composition of the resulting gas.

0044

HEAT AND GAS CALCULATIONS UNDERLYING THE PROJECT OF UNDERGROUND GASIFICATION (OF COAL)
V. V. Pomerantzev, N. I. Sazonov and S. N. Suirkin
Podzemnaya Gazifikatziya Uglei No. 1, 9 (1935)

A discussion of gas movements, heat losses and gas composition involved in underground gasification of coal.

0045

SUMMARY OF THE FIRST EXPERIMENTAL RESULTS OF A SUBTERRANEAN GASIFICATION OF COALS
N. I. Sazonov
Khim. Tverdogo Topliva 6, 17 (1935)

The generation of gas by injecting air into subterranean coal deposits with subsequent ignition so as to produce gas suitable for technical purposes is described. The gases obtained were high in nitrogen and low in heating value. Details of the experiment are analyzed.

0046

SUBTERRANEAN GASIFICATION OF COAL
N. I. Sazonov
Khim. Tverdogo Topliva 6, 861 (1935)

Further experiments are reported on the generation of gas in coal mines. The increase of the concentration of oxygen to 24% yields a gas of 1350 kg. calories per cu. m. Alternate injection of air and steam on a low-grade coal at the Lisichansk experimental station yielded gas low in nitrogen (2.8-11%). The experiments at Krutovka on the intake coal vein yielded a producer gas of 1300 kg. calories per cu. m. The amount of air injected and the removal of the gas produced was regulated for the first time.

0047

BURNING OF ANTHRACITE PLATES FOR THE PURPOSE OF STUDYING PRODUCTION OF WATER GAS
A. I. Semenov, I. S. Galinker, and V. V. Kondakov
Podzemnaya Gazifikatziya Uglei No. 7-8, 23 (1935)

Anthracite plates measuring approximately 220 X 250 X 2650 mm. were placed in a large pit in the ground, in such a way as to form channels through the pile. The pile was ignited and oxygen-enriched air and steam were blown alternately through the coal pile. The optimum results were obtained by following a regime of 10 minute air (containing 60% oxygen) blow and 20 minute steam blow. The water gas thus obtained had a heat value of 2460 kg. calories per cu. m.