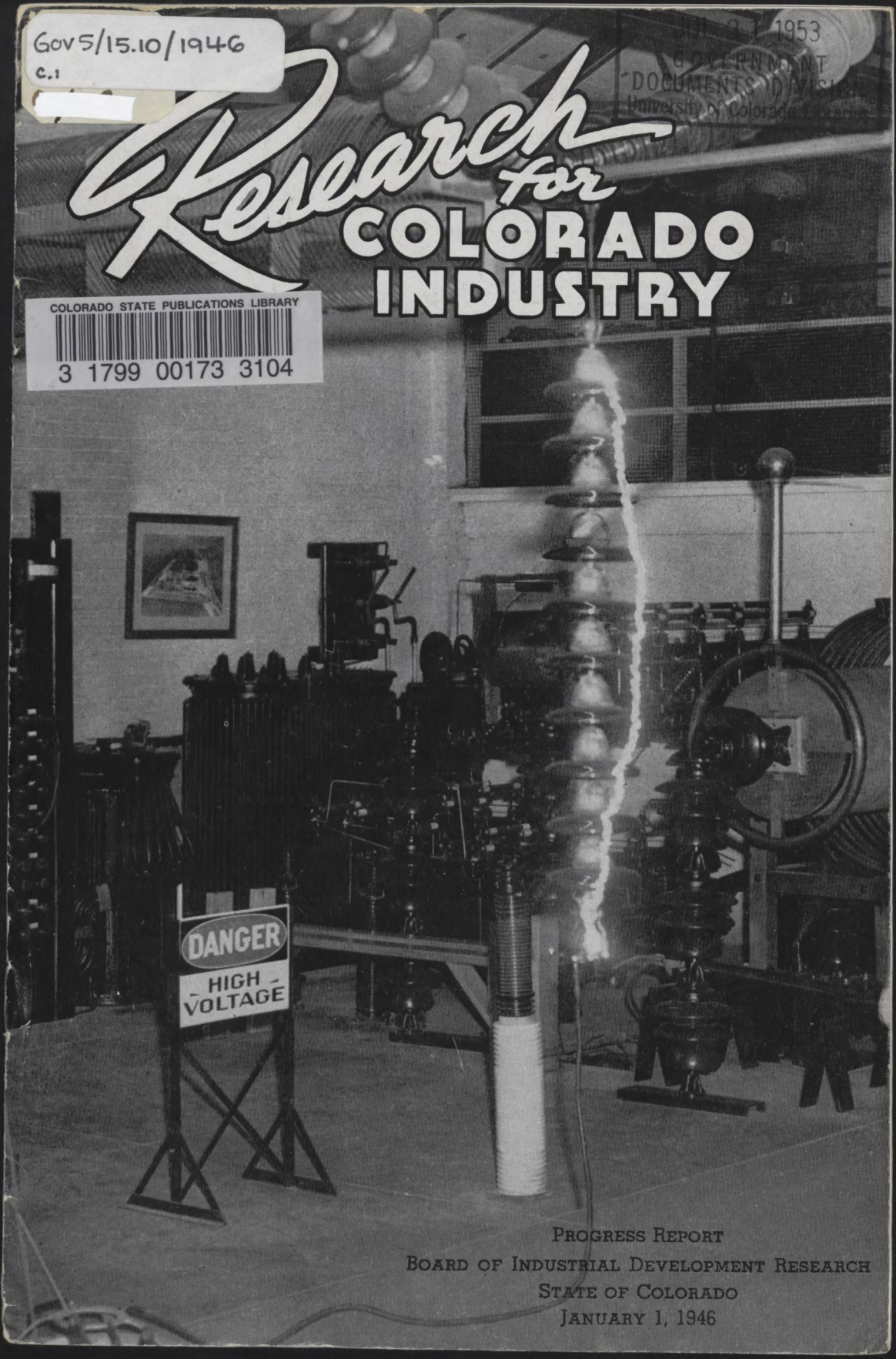
Research for COLORADO INDUSTRY



PROGRESS REPORT
BOARD OF INDUSTRIAL DEVELOPMENT RESEARCH
STATE OF COLORADO
JANUARY 1, 1946

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Front cover: photograph of lightning flashover experiments at University of Colorado Engineering Experiment Station. For details see page 11.

