

STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION
BOARD OF NATURAL RESOURCES AND CONSERVATION

INFORMAL OPENING
of the
NEW MINERAL RESEARCH LABORATORIES
of the
ILLINOIS STATE GEOLOGICAL SURVEY
DECEMBER 9, 1931



CERAMICS BUILDING, UNIVERSITY OF ILLINOIS CAMPUS
URBANA

PROGRAM

WEDNESDAY, DECEMBER 9

218 CERAMICS BUILDING

2:30 P. M.

WILLIAM A. NOYES, *Chairman*

*Secretary, Board of Natural Resources and Conservation;
Professor of Chemistry Emeritus, University of Illinois*

1. Introductory Remarks CHAIRMAN
2. The Geological Survey's Response to the Research Needs of the
State's Mineral Industries
From the Scientist's and Mineral Economist's Viewpoint
CHARLES K. LEITH
Head, Department of Geology, University of Wisconsin
From the Mineral Industries' Viewpoint BEN F. RICHARDS
President, Illinois Clay Manufacturers Association
JOSEPH D. ZOOK
President, Illinois Coal Operators Association
From the Business Man's Viewpoint . . . J. PAUL CLAYTON
President, Illinois Chamber of Commerce
3. Presentation of Keys of the New Laboratories
ALBERT J. HARNO
Provost, University of Illinois
4. Acceptance
For the Board WILLIAM A. NOYES
For the Geological Survey MORRIS M. LEIGHTON
Chief
5. Inspection of Laboratories
Laboratory of Coal Microscopy
Laboratories of Non-fuel Products
Laboratory of Geophysics
Laboratories of Geochemistry

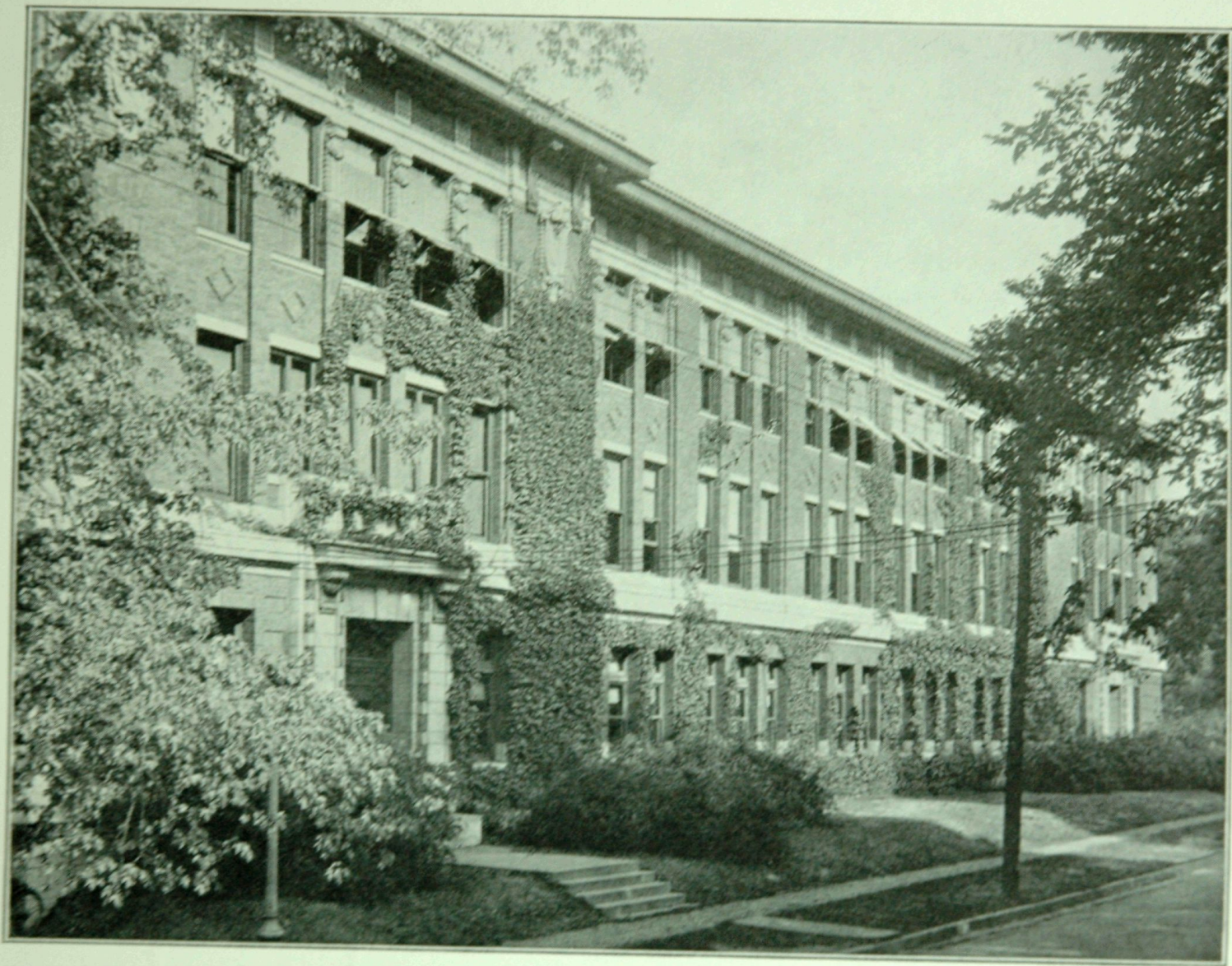
6:30 P.M.

