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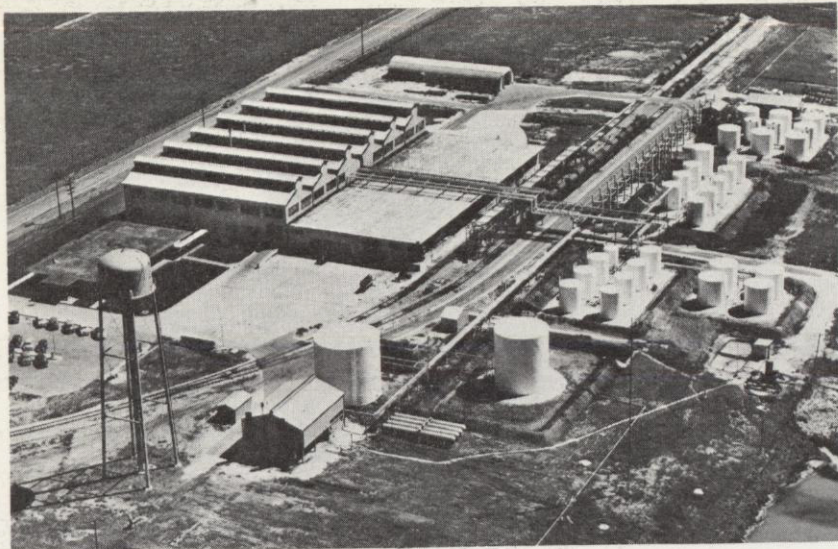
## FOREWORD

Since its founding in 1928, The Lubrizol Corporation has kept pace with the growth of the petroleum industry through the development and manufacture of chemical additive agents for all lubrication requirements. This booklet has been prepared to show you the functions of the various departments comprising Lubrizol. It will acquaint you with our facilities for research, development, and production, and give you an overall view of the company's services.

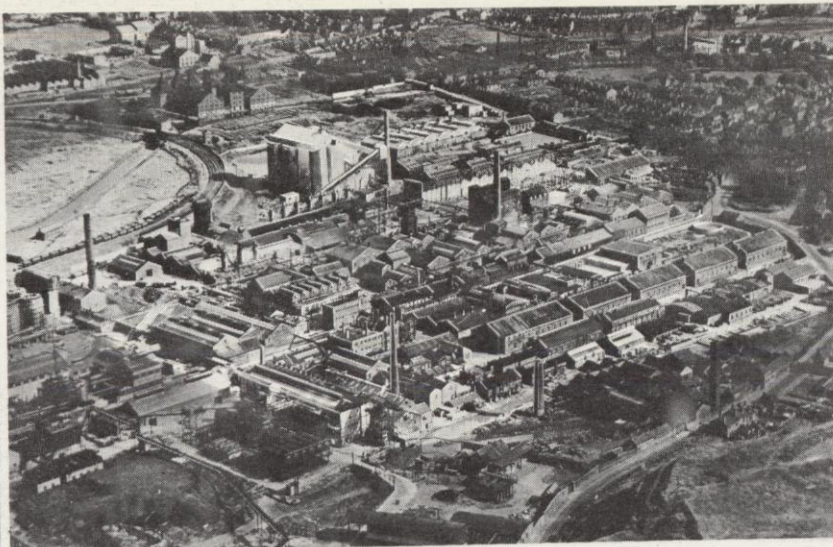
THE LUBRIZOL CORPORATION

*Cleveland, Ohio* ★ *Houston, Texas*

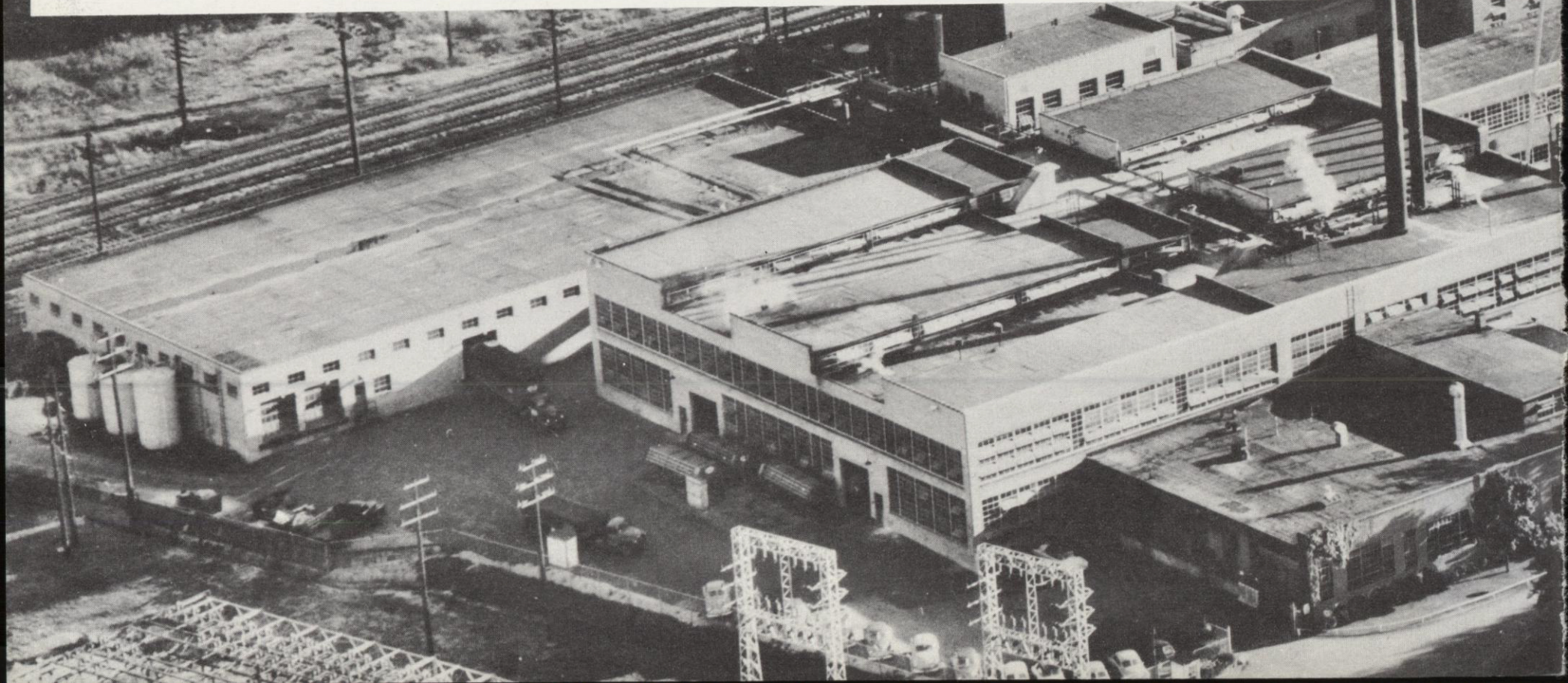
ANGLAMOL, LIMITED, *London, England* ★ LUBRIZOL OF CANADA, LIMITED, *Niagara Falls, Ontario*

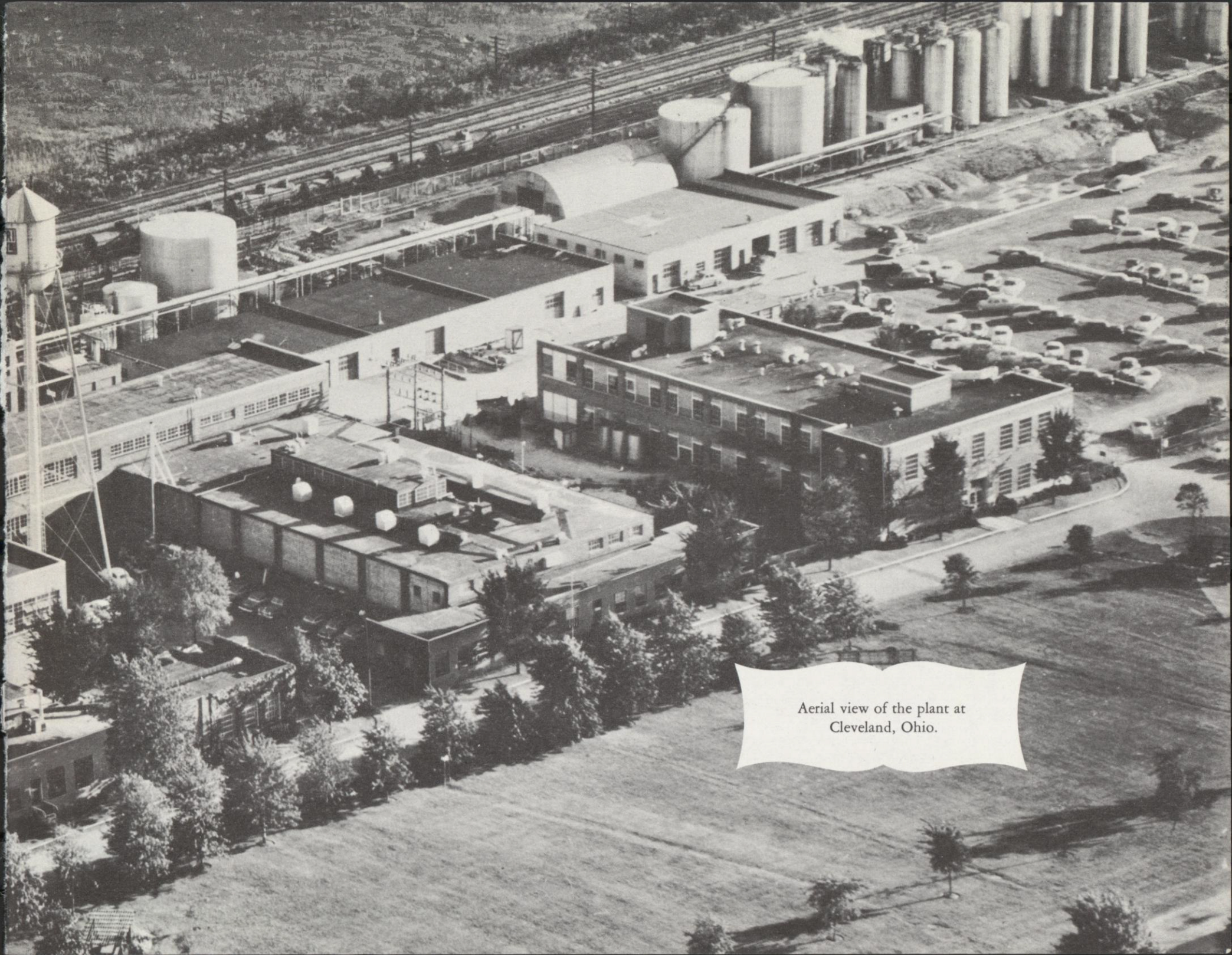


Manufacturing Unit at Houston, Texas.



Manufacturing Unit in Oldbury, England, where Anglamol's products are made.





Aerial view of the plant at  
Cleveland, Ohio.



## THE CHEMICAL RESEARCH LABORATORY

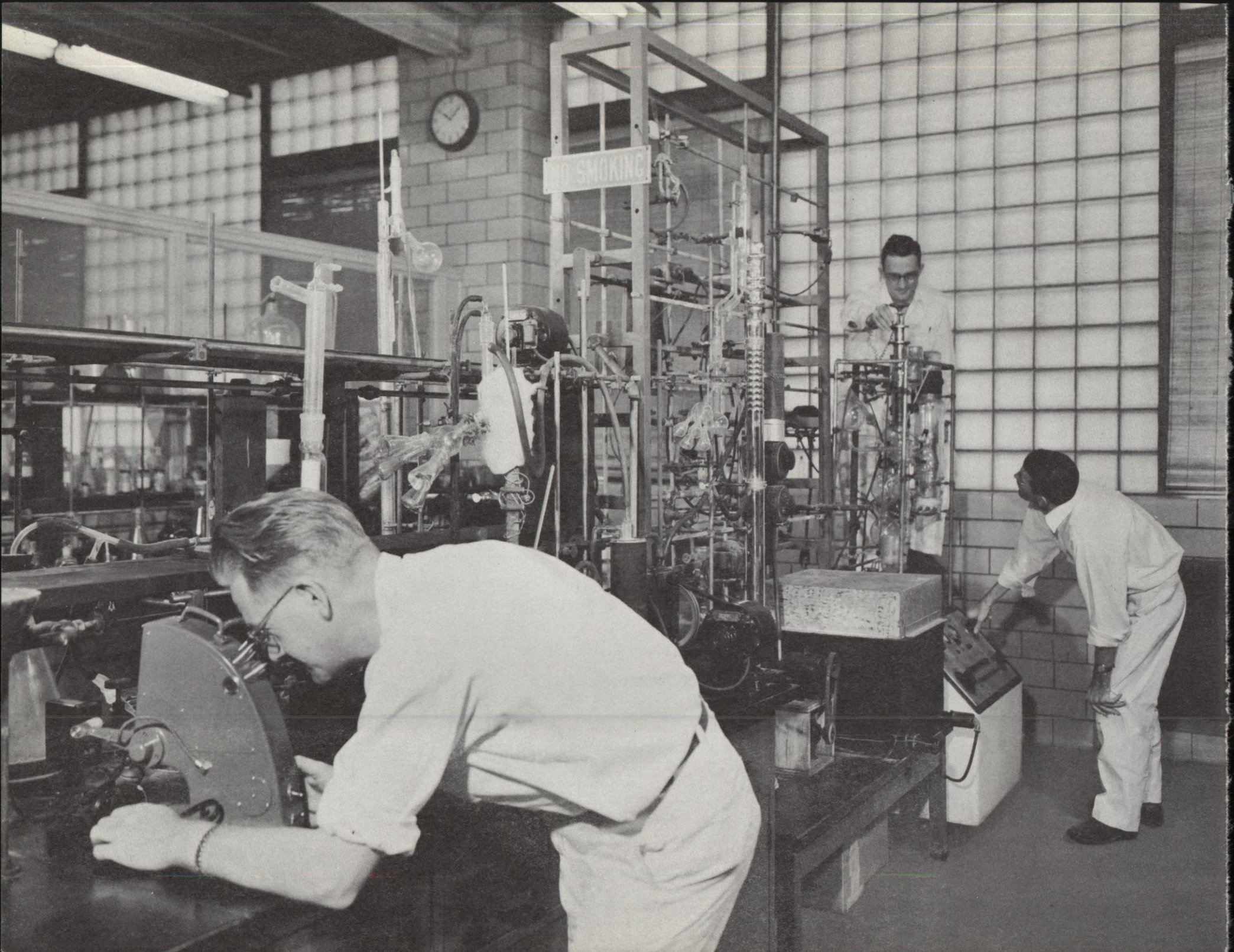
The process of developing a new additive or of evaluating an additive-treated lubricant begins in the chemical laboratories.