PROGRESS REPORT

Colorado Industrial Development Research
January 1, 1946

Under the terms of House Bill 575 passed by the State Legislature in April, 1945, there was appropriated $100,000 for industrial research during the biennium 1945-1947. With the help and counsel of an advisory committee of leading business, industrial, commercial, agricultural, civic, and mineral industry leaders, 17 research projects have been established and are now in progress at Colorado A & M College, Colorado School of Mines and the University of Colorado. One phase of the petroleum research, a compilation of well logs of Colorado, has already been completed and published.

This progress report summarizes the work to date and the objectives of each of these projects.

ORGANIZATION OF THE INDUSTRIAL DEVELOPMENT RESEARCH PROGRAM

Recognizing that "statewide economic research, especially that of the development, processing and industrial use of the natural resources of the state, and the exploration and determination of markets for Colorado products is a fundamental interest of the state government", the State Legislature in House Bill 575 appropriated $100,000 for the biennium 1945-1947 for industrial research. As stipulated in the Act, the fund is administered by the presidents of the three schools—Colorado A & M College, Colorado School of Mines and the University of Colorado—with the approval of the Governor.

The Board, with the consent of the Governor, selected an Industrial Development Research Committee of men especially qualified to advise the Board. The advisory committee reviews all requests, and recommends to the Board the projects that appear feasible. When a project is approved by the Board with the consent of the Governor, funds as available are allocated to a research group at one of the three schools qualified and willing to conduct the research. Results of all research conducted under the program are available to the public.

From the many suggestions for research submitted to the advisory committee and the Board, 17 projects have been selected for research. Projects were chosen which had the best possibility of commercial use within a reasonable time, and which could be completed within the two-year period of the appropriation. Many fundamental research problems had to be passed by because of the limited amount of funds available for the work.

Individuals or groups interested in the research may match the funds allotted by the State to increase the scope of a project or to purchase special equipment. Thus half of the cost of the wholesale market studies being conducted for Grand Junction and Pueblo is being paid by the local Chambers of Commerce.

COMPLETED PROJECT

Selected well logs of Colorado Work done at the Colorado School of Mines by Prof. Clark F. Barb, head of the department of petroleum engineering.

The first project to be completed under the industrial research program is a compilation of significant well logs from all parts of Colorado. This publication of approximately 450 pages is now in print and ready for distribution. The information contained in the volume is of great interest to men searching for petroleum and other minerals, because heretofore no similar compilation has been available.

The publication contains a selection of the significant logs from the more than 6,000 well logs in the library of the School of Mines. In addition, scores of logs have been obtained from other sources, such as the United States Geological Survey, oil companies, drillers, and other industries. The group of logs has been edited to select those wells giving valuable information on geological and petroleum possibilities. The publication contains approximately 500 detailed logs with about the same number of summarized logs. They have been selected from virtually every county in the state. Also included is a large map showing the location and depth of the wells and the deepest formations encountered. Known structural axes and oil seeps are also shown. The logs are given by counties and are numbered consecutively, these log numbers being shown on the map.

Copies of "Selected Well Logs of Colorado" can be obtained by writing the Director of Publications, Colorado School of Mines, Golden, Colorado.

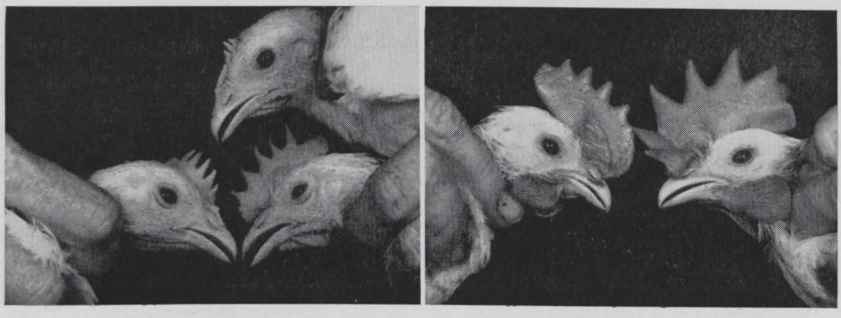
PROJECTS IN PROGRESS

Agricultural Research

Work being done at the Colorado Agricultural Experiment Station, Colorado A & M College.