Informal Dinner

Southern Tea Room, 624 East Green Street, Champaign

CHARLES C. WHITTIER, *Toastmaster*

*Secretary, Illinois Mineral Industries Committee;
Engineer, Robert W. Hunt Company*



Ceramics Building, University of Illinois. The offices of the State Geological Survey occupy the third floor, and the geophysical and geochemical laboratories are temporarily located in adjacent quarters.

THE NEW MINERAL RESEARCH PROGRAM OF THE STATE GEOLOGICAL SURVEY

The mineral industries of Illinois are of the very greatest importance to the welfare and prosperity of all of the people of the State. Government statistics show that the annual average market value of the mineral products of the State, for 1924 to 1928, inclusive, was \$215,000,000. This is, approximately, half of the average annual value of the State's agricultural products for the same period (\$442,000,000), which is in contrast to the one to three ratio of mineral to agricultural products of the United States as a whole.

In value, Illinois' mineral production exceeds that of 41 other states; it surpasses the combined production of three of the bordering states, Wisconsin, Iowa, and Missouri, and its value is two and one-half times the value of the annual gold and silver production in the United States, including Alaska.

Coal accounts for 60 per cent of the value of the total mineral production, and the coal industry employed, for the period 1925-1929 inclusive, an average of 78,000 men. Clay and clay products rank next to coal in value, then follow stone, cement and lime, oil and gas, sand and gravel, silica, fluorspar, fullers' earth and other non-metallic substances.

The State's reserves in all of these, except possibly oil and gas, are very large, and await research in their constitution and properties for many uses in the chemical, metallurgical, structural, and agricultural industries. Some of our mineral industries are essential to agriculture. More agricultural limestone is produced and used in Illinois than in any other state, totaling \$843,693 in value in 1929.

ECONOMIC CONDITIONS

Without relationship to the present world-wide depression, the mineral industries of Illinois are confronting rapidly changing operative and economic conditions, which if met properly will vitally nourish a greater industrial growth than has yet been attained, but which if neglected will turn industry elsewhere. The public welfare shares in the fortunes of these industries and it is therefore pertinent to inquire into the principal elements of these changing conditions.