In the search for better additives, groups in this department are at work on many problems extending from long range development of basic chemical compounds to synthesis of small quantities of known additive types.

Oils are given initial identification tests for viscosity, viscosity-index, color, pour-point and other characteristics. The oil is then treated with an additive or

combination of additives designed to achieve the performance desired and the blend is tested to determine whether all its components are compatible and if any changes in the physical properties of the original oil have occurred.

As the treated oil progresses through small and full scale engine tests, another group analyzes drain oil samples for variations in carbon residue, viscosity, insolubles and other characteristics. Only by such thorough appraisal is it possible to produce a lubricant with the best combination of desirable properties.

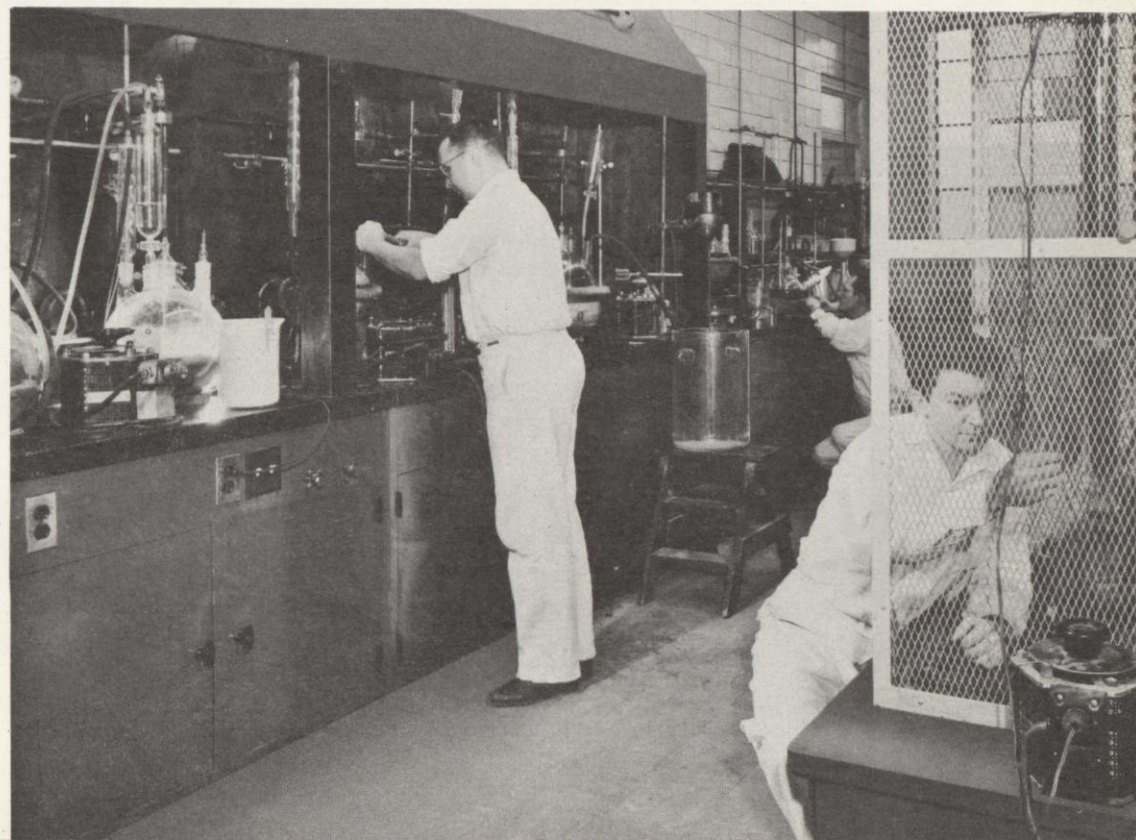
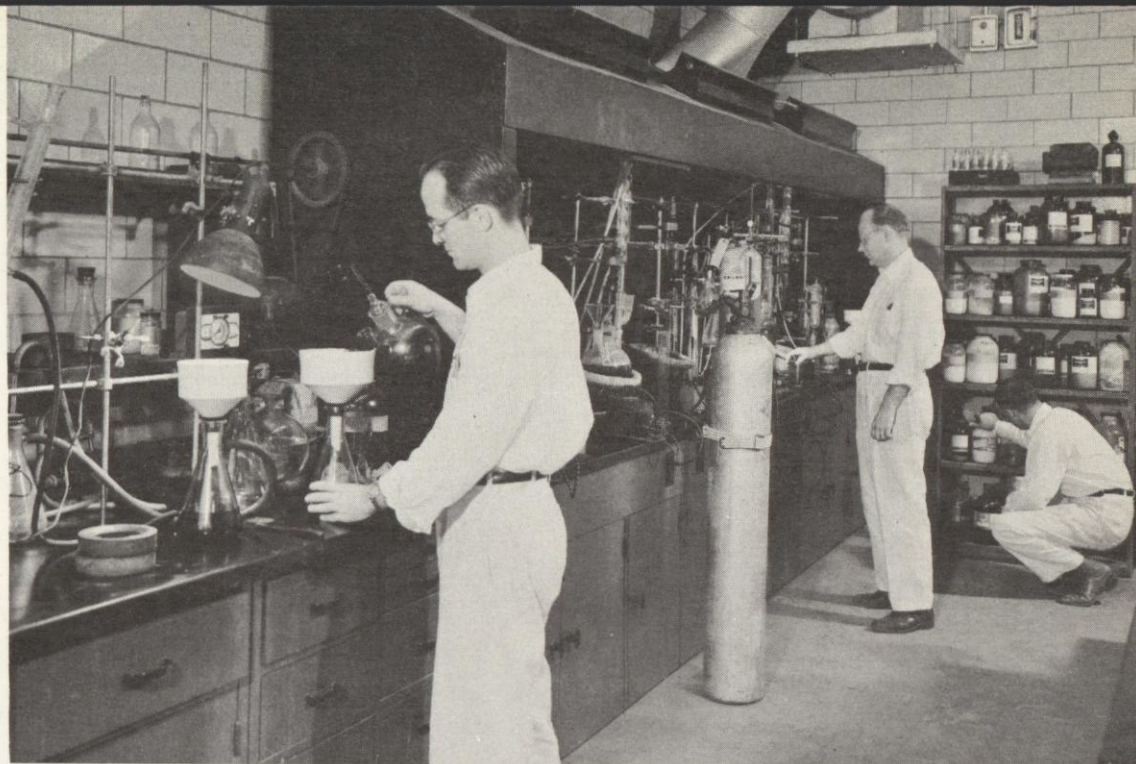




◀ The search for better additives begins in one of these laboratories. Apparatus shown on the opposite page is typical of that used in synthesizing organic compounds.

In another part of the laboratory this group brings future product development one step nearer engine testing and manufacturing. ▶

New additive types are made by this group in sufficient quantities to treat lubricant samples for engine tests. Apparatus used here is similar to that found in our other research laboratories, except the equipment is on a larger scale. ▶





Identification of base oil characteristics, both physical and chemical, is a necessary preliminary step in the selection of the proper additive treatment.

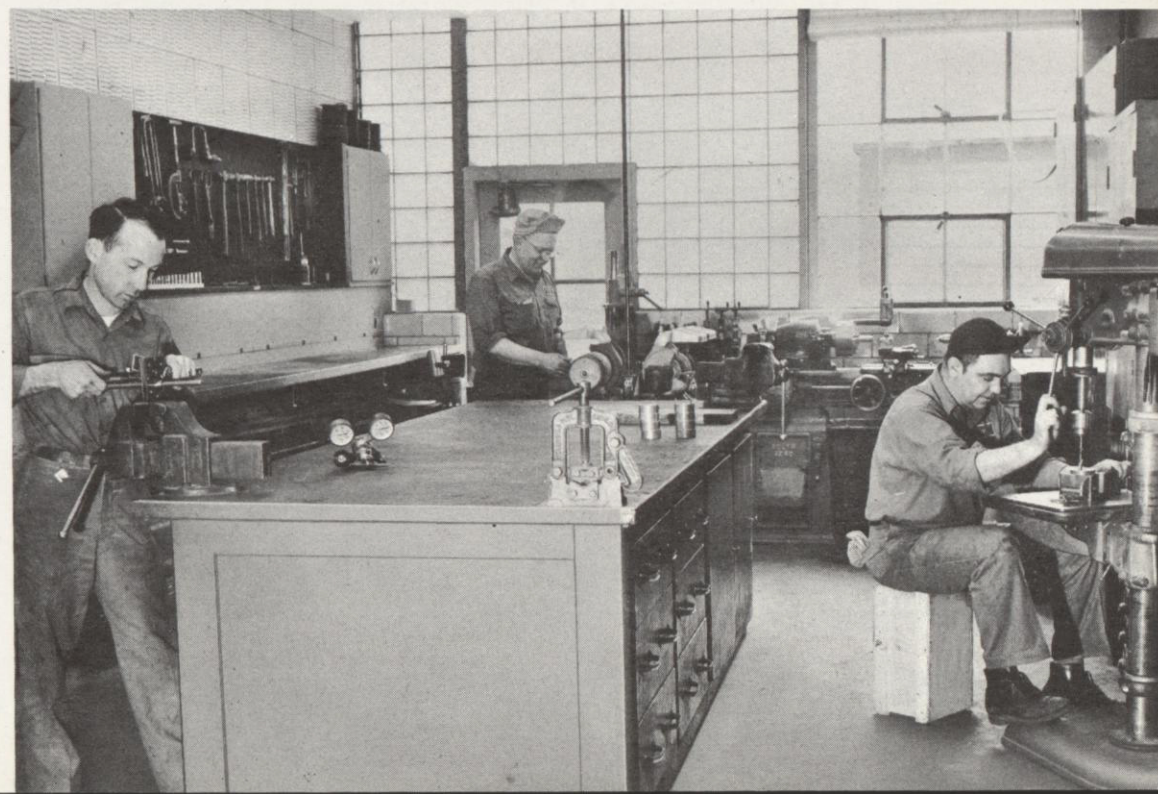


In this part of the laboratory analyses are made on individual chemical compounds and on blends of additives with lubricating oils.

Complete stocks of laboratory equipment and chemicals are available. Samples of base oils are also stored here for use in blending small quantities for engine tests. After testing, drain samples are retained for future reference.



Equipment necessary for special research problems is quickly fabricated in this complete maintenance shop.





## THE MECHANICAL TESTING LABORATORY

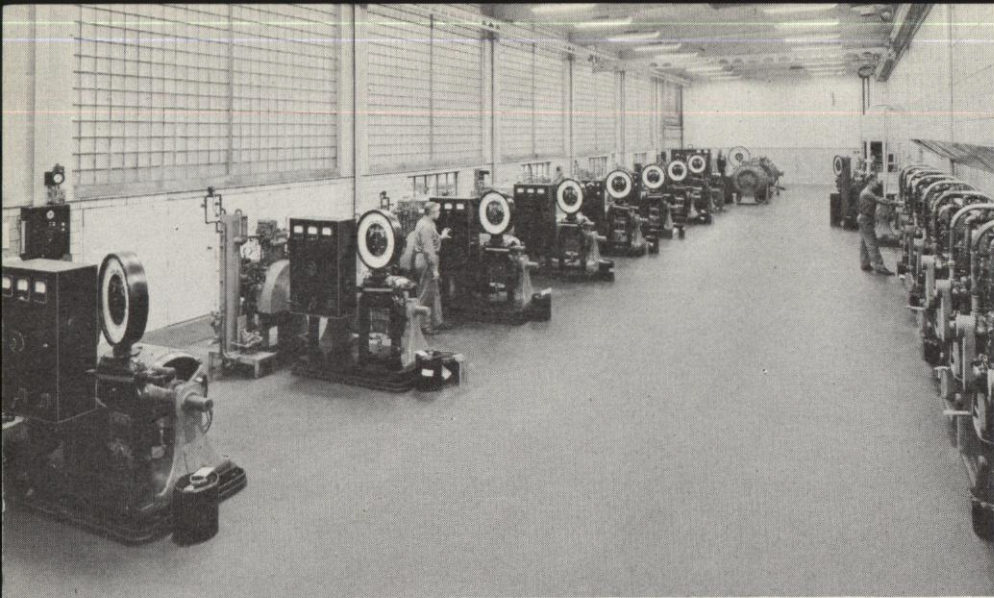
Additive treated oil samples are tested in small and full scale equipment under closely controlled conditions.

Experience shows that the correct amount and type of additive treatment for one oil often will not be equally satisfactory in another one. Each oil and additive combination must be evaluated separately.

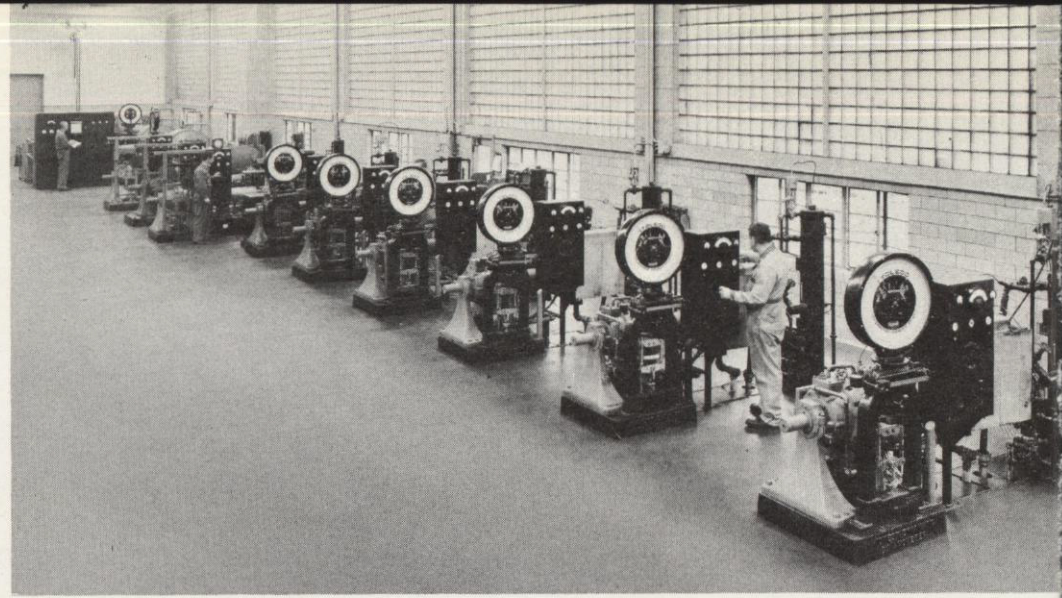
Frequently, extensive testing is necessary with various additive combinations to develop a balanced lubricant with the most desirable properties. The only reliable method for determining the exact treat-

ment needed to accomplish the desired result is to conduct tests in full scale equipment, both in the laboratory and in fleet operations. Only in this way can practical data on the effectiveness of additive treatments be accumulated.