Use of animal wastes as a possible source of certain hormones and other drug products Under the direction of Dr. F. X. Gassner, pathology and bacteriology section.

The aim of this project is to determine whether certain hormones might be obtained commercially from cow manure and cow urine. The hormonal substances are being extracted to determine if there is enough of these substances present in cow manure and urine to be a cheap source of hormones for treating both man and farm animals for insufficient male hormone secretions. The high economic losses suffered by the dairy and beef cattle industries due to animal sterility justify

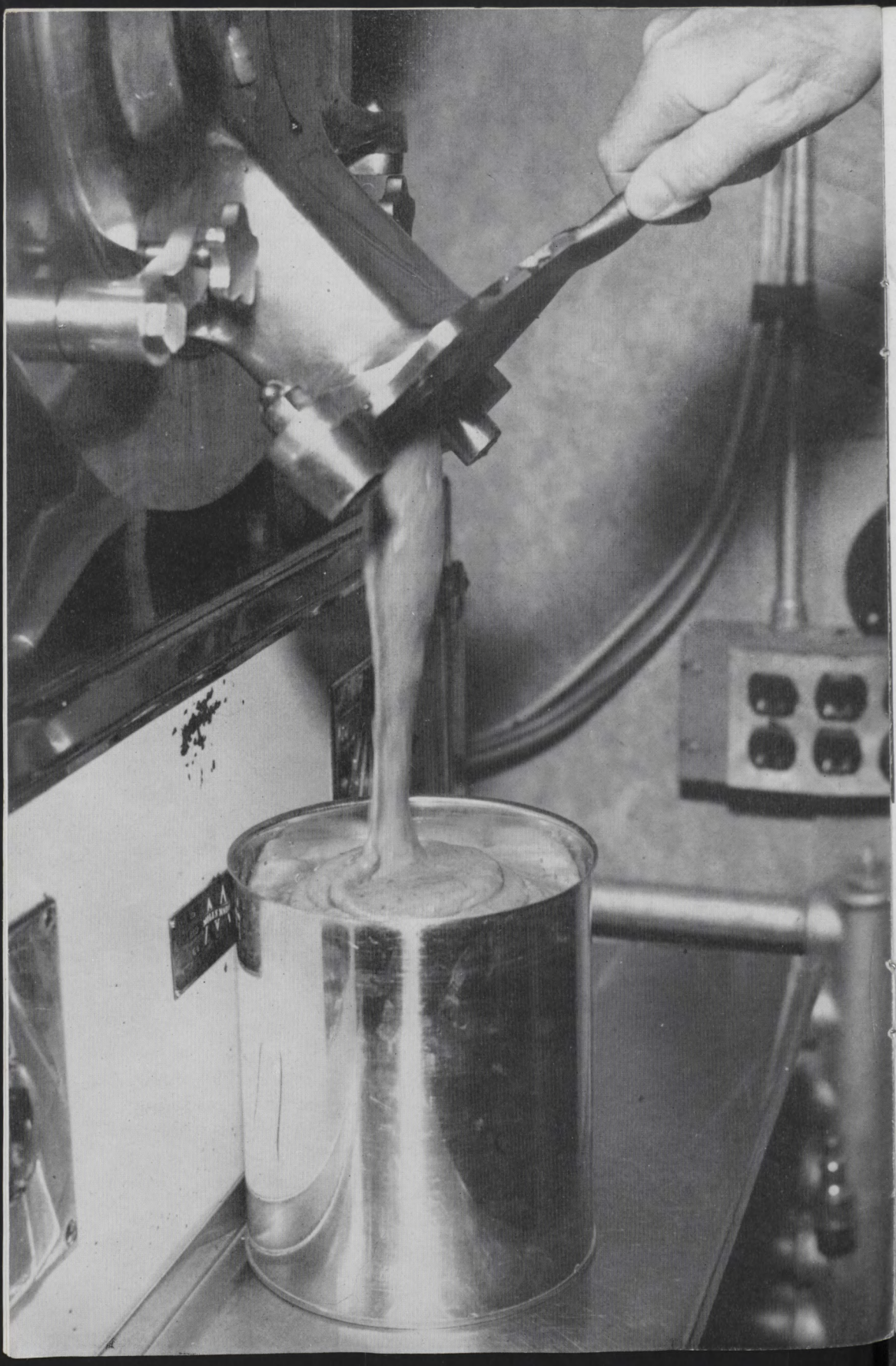


Effect of feeding cow manure on the chick comb. Left, chicks fed a normal ration; right, chicks whose ration has included 10 per cent dried cow manure.

the efforts to learn how to correct insufficient male hormone secretions with a cheap source of hormones.

In the experimental work, manure and urine have been separately collected from three mature, high-producing dairy cows, two of which were pregnant. The manure is dehydrated and ground, and the urine is stored for extraction. The dehydrated manure has been tested with 1,100 chicks and 60 castrated male rats to determine the nature and amount of hormonal substances present.

Experimental results to November 20 indicate a very high concentration of male hormone substance in the manure of pregnant cows. There is encouraging evidence that soon it may be possible to crystallize and identify these hormonal substances for the benefit of both man and livestock.



Extracts of feces from pregnant cows are being fractionated for crystallization and identification by Dr. B. B. Longwell, University of Colorado Medical School at Denver.

Use of fruit and vegetable wastes and culls in the manufacture of food specialties Under the direction of Dr. C. F. Metz, chemist in charge of industrial research.

The purpose of this project is to find ways to use in processed form Colorado's perishable fruits and vegetables which would not otherwise be marketable. The possibility for additional income for fruit and vegetable growers in certain areas of Colorado makes this problem of immediate importance.