IMPORTATION OF MINERALS

Importations of minerals from outside the State have seriously reduced the production of minerals within, caused the abandonment or temporary closing of many mines, pits, and quarries, reduced employment, seriously affected the comfort and happiness of thousands of homes, curtailed the business of many communities, lowered property values, and diminished tax returns for the support of public schools and other essential institutions. Whatever the factors which have permitted this, it is evident that any attempt to regain the lost markets must take into consideration the new evolutionary changes and readjustments in business.

In 1929, in the production of Illinois coal, there was a decrease below normal which resulted in a loss in wages to coal miners alone of more than \$20,000,000. Gas from the southwest is already being delivered in Illinois by pipe-lines. Crushed limestone, cement, clay, sand and gravel, silica, and architectural building stone are coming in in large quantities, which mineral substances in large part, we believe, can be made available from Illinois sources by research of the order hereinafter outlined.

As would be expected from the above mentioned facts, the statistics of the U. S. Bureau of Mines show an alarming decline in the value of the minerals produced in Illinois, while the statistics of the Bureau of the Census show an increase in population. Those statistics are as follows:

	<i>Mineral Production</i>	<i>Population</i>
1921.....	\$254,000,000	6,528,000 (1920)
1922.....	245,000,000	6,744,000
1923.....	283,000,000	6,856,000
1924.....	236,000,000	6,987,000
1925.....	232,000,000	7,093,000
1926.....	237,000,000	7,203,000
1927.....	180,000,000	7,206,000
1928.....	188,000,000	7,396,000

It is evident that all of the mineral industries of Illinois did not share in the increased use of minerals resulting from a growing population, equivalent to an added city each year of 100,000 persons.

During the period 1921-1928 inclusive, the amount invested in construction of all kinds, according to the F. W. Dodge Corporation, in nine central states increased from \$695,585,000 to \$1,934,775,000. In other words, the value of construction trebled, but Illinois' mineral industries did not all share in the opportunities afforded. On the other hand, the value of minerals produced in the United States increased \$1,246,700,000, in spite of the decline of such an important mineral producing state as Illinois.

This is an unsound economic condition. Considered from every angle, the welfare of the State demands that this decline cease. We believe that by ascertaining fully our mineral resources and all of the possible means of utilizing them, one of the most effective means of arresting this decline will be accomplished.

EFFECT OF DISCOVERIES OF NEW DEPOSITS AND NEW INVENTIONS

Aside from the very great competitive pressure from other areas, is the fact that the mineral industries are in a state of change, due to the constant discovery both of new deposits in the field and new uses by research laboratories and of new inventions and changes affecting recovery, processing, transportation, and marketing. Consequently, new problems are constantly presenting themselves for solution.

Information must be secured regarding the adaptability of Illinois' materials, active research prosecuted to find further uses, and a knowledge of economic factors obtained.

CHANGES IN TRANSPORTATION

New forms of transportation are dynamic factors in the present situation. Pipe-lines have proved economical in the transportation of petroleum, gasoline, and natural gas from the mid-continent fields into the Middle West, delivering these fuels at the doors of the consumers at rates competitive with Illinois coal, coke, oil, and gas.

The Great Lakes also afford cheap transportation for eastern coal into Wisconsin and Illinois ports for distribution in Illinois and within the natural geographic territory of Illinois coal distribution to the north and northwest.

Shipment by boat from the northern and western shores of Michigan have brought high-calcium limestone and sand and gravel into Illinois in competition with our own deposits.

The opening of the new Illinois Waterway will offer opportunity for favorable movement of much raw material heretofore inaccessible, when the quality and uses have been developed by research. It may also give opportunity for importation of materials from outside the State which can not now have an economic inflow. Chicago is already the second largest manufacturing district and distributing center in the western hemisphere and will attract additional industries by reason of the Illinois Waterway. Other points along the waterway will also attract new industries which in turn will influence the growth of our mineral industries, provided their products can compete with those obtainable from other areas.