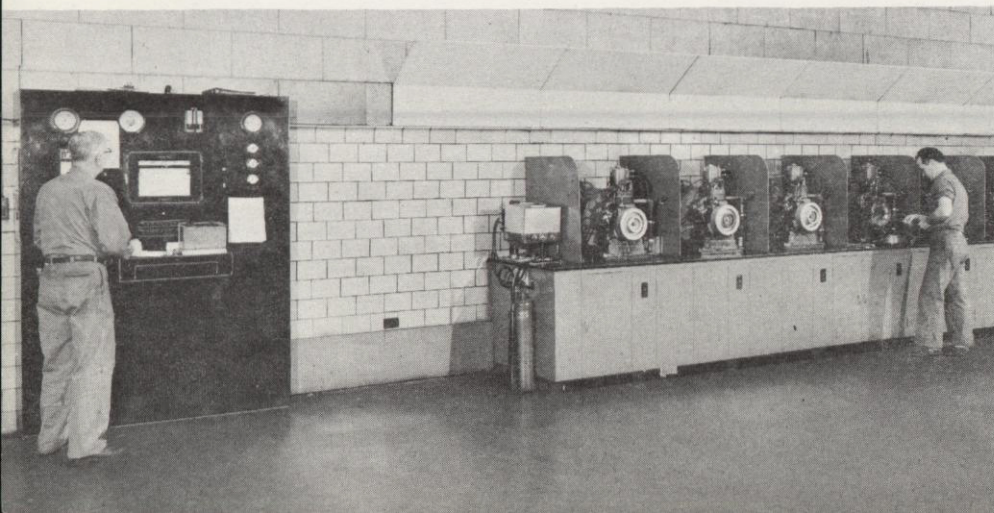
The final proof of the quality of any lubricant is demonstrated by results obtained in actual service. However, laboratory engine tests, under accelerated conditions, give useful and valuable indications of lubricant performance.



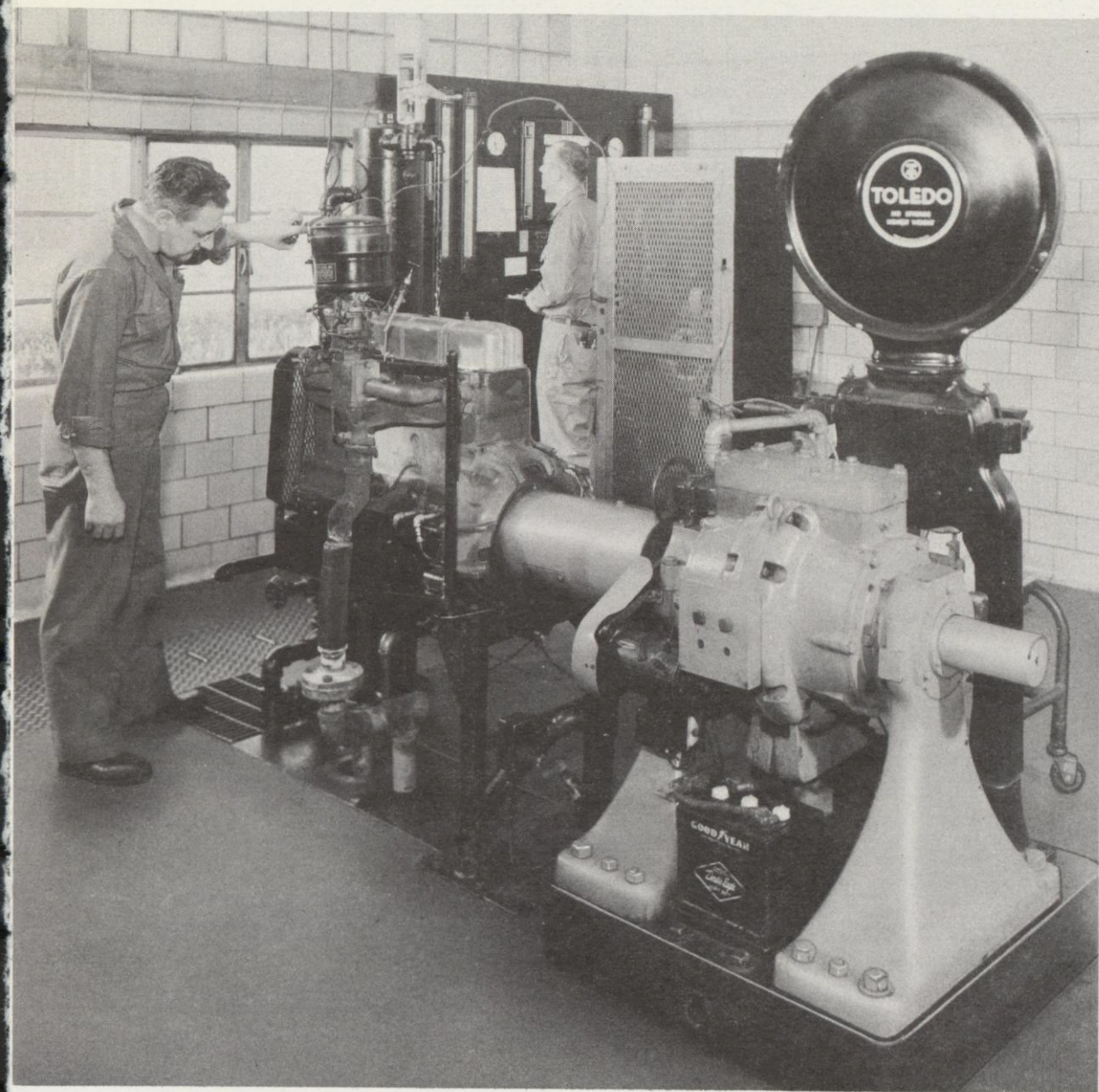
This section of the laboratory shows small and full scale diesel test engines in the foreground. In the far left background is a rear axle installation used for testing gear lubricants.



Another section of the Mechanical Testing Laboratory is devoted mainly to motor oil testing in gasoline engines. On the right is a line of passenger car engines for full scale testing. Several installations used to obtain additional information can be seen in the background.



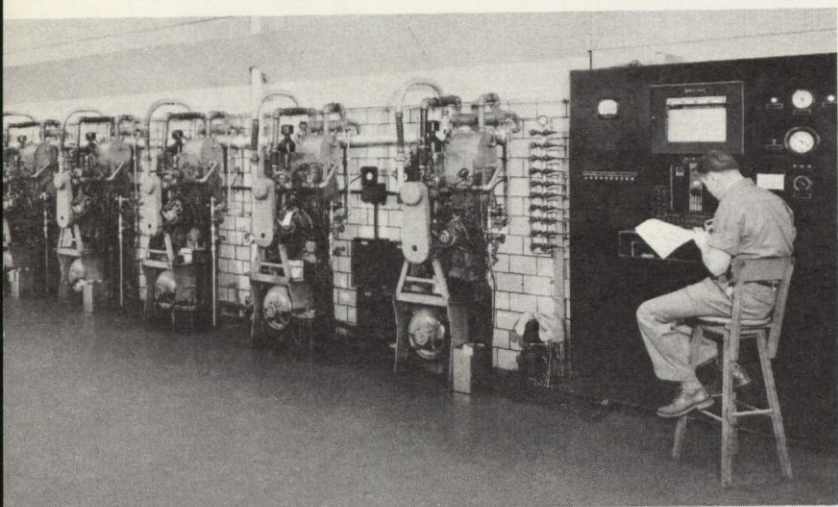
Lauson engines are being used in preliminary testing of oils for bearing corrosion and deposit forming tendencies. The automatic recording panel at the left maintains close control over water and oil temperatures.



Oils passing the preliminary screening investigation are next subjected to a high speed, high temperature, 36-hour test in an automobile engine. This test, designated the CRC L-4, is one of the most widely used and recognized methods of evaluating the oxidation stability and bearing corrosion characteristics of engine crankcase oils.

The procedure involves the operation of a Chevrolet engine at constant speed and load for a period of 36 hours. Before the test is started, the engine is cleaned thoroughly, new piston rings, and two new weighed copper-lead bearings are installed.

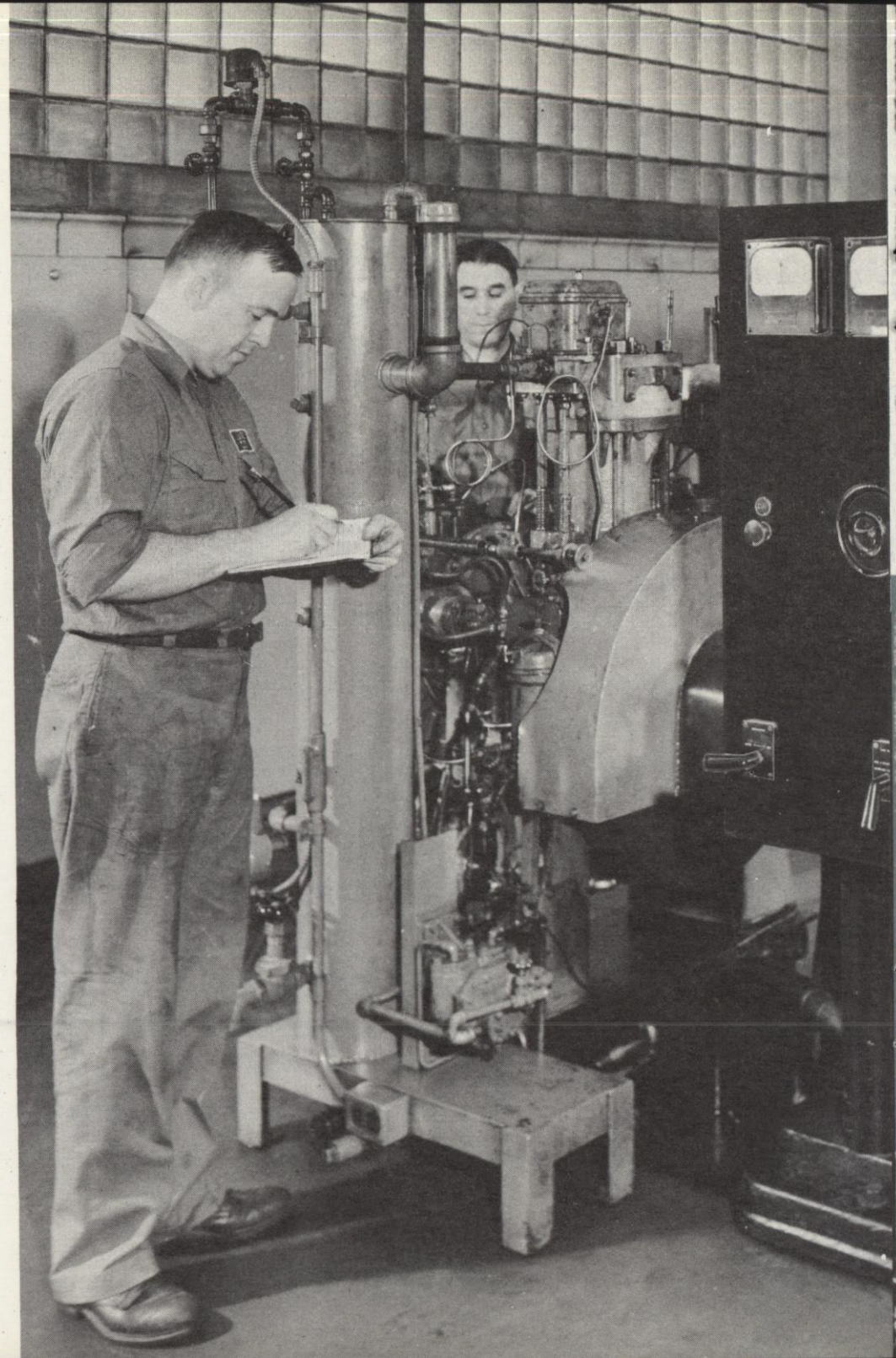
At the completion of the test, the engine is examined according to a numerical rating system for deposits and the copper-lead bearings are again weighed. The combined engine inspection data plus bearing weight loss is taken as a measure of the oxidation stability and bearing corrosion characteristics of the oil.