Fresh peaches, cherries and cantaloupes have been quick-frozen and the frozen fruit is being used in making fresh-fruit ices or sherbets.

Two advantages have become evident from preserving fresh peaches, cherries, and cantaloupes by freezing: (1) The fresh, tree and vine-ripened taste and quality are preserved to improve the product made from them. (2) The fresh fruit season is extended, thereby continuing the demand and the market.

Satisfactory formulae have been developed for the use of fresh frozen cherries in a fresh fruit ice or sherbet. Progress is being made with peaches. The use of cantaloupes, however, in sherbets or ices seems doubtful, not only from the standpoint of a satisfactory product but also because of the high cost.

Business Research

Work being done by Bureau of Business Research, School of Business, University of Colorado, under the direction of Henry B. Moore, associate director, Bureau of Business Research.

Market survey of Pueblo wholesale trading area

This study seeks to determine the competitive position of Pueblo as a wholesale center in relation to other wholesale centers in Colorado and neighboring states, and to show how much of their potential market Pueblo wholesalers are now selling. Half of the cost of this project is being financed by the Pueblo Chamber of Commerce.

Fresh cherry sherbet, made from frozen cherries, coming from the freezer.

Researchers have interviewed Pueblo wholesale merchants to determine the extent of the market which they now serve. This market is now being compared with the potential market available to Pueblo distributors on the basis of rail and motor transportation systems and freight rates.

When completed the trade area study will include an outline of the area served, an analysis of the population of the area, an analysis of the purchasing power of the area, a survey of transportation rates and facilities, an analysis of the market's competitive position, and an estimate of the market potential.

Market survey of Grand Junction wholesale trading area

A similar study is being made for Grand Junction wholesalers with half the cost of the project being paid by the Grand Junction Chamber of Commerce. The study will cover the same points as the Pueblo study.