EASTERN RESEARCH LABORATORIES

Three new research laboratories dealing with raw mineral materials have recently been organized in the East. Two of these, the Fuel Laboratory of Carnegie Institute of Technology at Pittsburgh, and the laboratories of the School of Mineral Industries at Pennsylvania State College, will carry on researches on eastern minerals that are competitive with Illinois sources, while the Battelle Memorial Foundation of Columbus, Ohio, is organized to be more general in geographic scope.

Illinois must meet the outcome of these searching investigations, and must not delay in becoming fully informed regarding its own basic resources and must also be aware of those that exist elsewhere, whether they be competitive or supplementary.

THE NECESSITY OF AN EXTENDED MINERAL RESEARCH PROGRAM

The foregoing conditions make imperative an extended mineral research program of an intensive character, a program that will be kept constantly oriented with the needs of the industries and of the Commonwealth.

Additional fundamental data are needed on the constitution and properties of coal, which may be applied to problems of utilization and manufacture; on the occurrence of source beds of petroleum, on structures favorable for the accumulation of oil and gas, and on the reserves of oil left in the oil sands but not recoverable by ordinary pumping methods; on the constitution of clays suitable for a wide range of ceramic products, of cement-making materials, concrete aggregate, limes, structural stone, highway materials, pigments, mineral fillers, absorbents, rock products for the manufacture of chemicals, fluxes, soil-conditioning and soil-nourishing materials, and other earth substances—which information will serve as the background of reference for exploration in the search for certain specific adaptable crude materials and for handling problems of utilization and synthetic manufacture.

The welfare and prosperity of more than one-third of our State, the southern portion, is dependent very largely on its mineral resources. The new technique of science must be employed here to ascertain the occurrence, constitution, properties, and commercial possibilities of its mineral deposits, if this area is to attain the industrial position that these resources seem to warrant. The northern and central portions of the State also have a variety of mineral resources, the possible uses of which are only partially known.

In addition, there is a rapidly increasing call for data from the field of engineering concerning foundation conditions for dams, large bridges, and large buildings, causes and prevention of land-slides, rock-falls, and other movements of earth materials affecting the permanence and stability of highways and structures; the likelihood of subsidence affecting factory sites and water reservoirs over mined-out areas; drainage conditions over the state; precise level data; area of watersheds and other topographic information needed for bridge design, surface water supplies, and sewage disposal systems; maps for selection of highway locations; rock materials for concrete aggregates for paving and road-metal; and information for other related engineering undertakings having to do with earth materials, topography, surface and subsurface drainage, water-well drilling and geologic sources of water supplies for cities and industries.

CONCERTED MOVEMENT BY THE MINERAL OPERATORS, SCIENTIFIC,
ENGINEERING, AND BUSINESS ORGANIZATIONS

In October, 1930, representatives from the various mineral industries, and from scientific, engineering, and business organizations, state-wide in scope, formed an Illinois Mineral Industries Committee for the purpose of putting into effect the new mineral research program of the State Geological Survey, which had been approved by the State Board of Natural Resources and Conservation. Additions were made to the Committee as the interest grew, until finally it represented the coal, oil and gas, clay, terra cotta, stone, sand and gravel, silica, and fluorspar industries, the Western Society of Engineers, the Illinois Mining Institute, the Illinois Society of Engineers, the State Board of Natural Resources and Conservation, the State Department of Mines and Minerals, the Illinois Chamber of Commerce, the Peoria Chamber of Commerce, the Buy-Illinois Products Commission, the State Geological Survey, and several interested influential citizens.

Conferences were held with President Harry Woodburn Chase of the State University of Illinois, the Board of Trustees of the University, Governor Louis L. Emmerson, Director James A. Watson of the State Budget, and the Appropriations Committee of the House and Senate. At the conference with the Governor, the Chicago Association of Commerce was also represented, and at the hearing of the Senate Committee, the Illinois Mining Investigations Commission and the Legislative Committee of the Illinois Miners.