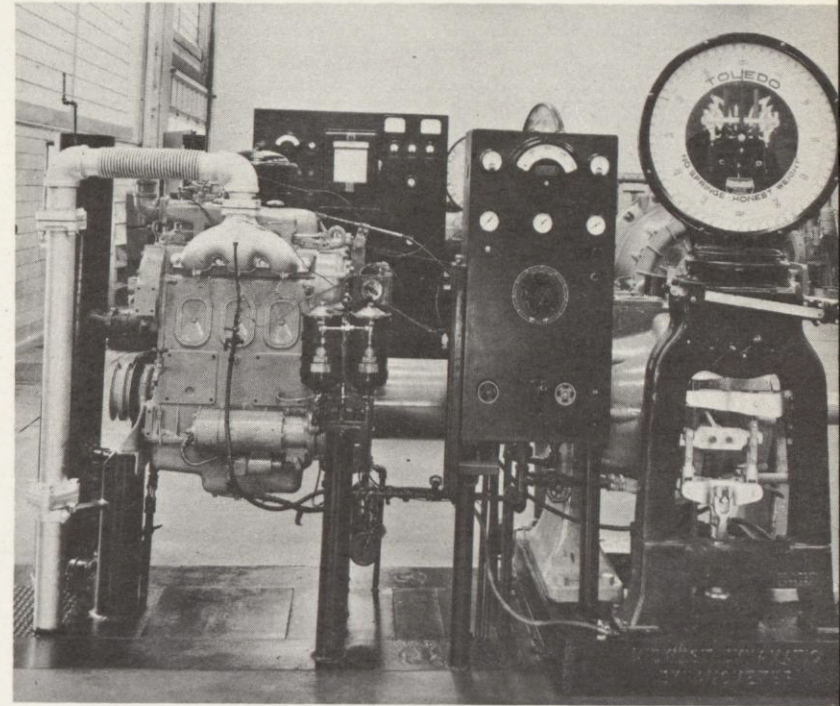
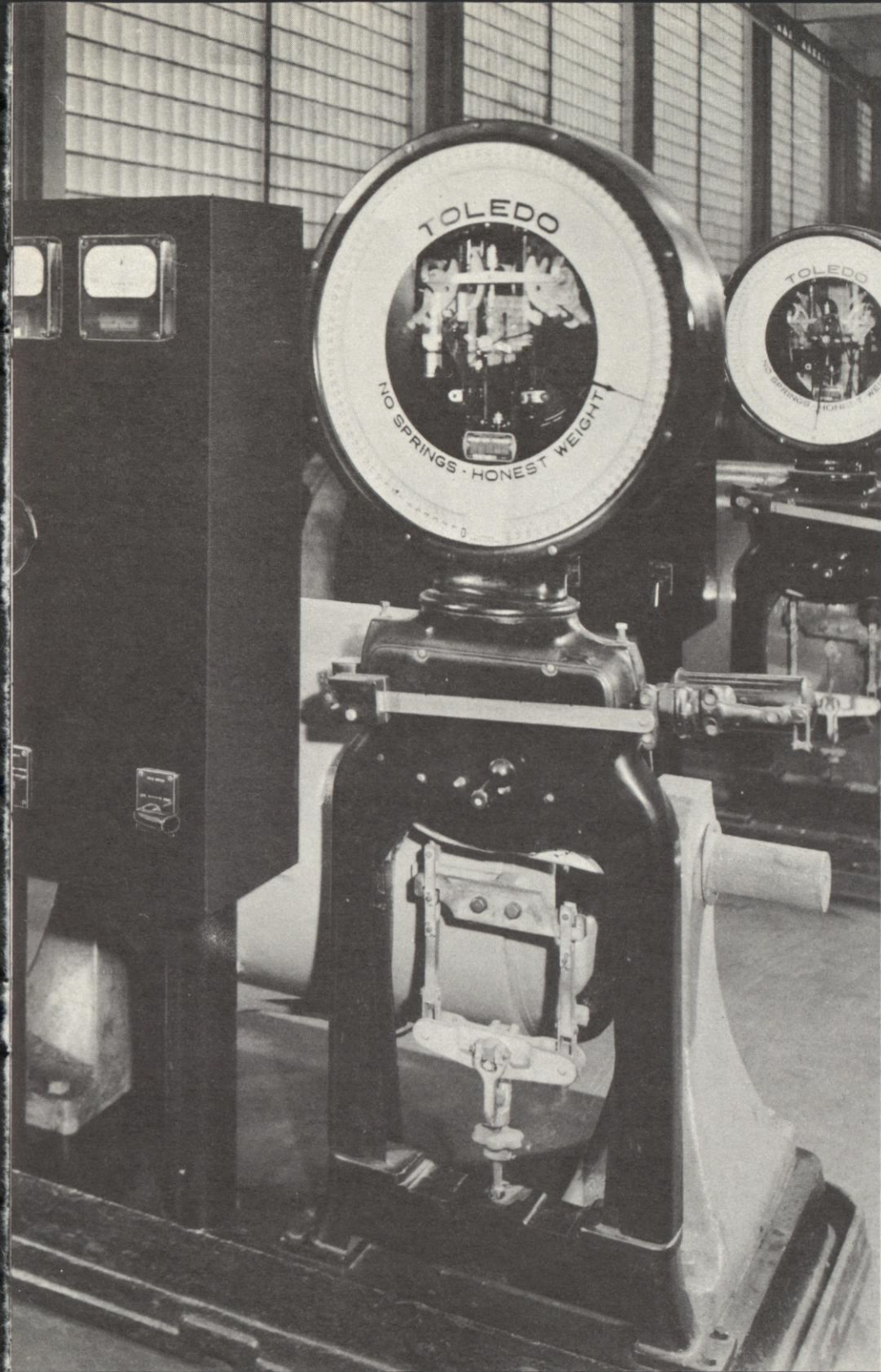
↑  
Preliminary evaluation of the detergent qualities of heavy duty motor oils is obtained with these Buda diesel engines. Test procedures of 100 hours duration provide information which correlates closely with full scale test results.

A series of diesel engines, one of which is shown here, is used to determine the detergent qualities, ring sticking tendencies, and other characteristics of heavy duty lubricating oils. The engines are operated for a period of twenty days with only three brief shutdowns for oil changes. →

At the completion of the test, the engine parts are carefully inspected in order to obtain an evaluation of the lubricant.



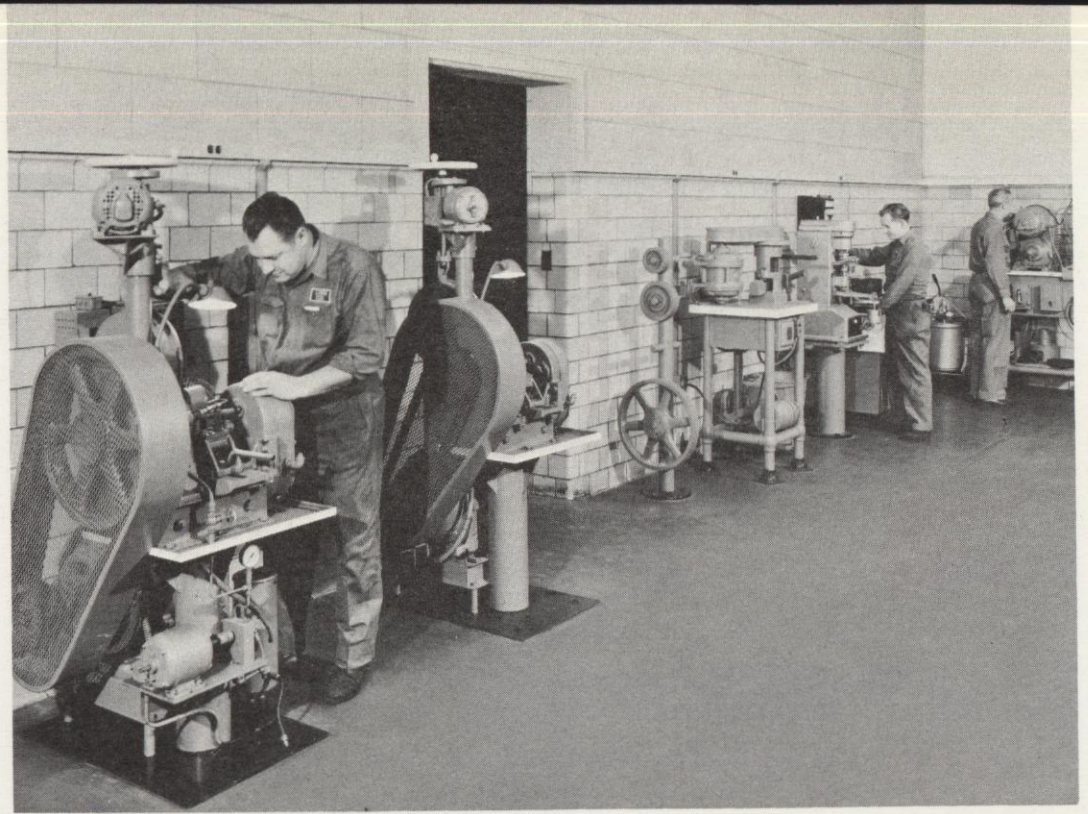




▲  
This two-cycle diesel engine provides performance characteristics which differ from those experienced in four-cycle engines.

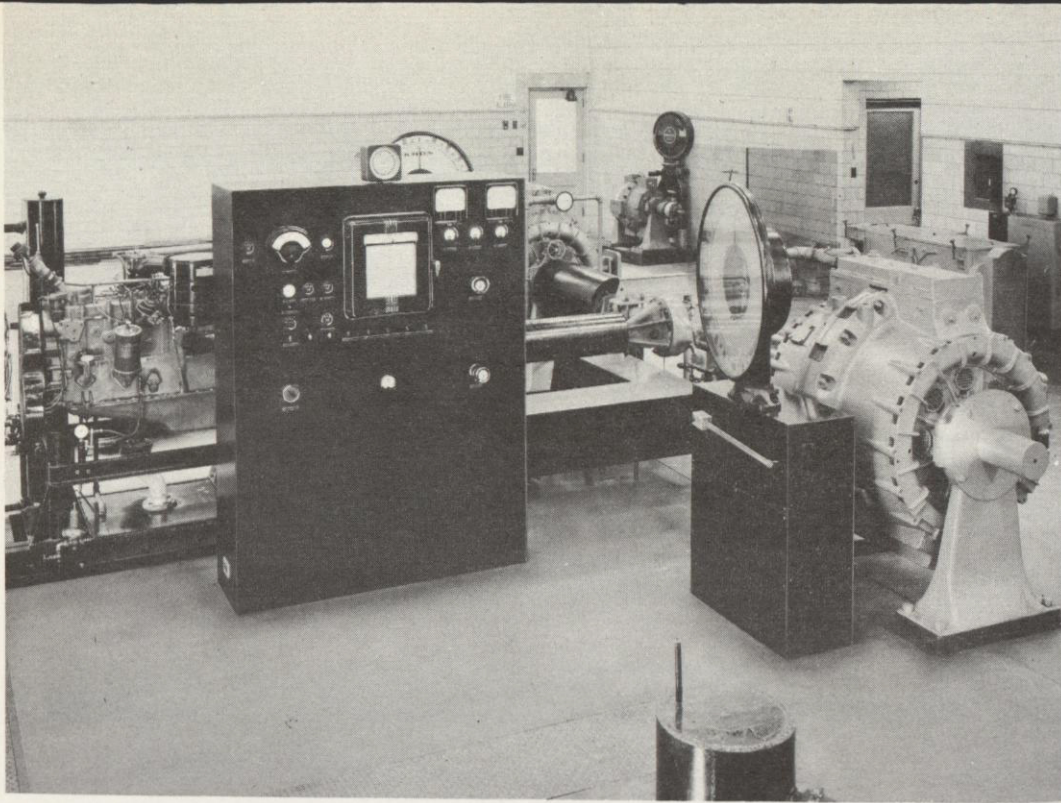
Rear axle lubricants are tested in a variety of equipment some of which is illustrated on these pages.

First, film strength machines of types widely used in the industry provide preliminary information on gear lubricant qualities.