Market analyses of commodities which might be produced in Colorado

There are many commodities not now being produced in Colorado or which are being produced only in small quantities which might be profitably produced and marketed. First attention is being given to the study of markets for products where methods of manufacture do not require new engineering research. A number of products for study have been suggested and work is underway on several.

Leather Although more than 10,000 tons of raw hides originate in Colorado each year, there are no large-scale tanning or leather fabricating plants in the state. A study is now in progress to determine whether it would be practicable to establish leather tanning plants in Colorado. The study will include the raw material, labor, power, water, and financial requirements for a plant, and an analysis of the marketing of tanned leather.

Glass A glass bottle manufacturing plant is now being built in Denver, but as yet no satisfactory source of glassmaker's sand has been found in the state. The geology department of the University has suggested a number of deposits for sampling, and samples of three deposits are now being chemically analyzed to determine if they are suitable.

The Colorado Springs Chamber of Commerce is particularly interested in the possibility of establishing an art glass plant in Colorado Springs and has submitted samples of sand for analysis. When the analyses are complete, market studies

will be done on the economic practicability of establishing such a plant.

Other subjects In response to questions raised by many Chambers of Commerce throughout the state, the Bureau has given technical information on such varied products as wood novelties, pumicite for household abrasives, clay deposits, Vitamin D efficiency of Colorado sunlight, and by-products of coal.

Other products on which work will be done soon are wool scouring and the manufacture of wool products, the possible use of agricultural wastes for alcohol production (a joint project with the Agricultural Experiment Station, Colorado A & M College) and the production of wood pulp.

Engineering Research

Work being done at the Engineering Experiment Station, University of Colorado, under the direction of Dr. Carl W. Borgmann, director, Engineering Experiment Station.

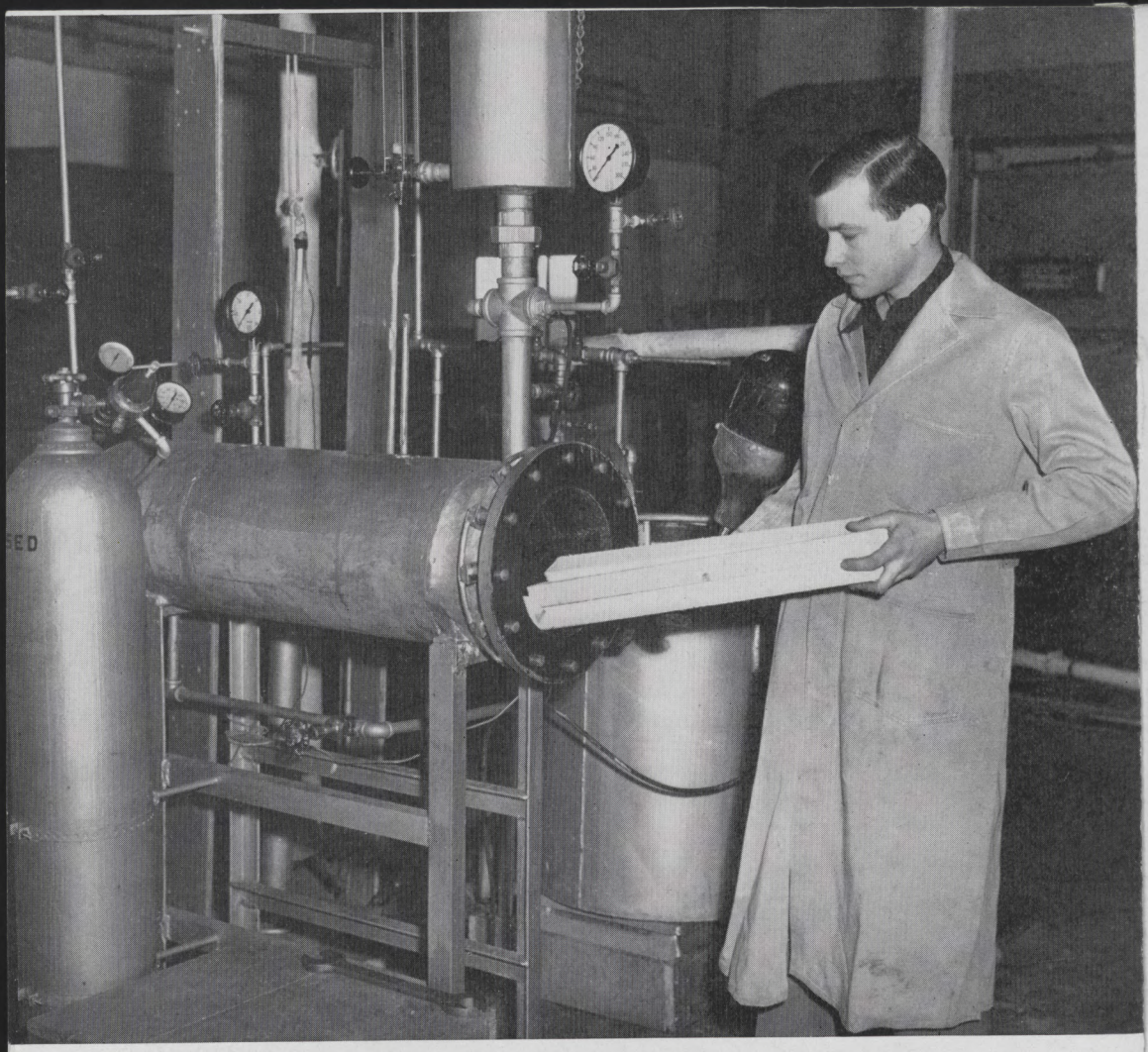
Soil studies of municipal airports in Colorado Project being conducted by William H. Thoman, professor of civil engineering.