The appropriations bills for carrying out the new program, appropriating a total of \$468,890 for the biennium were duly passed

by the 57th General Assembly and signed without vetoes by Governor Emmerson. The funds became available July 1st, and immediately steps were taken by the University of Illinois to provide the necessary additional housing and by the Chief of the Survey to select capable personnel and suitable equipment. The additional housing necessary for the new laboratories is of a temporary character in view of desirability for strict economy at this time.

OUTLINE OF THE NEW PROGRAM

The motives of the new program are :

(1) To secure and make available scientific and economic information essential to the nourishment and promotion of the State's mineral industries and helpful to the public welfare.

(2) To investigate thoroughly the constitution and properties of the mineral and rock substances, such as is needed to light the way for beneficiation, improved uses and new uses.

(3) To bring the fundamental information to the point where it can be of use to industrial organizations and individuals in successfully and profitably exploiting the mineral deposits to the fullest extent.

(4) To make known the production and flow of minerals into and out of the State, the opportunities of the consuming market in the natural geographic market area of the State, the obstacles or limitations existing, and the trend of the industries. It is expected that the possession and distribution of such information will not only aid the industries but will be helpful in keeping the research program constantly oriented with respect to the urgent needs of the industries.

It is intended that the Survey's laboratories shall not take on testing of a routine nature, inasmuch as there are excellent commercial testing laboratories already available. It would be fatal if the research for data of the character mentioned above were to be diverted and replaced by time-consuming routine testing.

Hitherto the Geological Survey has concerned itself primarily with the study of the raw minerals and rock substances of the State. This work will continue, but the new program proposes to take advantage of the mass of information already gathered and that which it will continue to gather by detailed surveys, and extend the scope of research to cover utilization and marketing. This is an undertaking which cannot be carried to its ultimate goal except by an organization which is in position to approach it from a compre-

hensive knowledge of the occurrence, relations, constitution, and availability of the various formations and deposits, and a knowledge of the marketing opportunities.

A great deal is now known about the occurrence of Illinois coal and its adaptability for raw fuel, and much has been revealed by the late Professor S. W. Parr in regard to its low temperature carbonization, the procedure of commercial analysis, the nature of the sulphur compounds and the occluded gases, and the use of solvents for the analysis of coal. There is, however, a paucity of information on the immediate constitution of coal—the nature of the organic substances as they occur in the coal bed. Such information, together with that obtained from microscopic and X-ray studies of the ash, is necessarily basic to three lines of effort in extending the use of Illinois coal, (1) efforts in beneficiation, (2) selective mining of coal adapted to special fuel purposes, and (3) new uses for coal other than as fuel. The Survey will now attack the problem of the immediate constitution of coal and of the occurrence and character of the ash, using the most modern chemical and physical methods, carefully scrutinizing all new data for items of promising industrial application for this vast resource.

The clay-products industries of the State are next to coal in production importance. Recently the technique of microscopic and X-ray methods of identifying the mineral constituents of clays have been so perfected that the information on the constitution of our clay deposits can now be more successfully secured than ever before. The first essential here is to ascertain what the constituents of the deposits are, their physical, chemical and ceramic properties, and their effect on the products, so that the materials, either by beneficiation of one kind or another, or by blending, may yield commercially superior products or new products not now known to be possible.

The silica sand of the State, of which glass sand is an important commodity and which is already the basis of a large industry, will in due time receive research attention, our belief being that this high silica sand will be found to have wider application.

The blending of different mineral and rock substances for the manufacture of commercial products not now produced by our industries is a field that so far has received very little attention and will not be overlooked. Additional research is directed toward the improvement of existing uses of stone and the products of the stone industry and in the locating of deposits of stone for architectural or other special uses.

Investigations are now under way dealing with the silica, novaculite, gannister, fullers' earth, and sand and gravel deposits of southern Illinois, with a view to extending their uses.