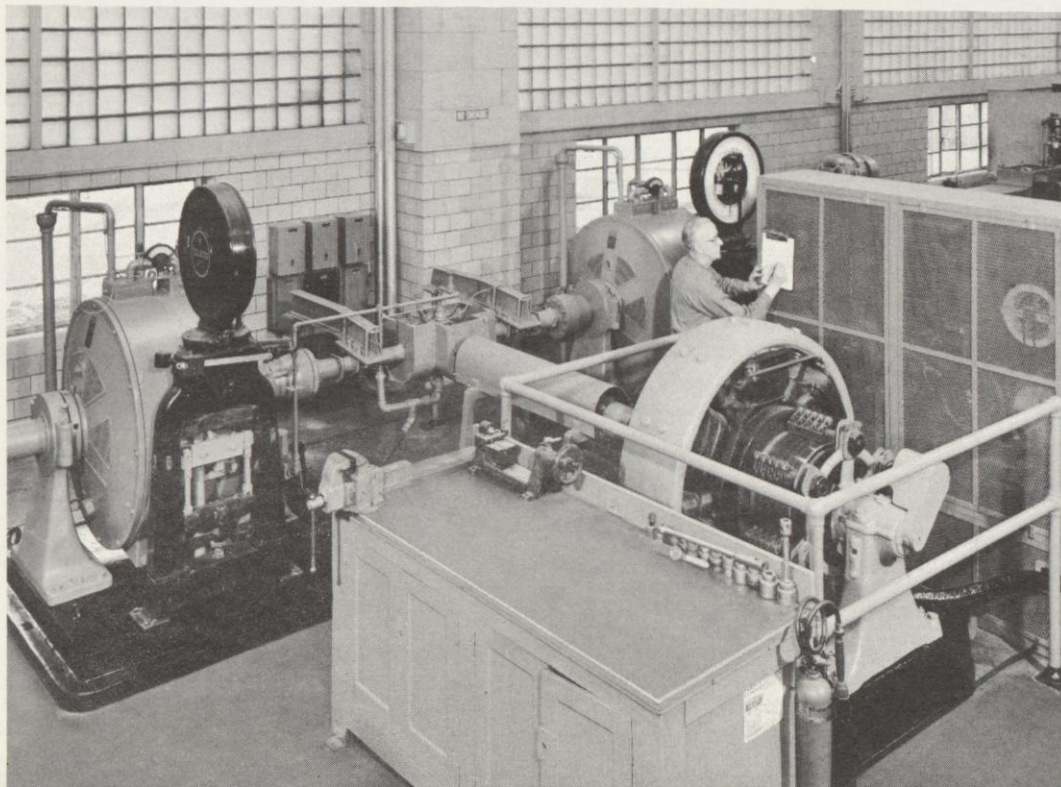


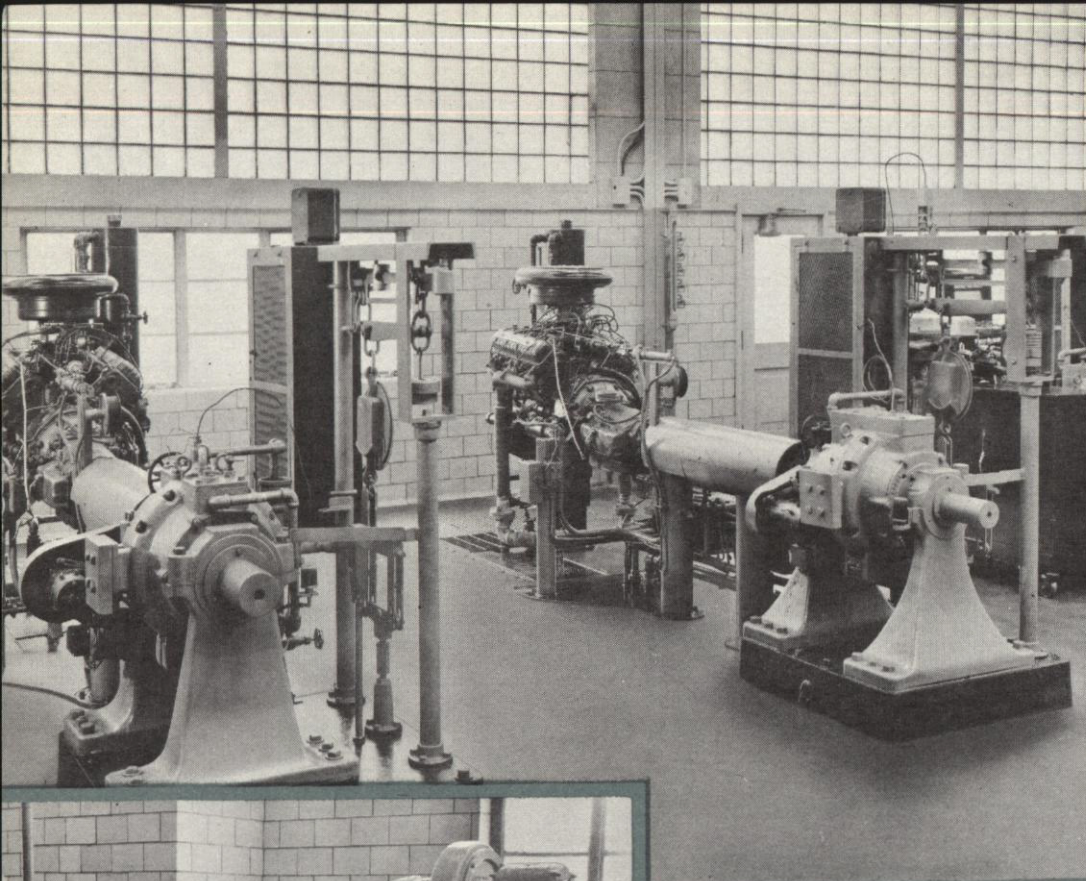
A chassis dynamometer is used for high speed cycling and the application of shock loads.





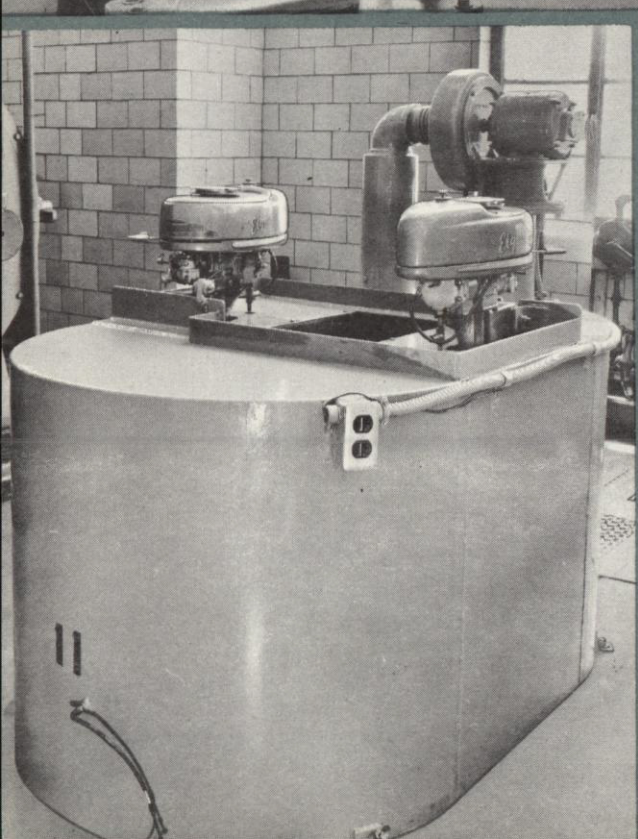
Heavily loaded axle test equipment is shown on this page. These tests simulate field service over a wide range of speed and load conditions for both trucks and passenger cars.



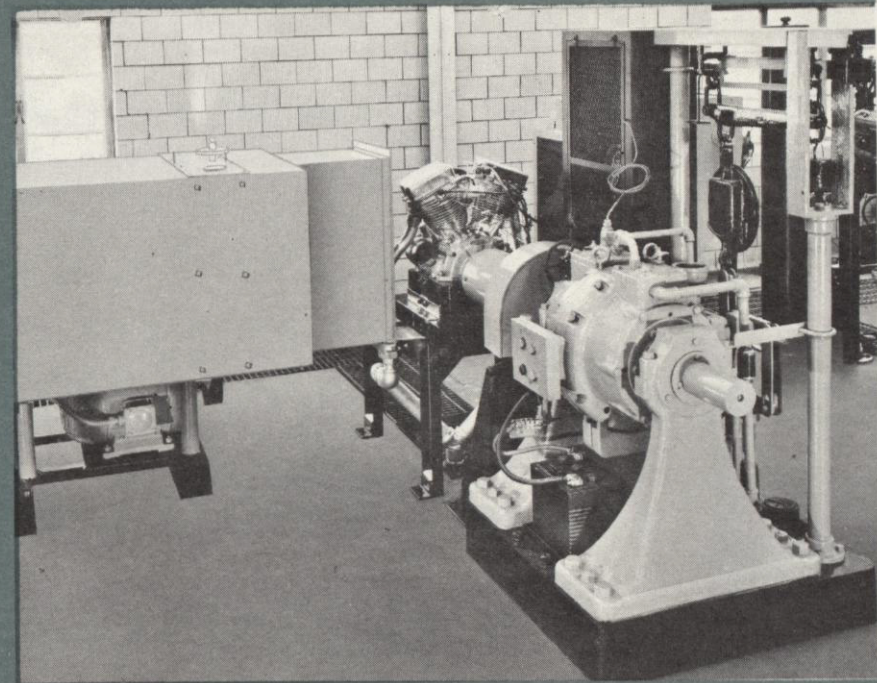


The problems encountered in lubrication are as varied as the types of equipment in use. Only by intensive investigation of each problem can an oil with suitable properties be developed.

◀ One test in the development of automatic transmission fluids having improved performance properties makes use of these hydramatic transmission units. The engines driving these units are also used to study the effects of motor oils on combustion chamber deposits.

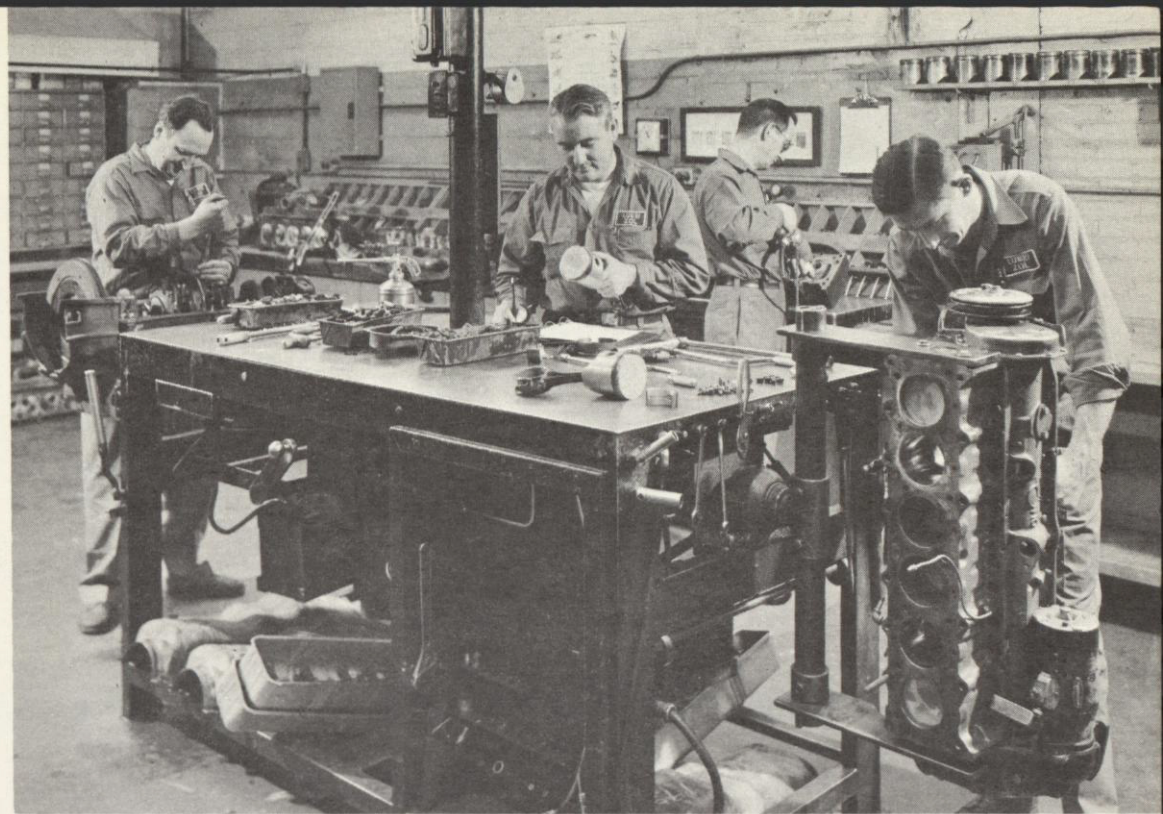


◀ Air and water cooled outboard engines are used to determine lubrication requirements in this type of service.



This motorcycle installation is used to investigate lubrication problems in high temperature, air cooled engines.

Engines are disassembled at the conclusion of each test and parts are inspected. A sample of the drain oil is returned to the Chemical Research Laboratory to be checked for changes from original characteristics. Engines are then cleaned, measured, and rebuilt with new pistons, rings, and bearings.



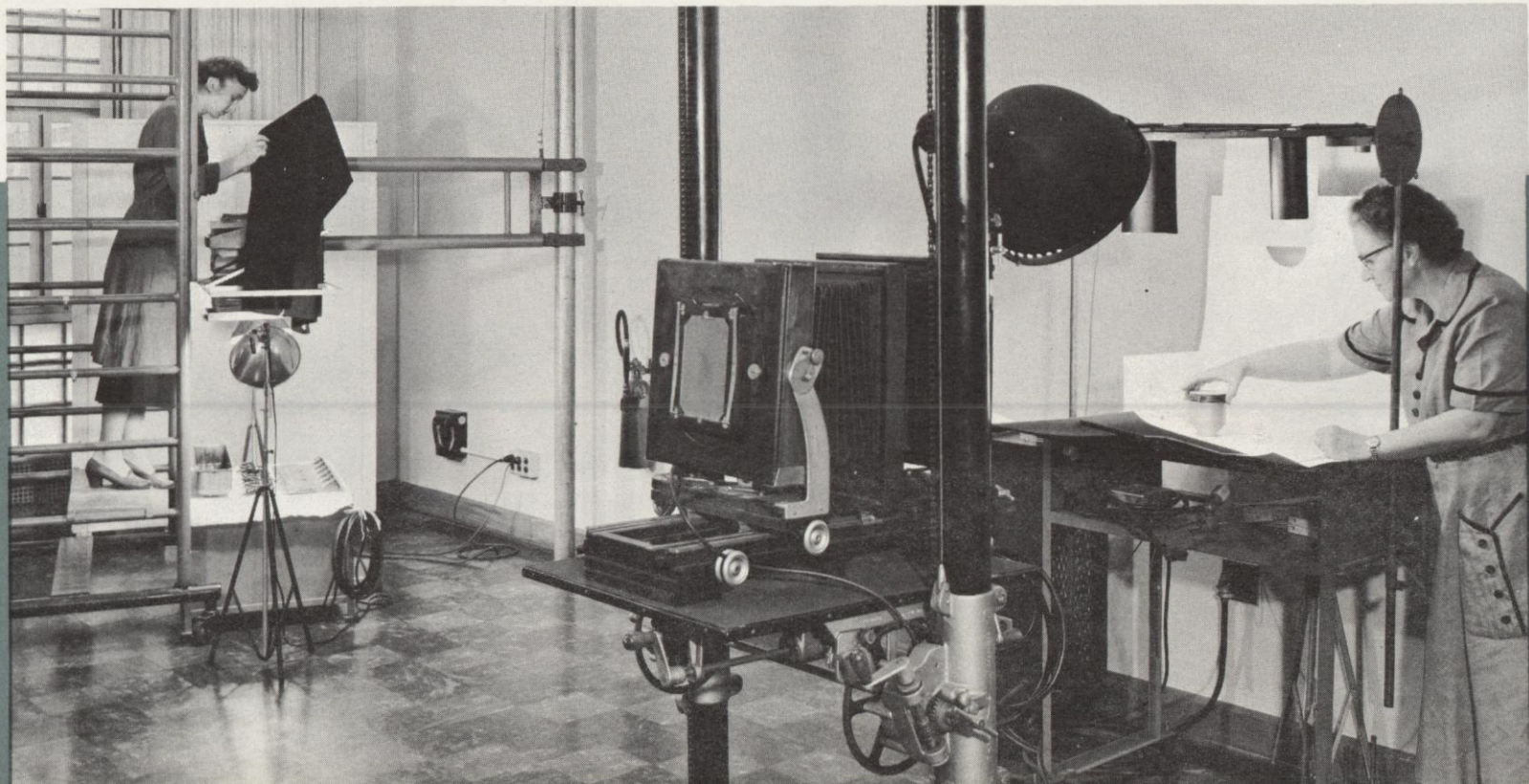
All bearings used in the laboratory are accurately weighed before and after each engine test. Weight loss of these bearings determines the ability of the lubricant to prevent corrosion.





◀ All test parts are examined by experienced technicians. After inspection, these parts are marked, cataloged, and stored for future reference.