Airport runways require engineering planning similar to highways, particularly in respect to the soil base on which they are laid. With Colorado communities planning to invest as much as $5,000,000 in airport facilities, it was felt desirable to set up a program of soil testing and engineering advice on the type of runway construction required.

Invitations to participate in the program were sent to all Colorado towns and requests for soil surveys have already been received from nine communities. Field work and laboratory testing are underway for surveys at five of these towns. Further sampling will have to wait now until good weather in the spring. Laboratory work, however, will be done this winter on samples already taken.

Resin impregnation of native timber Project being conducted by Dr. C. O. Reiser, assistant professor of chemical engineering, and John Corn, junior research engineer.

A recent development of the Forest Products Laboratory of the Department of Agriculture is a process by which plywood and thin sections of soft woods may be impregnated with synthetic resin solutions (like those used to make plastics) to give the woods properties similar to the common hardwoods.



Loading the pressure autoclave in which timber sections are treated with plastic resin solutions to give them the properties of hardwoods.

At the Engineering Experiment Station engineers are studying the use of these impregnants in native timber with the objective of opening a new market for Colorado lumber.

The apparatus for the experiments has been assembled and tests have begun to determine if heavy sections of native woods such as Englemann spruce and lodgepole pine can be impregnated. Preliminary results indicate that it may be difficult to get satisfactory impregnation in heavy sections, but little difficulty is expected with thin sections.

After the engineers have developed satisfactory procedures for the process, the Bureau of Business Research will study the economics of commercial production of treated timber.

Production of basic organic chemicals by the hydrogenation of coal Project conducted by C. H. Prien, assistant professor of chemical engineering.

New processes involving the use of coal as a raw material for chemical production might well open new markets for the coal industry of the state and lead to the establishment of a new chemical industry in Colorado. Hydrogenation or liquefaction of coal results in liquid fuels similar to gasoline and many useful chemicals. This project will study the production of several groups of chemicals which might be produced by the hydrogenation of Colorado coals. These chemicals already command a wide market and more will be required as their plastic, lacquer, and solvent uses increase.

The work to date has included the preparation of a bibliography of the pertinent technical data already published, a survey of Colorado coals to select the types which will be used in the tests, and the construction of an explosion-proof area for the high pressure equipment which has been ordered. Two-foot sand barricades and one-quarter inch thick steel plates will protect the operators while the equipment is operating at high pressures (up to 6,000 pounds per square inch).