Other lines of research that seek to turn the State's mineral resources into industrial development include searches for more mineralized belts of fluorspar in Hardin County, using geophysical methods where the bedrock is hidden below a surficial clay mantle, geophysical search for buried gravel deposits that may be reservoirs for water supplies close to municipalities that are in need of additional supplies, a study of more efficient recovery methods of petroleum in those oil pools of the State which have been pumped close to the economic limit of production, and a search for additional oil and gas structures favorable for test drilling when the over production of oil elsewhere has subsided.

MINERAL ECONOMICS

For some years the State Geological Survey has coöperated with the Federal Government in the collection of mineral statistics, except in the case of coal which are efficiently gathered by the State Department of Mines and Minerals. To-day, however, production studies cover only a small portion of the economic picture. Accordingly the Survey's new program includes the following items, (1) prompt collection and early publication of mineral production statistics, and (2) studies in distribution and consumption of Illinois materials in relation to materials produced elsewhere, including non-competitive as well as competitive. This, it is believed, will provide a complete picture of the flow of minerals into and out of the State, the conditions which govern the flow, and the opportunities for developing and enlarging the outlet for Illinois minerals.

FIELD AND LABORATORY FACILITIES

To attain these and other objects within the scope of the Geological Survey, the Survey is adopting the most modern devices for field investigations and is providing laboratory facilities for fundamental physical and chemical studies of the earth's materials and of problems of their utilization, utilizing whenever available special equipment in the laboratories of the University.

Geochemical laboratories.—The geochemical laboratories of the Survey include an analytical laboratory, a special fuels laboratory, a special non-fuels laboratory, a high temperature laboratory, and an industrial research laboratory.

The analytical laboratory is equipped for proximate and ultimate analysis of coal, analysis of rocks, clays, silica sands, coal ash,

brines, etc., extraction and analysis of oils, analysis of gases by the Shepherd modification of the Orsat equipment, and analysis of gases, particularly natural gas, by low temperature fractionation with the Podbielniak equipment.

The fuels laboratory is equipped with suitable equipment for fundamental chemical studies in regard to the composition and constitution of coal, oil and gas.

The non-fuels laboratory has equipment suitable for physico-chemical studies on the non-fuel minerals.

The high temperature laboratory contains gas and electric furnaces for the use of the analytical and research laboratories and an electric pyrometer which is connected through a multiple point switch to thermocouples from each furnace where temperature control is desired.

Provision is made for equipment for fundamental studies on problems of industrial application of research results, in the industrial research laboratory.

The University of Illinois, in its Department of Chemistry, will cooperate in the use of its X-ray equipment on problems requiring X-ray photographs.

Laboratory of Coal Microscopy.—This laboratory of the Coal Division is equipped to obtain complete columnar samples of the coal beds, to prepare polished sections and thin sections, to examine these under high-power microscopes, and to photograph thin sections on a magnification as high as approximately 1000 diameters. In this laboratory is also studied the maceration products of coal, as a part of the study of the constitution of coal.

Non-Fuels Laboratories.—The non-fuels laboratories are equipped in themselves, or with the cooperation of the State Highway Division and the Department of Ceramic Engineering of the University of Illinois, to undertake the wide variety of physical tests and studies necessary to accurately determine the physical composition and properties of the state's non-fuel minerals. Modern laboratory crushing and drying machinery for preparing earth materials for study are provided as well as microscopes for the examination of these materials and their commercial products.

Laboratory of Sedimentary Petrography.—This laboratory is equipped for the making of thin sections of unconsolidated materials, as well as consolidated, for the separation of heavy minerals, and for the microscopic determination of mineral and rock constituents.

Laboratory of Geophysics.—This laboratory is equipped for the study of porosity, texture, saturation with oil, and other features of cores of oil sands, and for the determination of oil reserves in the various oil-sand horizons of the State's oil fields.

Equipment for field geophysical studies include an Askania magnetometer and a Megger apparatus for determining electrical resistivity of earth materials.



Temporary quarters for the geophysical and geochemical laboratories.