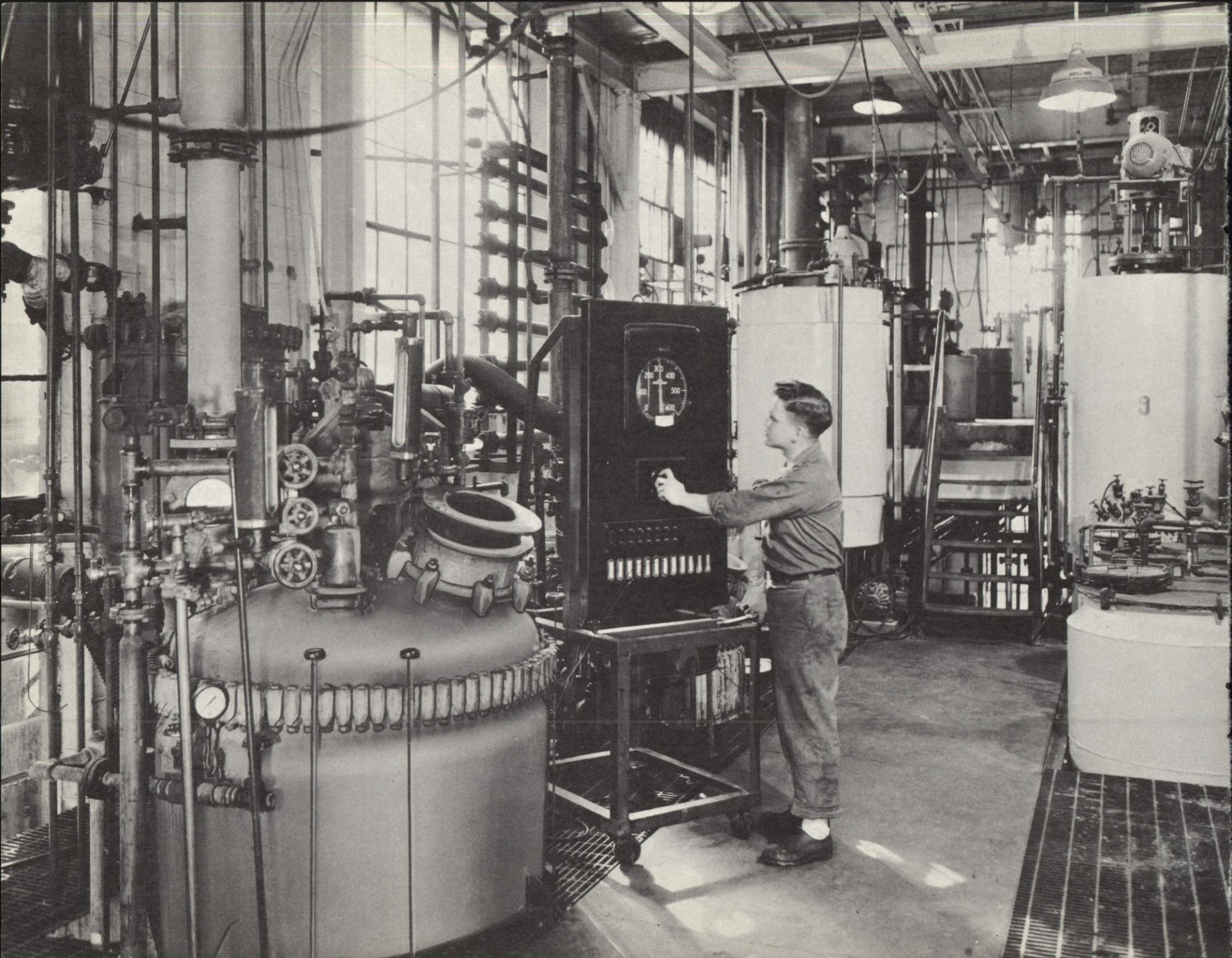
Photographs are made of various component parts of the test equipment. These serve as permanent records and are invaluable in presenting test results to Lubrizol customers.



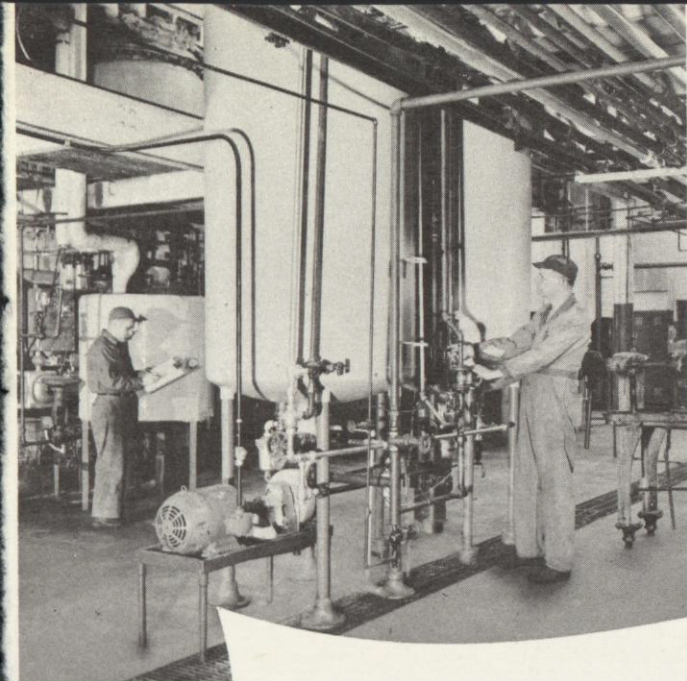


## LUBRIZOL TEST FLEETS

Extensive fleet tests are used in the final evaluation of customer oils containing Lubrizol additives. These tests are also used to provide comparisons between laboratory results and actual field performance.





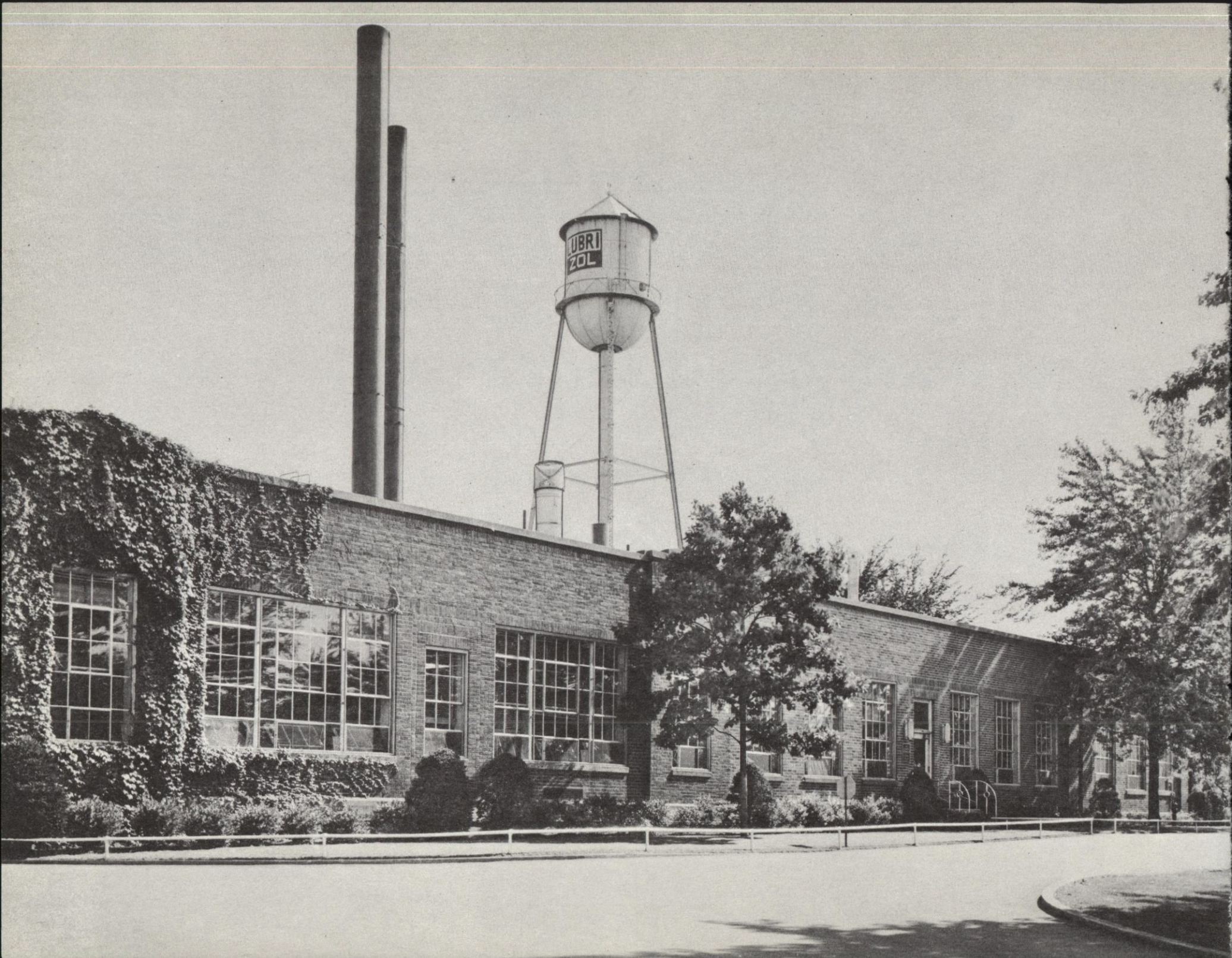


## THE PILOT PLANT

Here is the link between chemical research, mechanical testing, and production. A small manufacturing unit in itself, this well-equipped plant has its own experimental and control laboratory. Manufacturing procedures for new chemicals are carefully worked out in small scale equipment. The Pilot Plant also serves as a proving ground for refinements in techniques used in manufacturing

Lubrizol products.

Equipment in the pilot plant includes glass-lined and stainless steel tanks, stills and condensers. Extensive control and recording instruments enable development of continuous flow processes. A completely equipped laboratory within the pilot plant maintains accurate control over new developments.

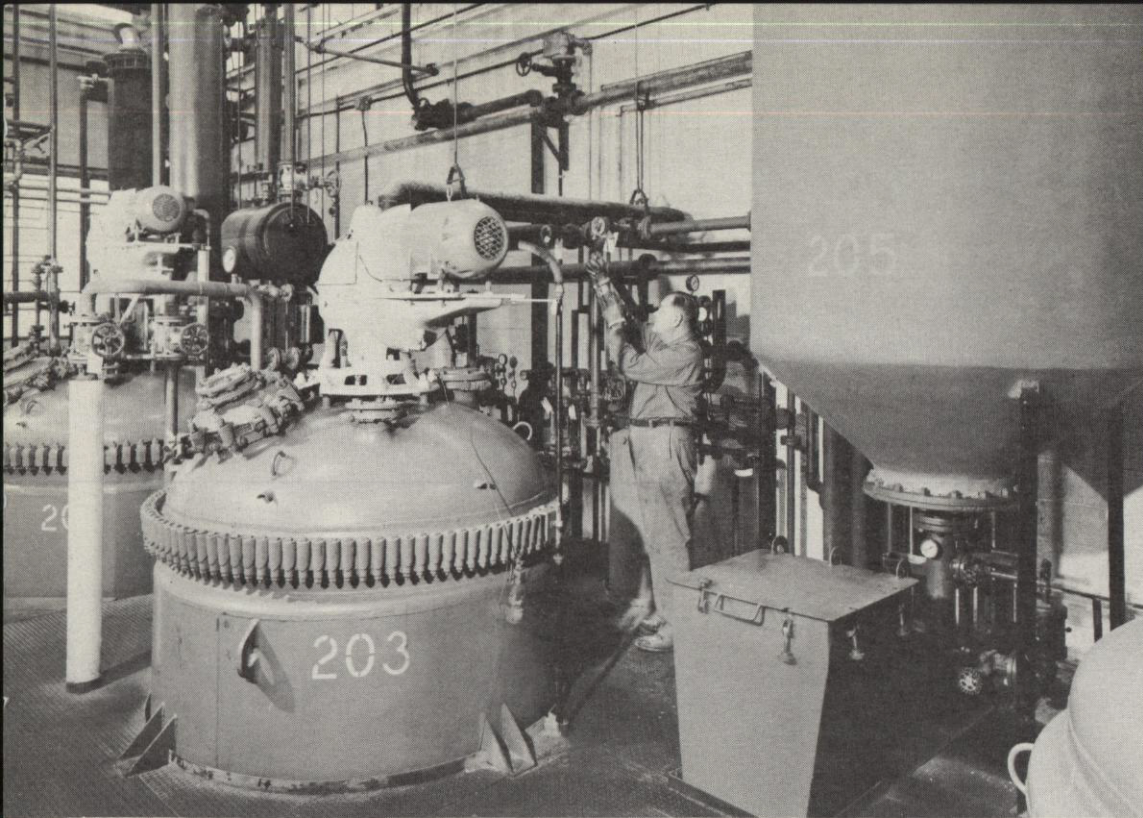


## MANUFACTURING PLANT AND GENERAL OFFICES

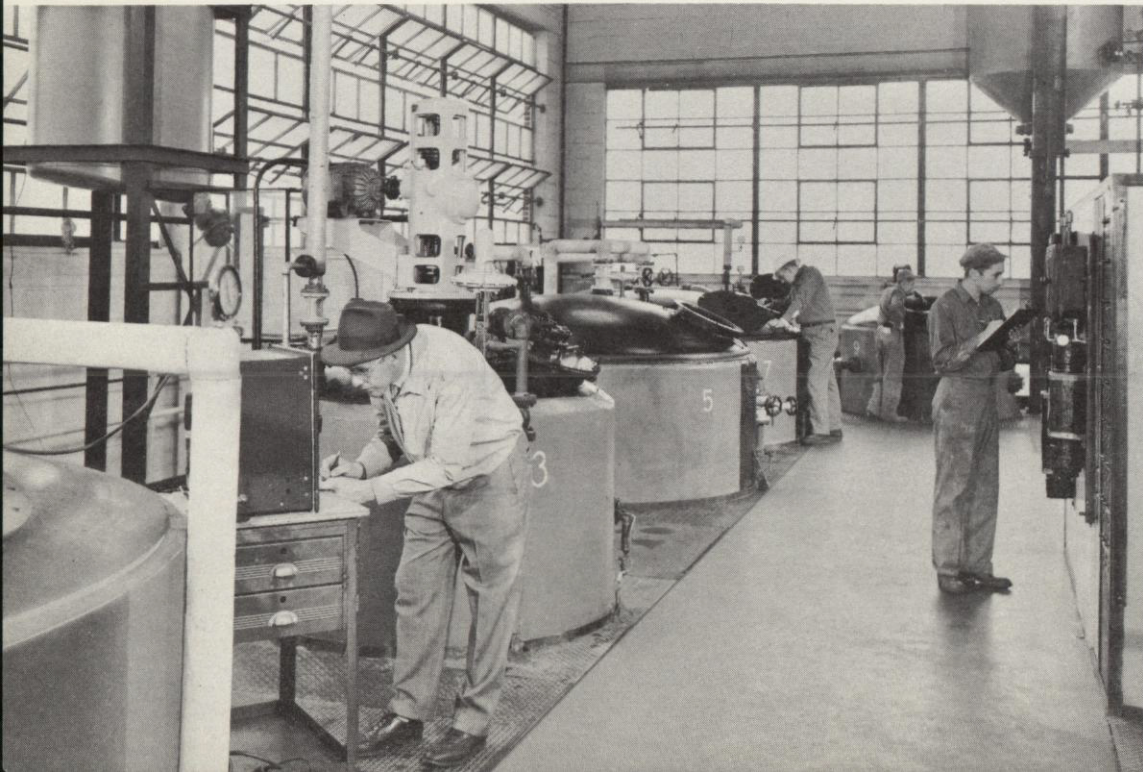
Lubrizol manufacturing units are capable of producing chemicals in large quantities and of considerable variety. Some operations are continuous. Instruments automatically control and record the processing of materials. All equipment installations are designed to permit maximum flexibility. By this means conversion from one process to

another can be accomplished in a minimum of time.