Effect of altitude on lighting flashover of power line insulation Project conducted by F. A. Eastom, professor of electrical engineering.

Lightning is the cause of the majority of interruptions on electric power systems. At high altitudes lightning effects are more intense and equipment must be more heavily protected. This study is to determine correction factors by means of which the rating of high voltage equipment for high altitude operation can be definitely established.

Using the million-volt lightning generator in the University's electrical engineering laboratories, this study has been underway for several years and a considerable amount of useful data has already been obtained. The Industrial Development Research Board is partially financing the work for another year and has purchased some new equipment for the studies.

Data from this project are expected to help power engineers reduce the cost of operating power systems in Colorado, and to help them prevent fires that result when lightning follows a power feeder into a house or building.

Petroleum Research

Work being conducted at the Colorado School of Mines under the direction of Prof. Clark F. Barb, head of the department of petroleum engineering, and an advisory committee of Dr. F. M. Van Tuyl, head of the department of geology; Prof. Clark B. Carpenter, head of the department of metallurgy, and Dr. Ben H. Parker, associate professor of geology.

Selected well logs of Colorado

This project has been completed. The results have been published and are available for distribution. A description of the work appears on page four.

Underground storage of gas

In many eastern states, natural gas is stored underground to supplement pipeline supply during emergency periods. This is a study to find suitable underground gas storage locations near Denver or Pueblo or both.

Some work has been done on this project through a study of well logs and structural geology, in addition to the water conditions in the sands of the districts.

Collecting, indexing, and study of Colorado well samples

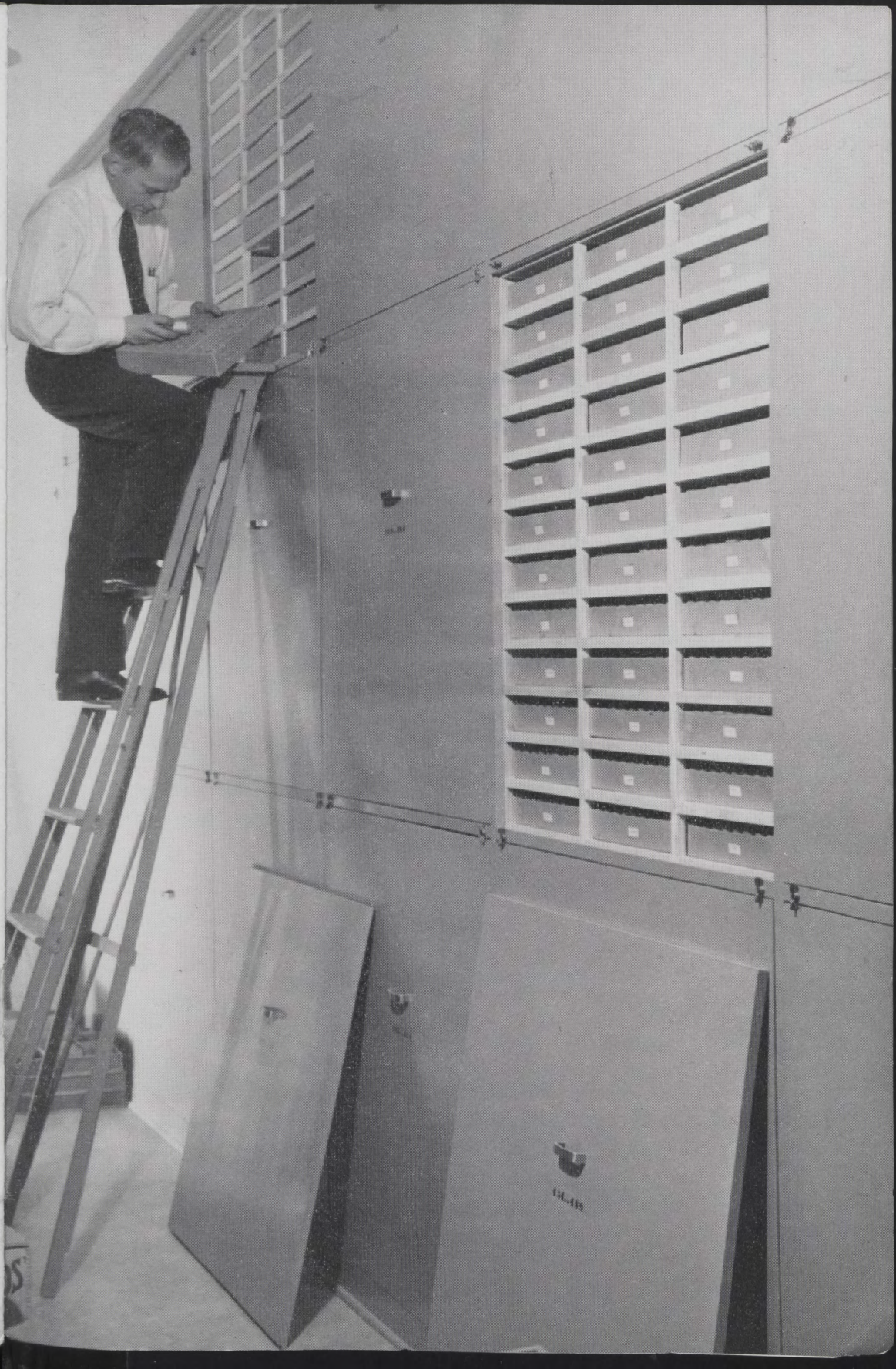
The department of geology at the School of Mines has over 160,000 samples from many hundreds of wells, and although a few of them have been classified and indexed, the bulk of the work is yet to be completed.