THE ORGANIZATION OF THE STATE GEOLOGICAL SURVEY
FULL TIME STAFF

OFFICE OF THE CHIEF

MORRIS MORGAN LEIGHTON, Ph.D., *Chief*

ENID TOWNLEY, M.S., *Associate Geologist and Assistant to the Chief*

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JOHN ROBINSON, B.S., *Assistant*

MINERAL ECONOMICS SECTION

WALTER H. VOSKUIL, Ph.D., *Mineral Economist*

For certain special projects, specially qualified scientists and technically trained men are employed on part-time appointment.

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DOROTHY E. ROSE, B.S., *Editor*

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GEORGE WELLINGTON PICKELS, B.C.E., C.E., *Drainage Engineer, University of Illinois*

Geography

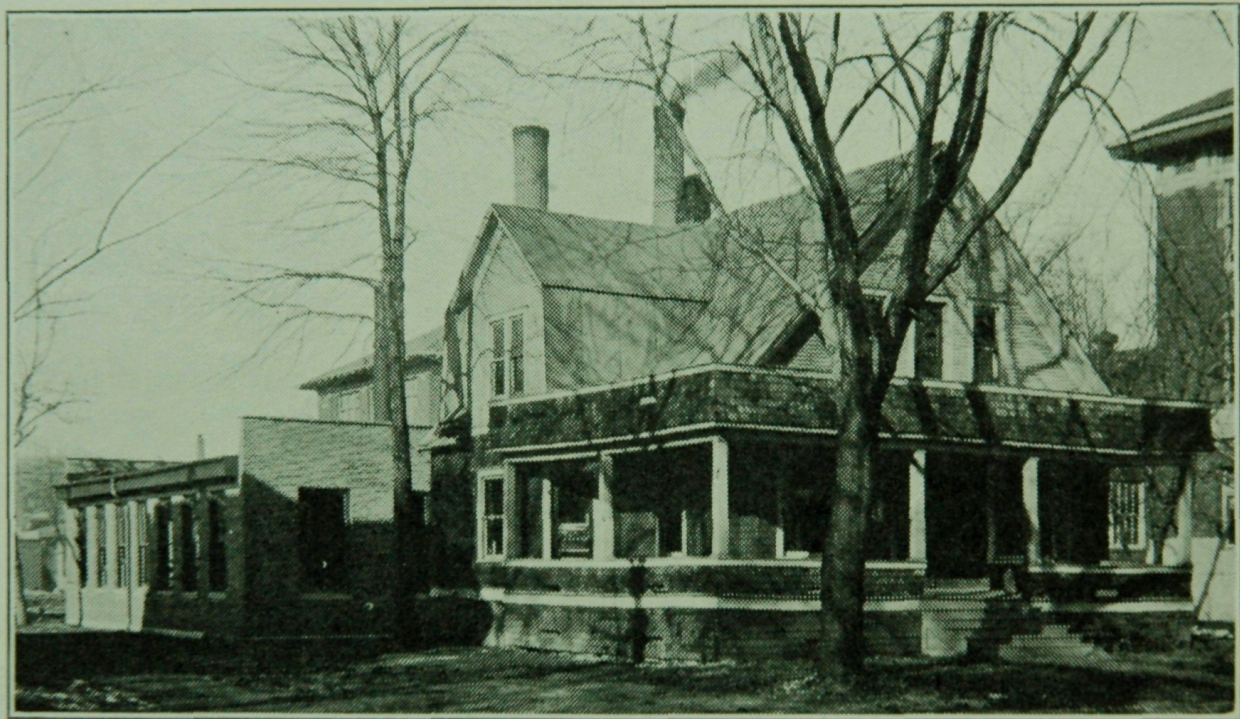
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FRANK COLLINS BAKER, B.S., *Consultant in Pleistocene Invertebrate Paleontology, University of Illinois*

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GLENN S. SMITH, *Division Engineer in charge of Central Division of Topographic Surveys, Urbana and Washington, D. C.*



Temporary quarters for the geophysical and geochemical laboratories.