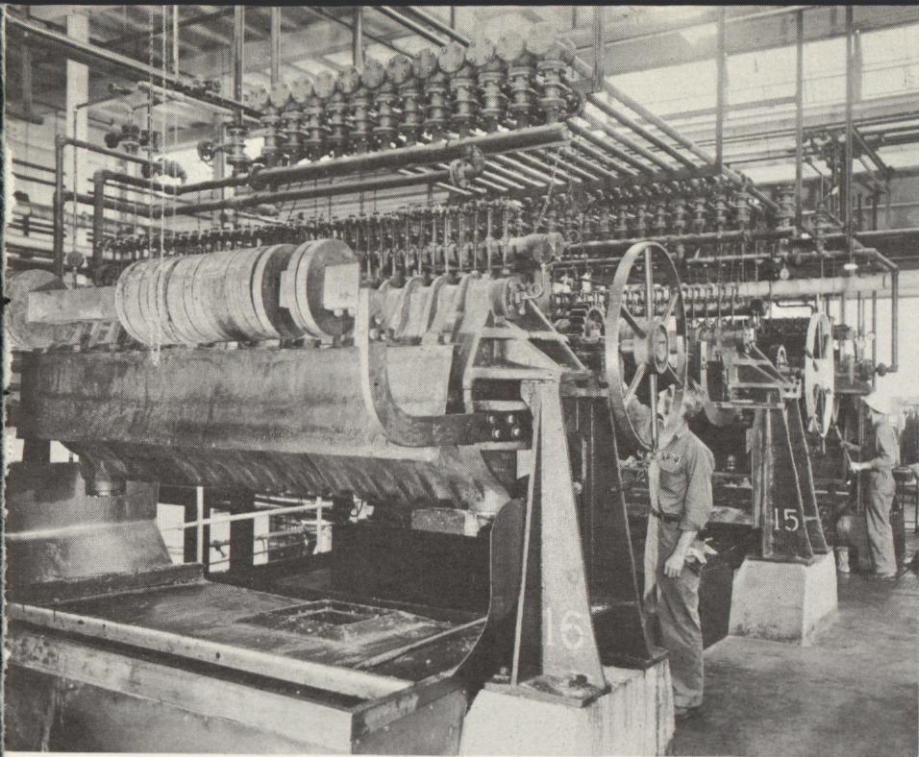
A well-trained staff of experienced technicians and chemical engineers carefully control all production operations. These factors combine to assure each Lubrizol customer highest quality materials and prompt service.



Here in one section of the production department are large glass-lined chemical reactors.

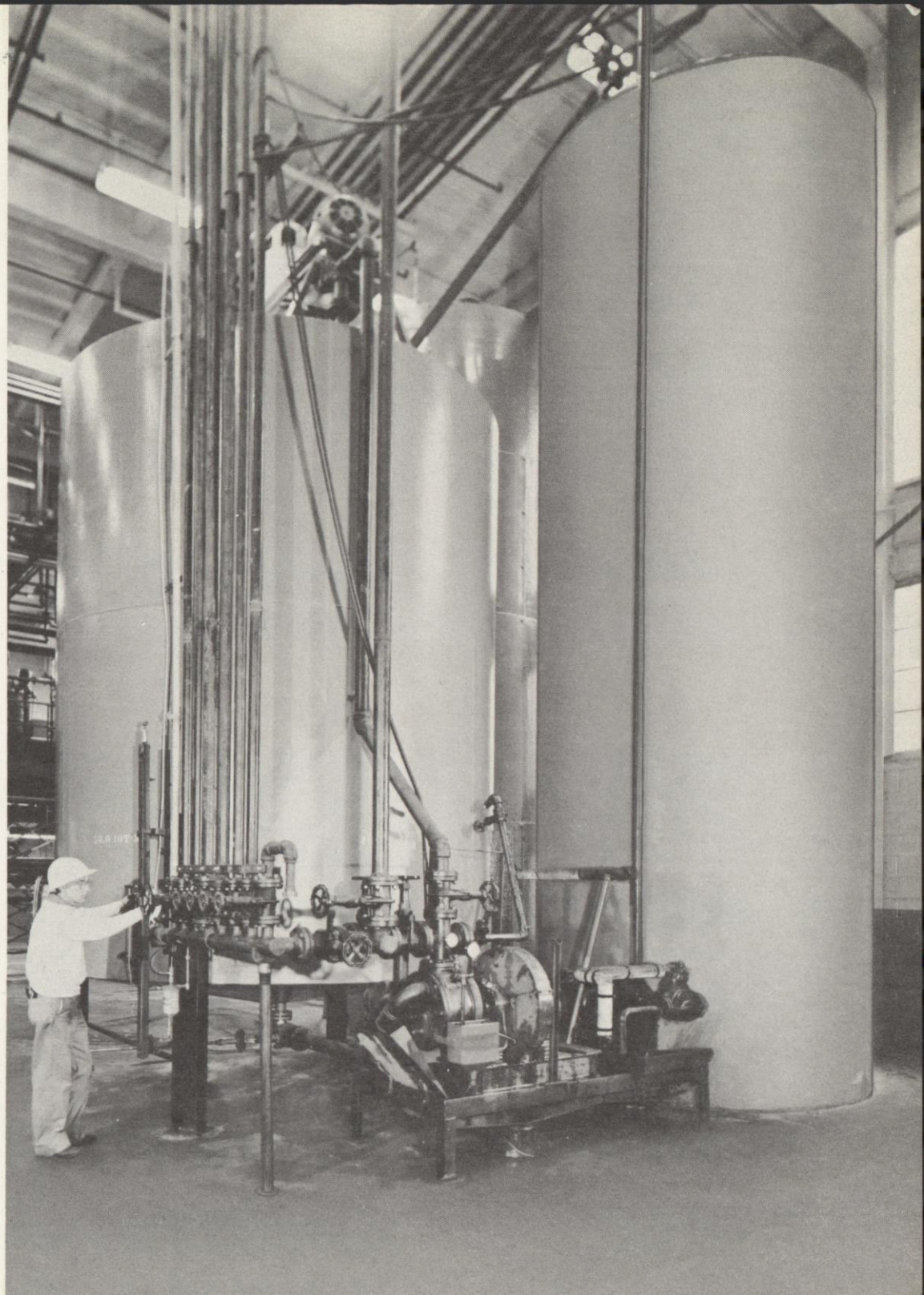


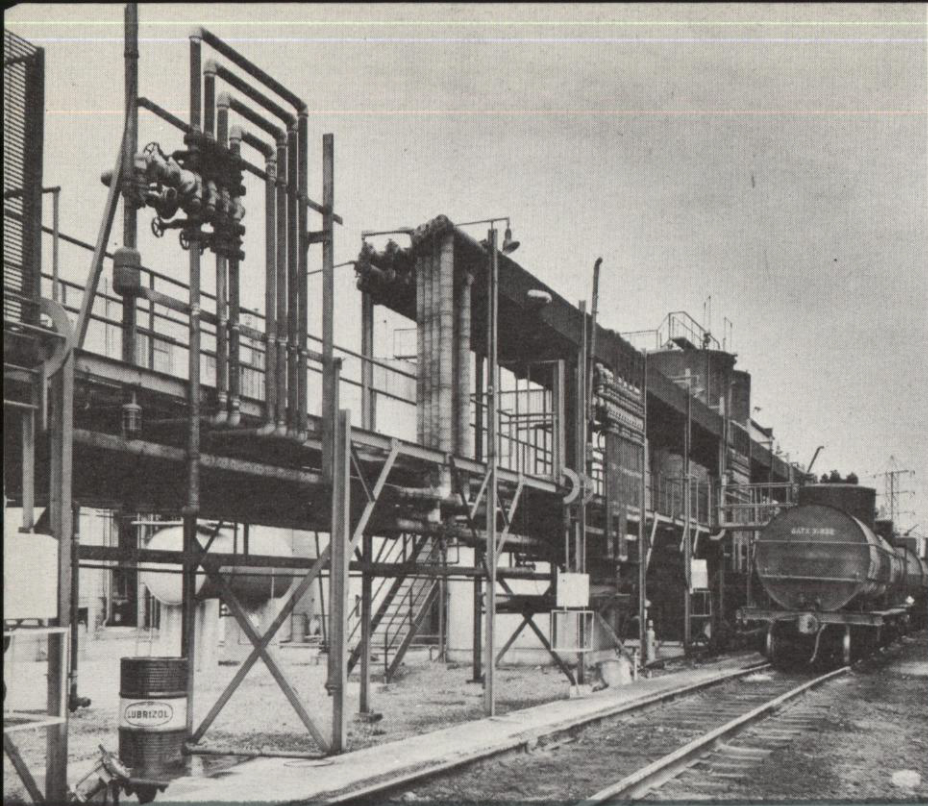
In another section are stainless steel processing units for various intermediate products.



Filtration of all products insures an absolute minimum of impurities.

In these tanks intermediate products are carefully blended before shipment to customers.



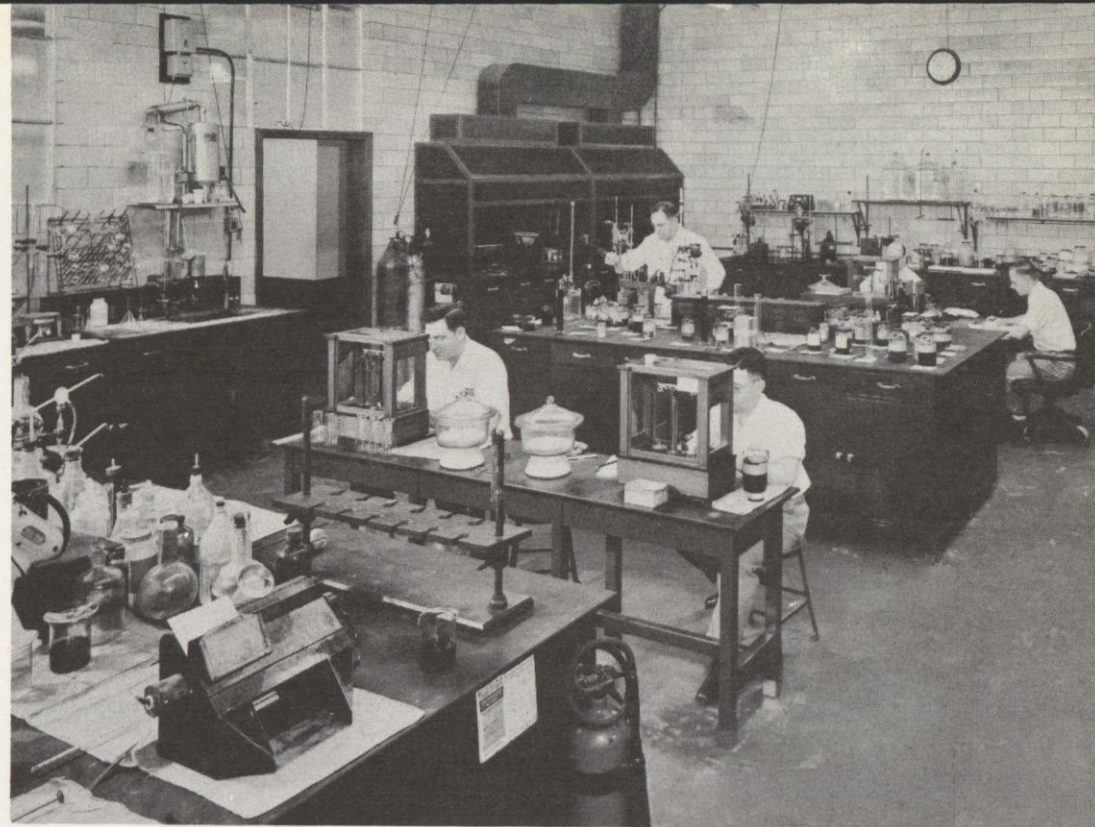


Finished materials for tankcar shipments can be loaded directly from the blending tanks through this overhead loading rack.

This warehouse is used for storage and shipment of additives in drum quantities.



The manufacturing plant's control laboratory is operated separately from the research laboratories. Each step of the manufacturing process from raw material to finished product is closely checked to insure uniform quality.



The general offices, only part of which are shown here, provide facilities for Manufacturing, Sales, Purchasing, Traffic, Accounting, Finance and Personnel.