This project is well under way and a publication giving the results of the work may be expected within a few months. The publication will consist of a list of the samples with an index. The samples will be available for study by geologists and others exploring for petroleum.

Collection of well cores

This is a continuing project of collecting and storing well cores to make them readily available for reference. The study will show the physical characteristics and fossil content of the formations, important for estimating oil reserves and future rates of recovery. The U. S. Bureau of Mines has agreed to

A portion of the room in the department of geology, Colorado School of Mines, devoted to the storage of cuttings and cores from wells drilled for oil and gas. The collection offers wide opportunity for research on the accumulation of oil and natural gas.



furnish cores of all wells drilled on the Rifle project for the purpose of getting information on the oil shales of that district.

Collection of electric well logs

This project is conducted in conjunction with the well-log study and well-sample collection. Through the splendid cooperation of oil companies and geologists, this supplementary aid in evaluating petroleum fields is almost complete to the present time.

Subsurface correlation study

This project would be a continuation of the study and correlation of well cuttings. No work will be done on it until the school is able to obtain personnel properly trained for this research.

Bibliography of all articles on the Colorado oil industry

This project would lead to a better understanding of the production, refining, transportation, and marketing needs of the state. It is still in the planning stage.

Hydrocarbons of western Colorado

No active work has yet been done on this project which would be a study of the solid and semi-liquid hydrocarbons of western Colorado, including oil shale, with particular reference to their geological and geographic occurrence and their chemical composition. Some laboratory work would be done to determine the composition and physical characteristics of these materials. Certain of these hydrocarbons have peculiar characteristics that may have great industrial value.

FUTURE RESEARCH

As some of these projects are completed, experienced research personnel and funds will be available for further research studies. A number of new projects are already scheduled, but other subjects would be considered.

Under the terms of the act establishing this program, "Any individual, group of individuals or company, civic organization, agricultural, mining, manufacturing group and educational institution may request, in writing, that specific re-

search be undertaken to determine methods and feasibility of industrial development, processing and marketing of a given raw material, finished or semi-finished product of the state." All such requests are considered by the advisory committee when they make their recommendations for new projects.

Suggestions or requests for research studies are invited. They should be sent to:

Roy M. Green, Chairman
Colorado Industrial Development Research Board
Colorado A & M College
Fort Collins, Colorado