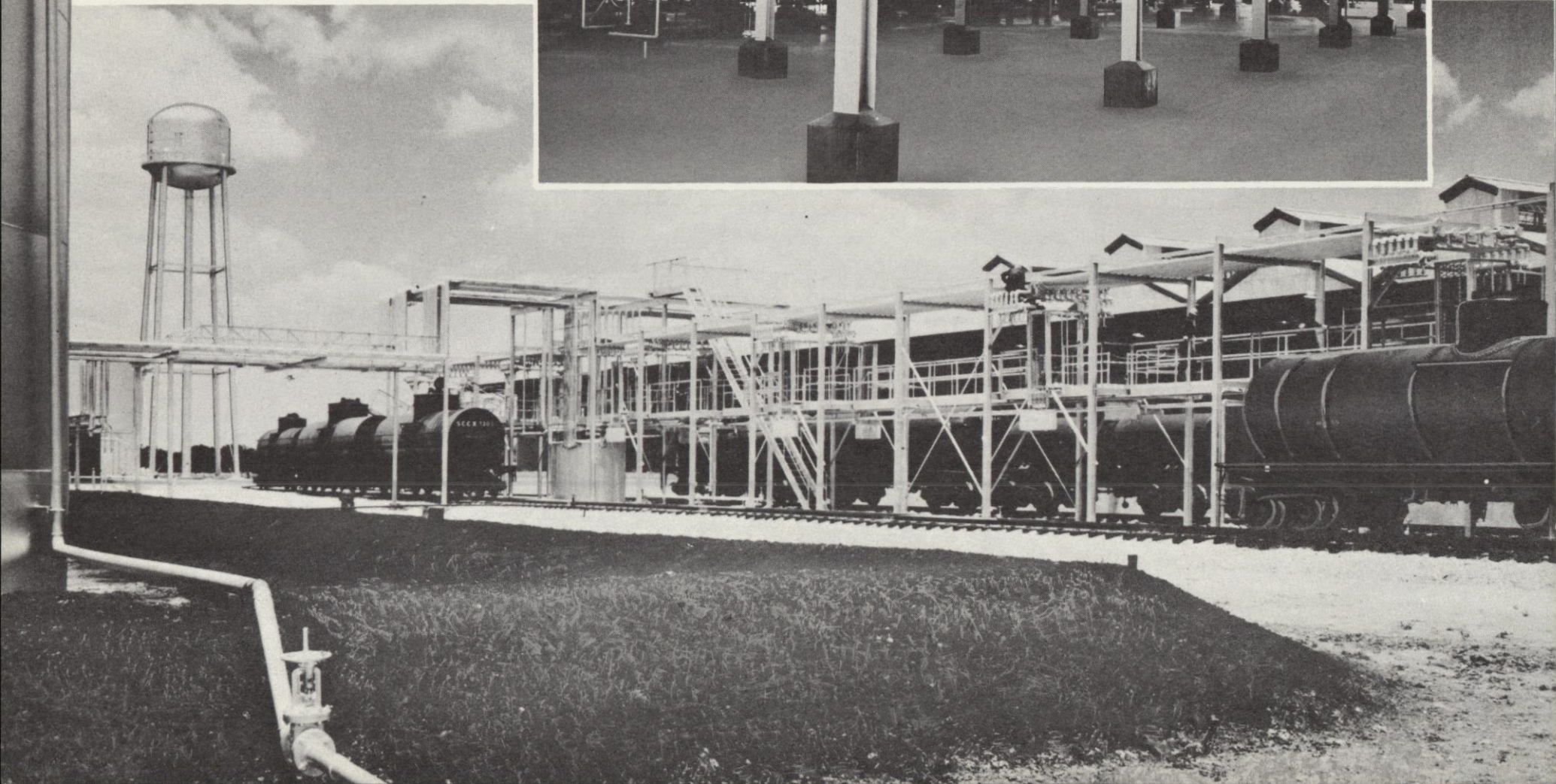
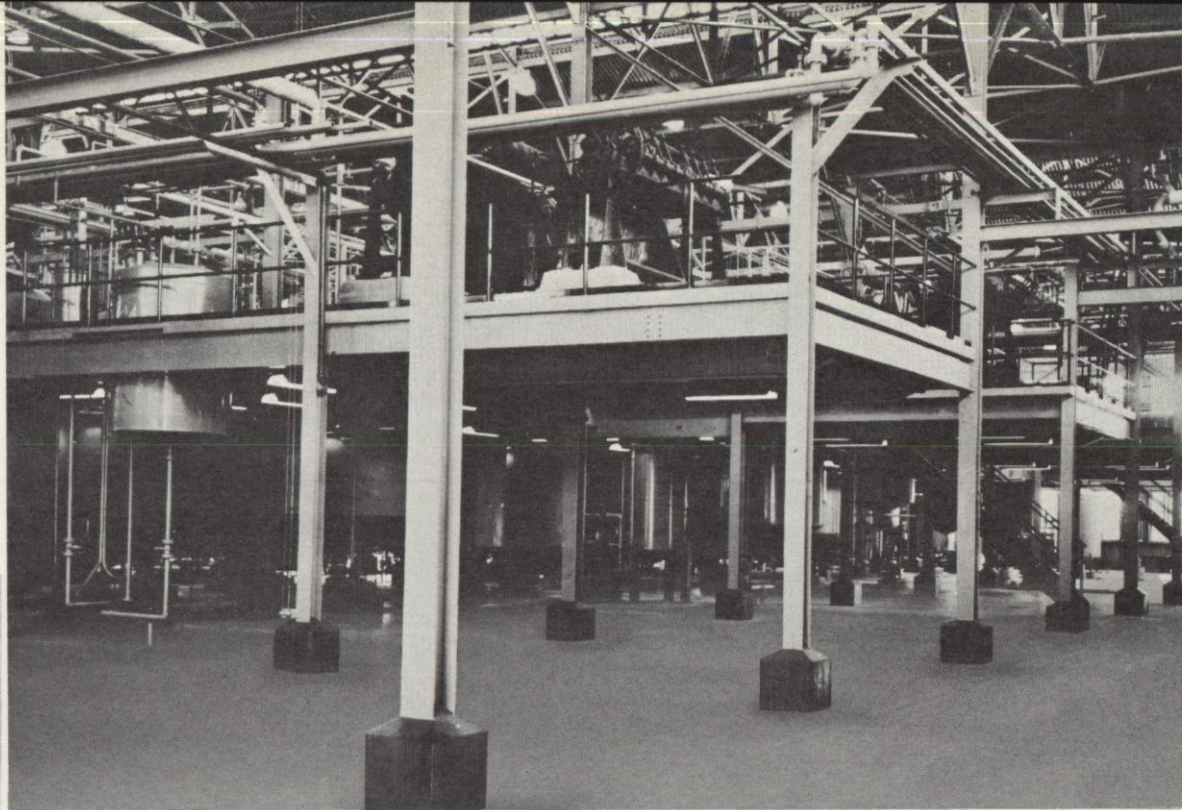
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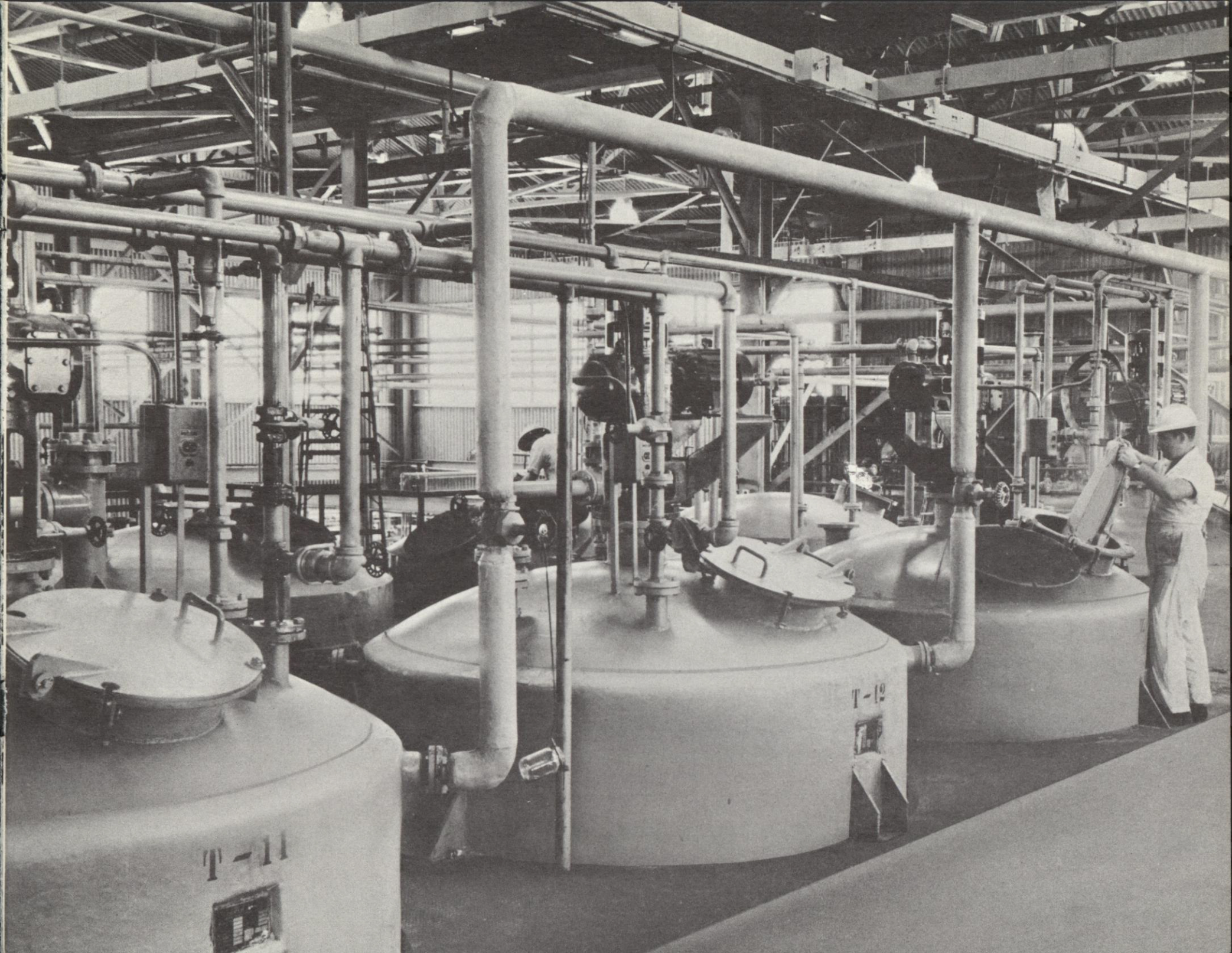


## HOUSTON PLANT

The manufacturing plant at Houston, Texas, is capable of producing a variety of additives identical in type and quality to those developed and made in Cleveland. Advantages to the customer include a substantial reduction in freight costs for shipments to southern and western areas, and the assurance of an uninterrupted flow of materials in the event of localized transportation difficulties or temporary shutdown of either plant.

The facilities at our Houston plant embody many refinements in manufacturing techniques previously developed at Cleveland. Typical installations are illustrated on these pages.

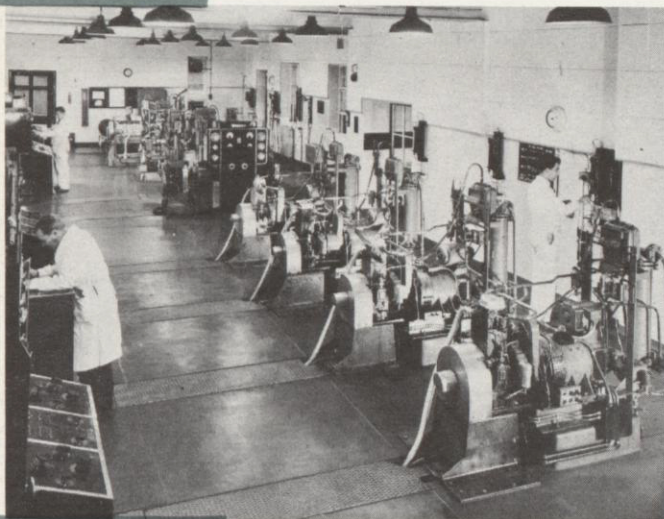






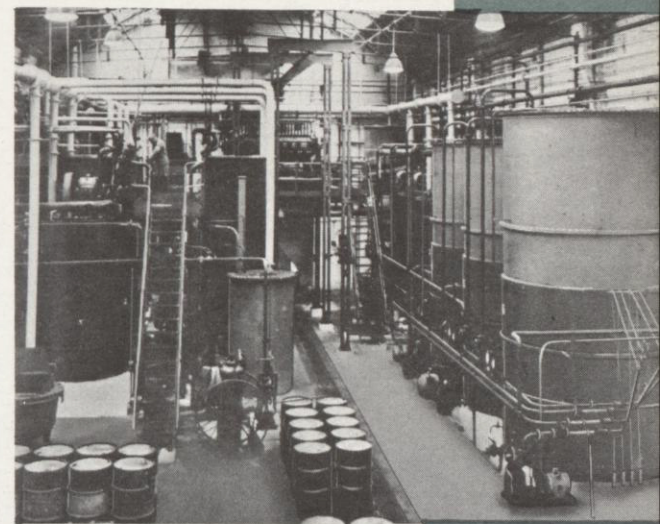
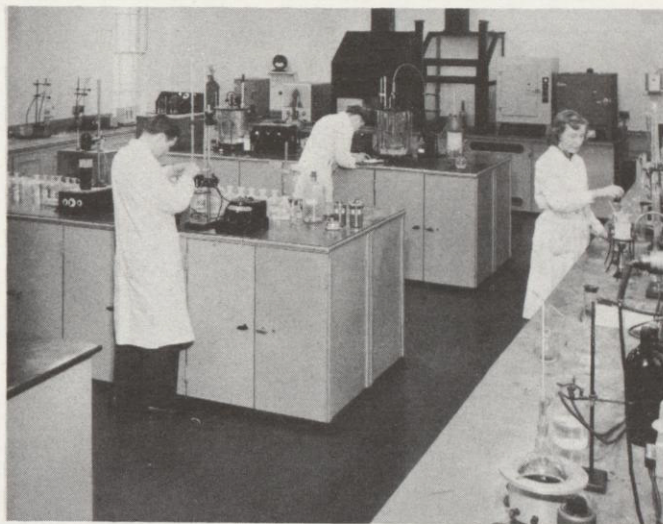
# ANGLAMOL, LIMITED

Anglamol, Limited, in England, is engaged in the development, manufacturing, and sale of additives for petroleum products used in the British Commonwealth and for export to many foreign countries.



The engine testing laboratory, "The Knowle", near Derby, contains the latest British and American equipment and has been approved for qualifying lubricants in accordance with U. S. and British Military requirements.

The chemical laboratory is equipped for complete analysis of base stocks, blended samples, and engine drain oils.



This photograph shows a typical manufacturing unit at Oldbury, Birmingham.





