CONTENTS

INTRODUCTION

SALESMANSHIP is one of the greatest and most important of the professions. Every man who succeeds in his line is almost invariably a first-class salesman.

This is true of many professions, as well as those engaged in the business of selling products or services—all must be salesmen to win success.

There are many factors that make for successful selling, but among the most essential are a thorough knowledge of one's company and its products and services. With such information well in mind, it is then equally important to know the product needs of each type of prospect and how to meet them with our products.

It was with the best interests of our salesmen constantly before us that we prepared this Manual. It is our sincere belief that we have developed information and suggestions of the greatest possible assistance to our field representatives. Additions, of course, will be made as the demand arises or the necessary information is developed.

All the information in this Manual has been carefully checked by the proper authorities—those responsible for Company policies, sales, advertising, manufacturing, laboratory activities, technical questions and, in fact, all phases of our problems.

This Manual provides the salesman with some of the necessary working tools, such as background information about National Lead Company and its policies; technical data on pigments and vehicles, competitive as well as our own; sales policies; a discussion of prospective customers and their needs; and suggestions as to what is expected of a successful salesman.

There is much of interest and value in this edition of the Manual, even to the Old Timer. Whether experienced or new to the job, every salesman will profit by giving the material most careful study.

It is also suggested that an occasional review of the Manual information which is most pertinent to the job would be helpful to the salesman.

Still another policy followed by successful salesmen is to have not only the Manual but the supplementary sales and technical material constantly at hand for ready reference in making contacts. The latter material should be organized and indexed in a handy brief case or folder for quick and easy reference during an interview.

It has been observed that every successful salesman is constantly asking for selling aids and it is our belief that he will welcome this Manual and the Company's literature as useful and helpful selling tools.

PART I

THE COMPANY

OUR COMPANY—*Its Past, Present and Future*

OUR COMPANY—*Its Far-Flung Interests*

OUR RESEARCH LABORATORIES

OUR PRODUCTION DEPARTMENT

OUR PAST PRESIDENTS

HEADQUARTERS EXECUTIVES *You Should Know*

ABOUT EXECUTIVES WITH WHOM YOU WORK

OUR COMPANY . . .

ITS PAST, PRESENT AND FUTURE

The average employee of National Lead Company knows vaguely that he works for a company with far flung interests, with a widely diversified line of products, of financial stability and with a reputation for integrity and honest dealing.

This at first blush would seem to be sufficient to cause the most cynical employee to feel a sense of personal pride in his company and in his job. But such is not always the case.

No employee is satisfied with generalities. He wants to know definitely the "whyfors and wherefors" of the component parts of National Lead Company, its resources, its products, its policies—everything that has contributed to the present-day leadership of our company in its field.

Even its history is of vital interest and importance to the intelligent, wide-awake employee. And by "history" we do not mean dates of incorporation and the like, but instead the humble "beginnings" that are so closely identified with the early struggles of American industry, the successful effort to bring order out of chaos that existed in the white lead industry during the early nineties, the steps taken to broaden the company's markets and keep it abreast of industrial progress—facts that make clear how National Lead Company weathered America's many financial storms and brought our Company to its present-day greatness.

It is the purpose of this chapter and Supplement No. 1 to give such information in sufficient detail to make every Dutch Boy salesman feel not only a pride in his company but a sense of security that will free him to concentrate on his job to the best of his abilities.

Complete knowledge of a salesman's company is as essential to his well-being, poise and self-confidence as is complete knowledge of his Company's products and services.

LEADING A LEADING INDUSTRY

The story of National Lead Company is not unlike that of other large American corporations which were organized late in the Nineteenth Century. It was formed as a combination of small white lead manufacturing units which had found that union meant strength in a period of rapid industrial expansion.

That this was a wise move is borne out by the fact that ever since its incorporation in December, 1891, National Lead Company has maintained leadership in what has become one of the country's most important industries—the lead industry—the products of which today probably have as great a diversity of use as those of any other American industry.

"Lead, the Precious Metal" is the well-deserved title of a book by O. C. Harn, former Advertising Manager of National Lead Company. In this book, which, by the way, is mighty interesting reading, you will find refutation of the widely mistaken idea that lead is used only in lead pipe and a few other products which are obviously made of the metal. It is not even generally known that white lead is nothing but pure metallic lead, corroded and processed.

Products Widely Diversified

The lead industry, in fact, has made great strides in diversification of products since the Nineties when National Lead Company was launched. And what is of special interest to us, is that our Company always has been among the leaders in product development and merchandising. A brief consideration of some of the many uses of lead and its compounds cannot fail to impress all of us as to the metal's importance in our modern way of life.

We might still be cranking our automobiles and using gas lights on them if it were not for the peculiar electro-chemical properties of lead and its oxides utilized in storage batteries. This same kind of battery propels submarines under water and electrifies airplanes in the skies, lights and air-conditions railway cars, is used in telephone communication, provides emergency power in utility plants and lights miners' lamps.

The corrosion resistance of lead, together with its flexibility, accounts for its broad use as sheathing for power and telephone cable, underground and strung on poles, on land and on ships at sea. In this case, a seamless lead sheath is extruded around the insulated conductors which form a core.

Lead Resists Acids

Sulphuric acid and other corrosive chemicals are essential in the production of thousands of modern necessities and conveniences, from high explosives to rayon, from synthetic rubber and gasoline to fertilizers for the farm and garden. Equipment and pipe lines made of or lined with lead, which resists the fiery attack of these corrosives, make possible the economical production of many of these modern chemical wonders.

The protective qualities, malleability and flexibility of lead foil are largely responsible for its wide use in packaging products that need protection from moisture and light.

Lead as an alloying element is found in bronze bearings and babbits and, as the principal ingredient of lead-base bearing alloys, has reduced costs and removed our dependence on imported tin for this purpose. These alloys are found in all kinds of vehicles on land, sea and in the air, and wherever machinery is used. Even more universal in use are the soft solders, which are alloys of lead and tin usually, but may be alloys of lead and other metals.

Important to X-Ray and Atomic Energy

The x-ray is vitally important to medicine and is rapidly assuming equal industrial importance as a means of detecting hidden flaws in products. Except in cases where the voltage is a million or more the high density and atomic weight of lead make it the most efficient material economically to confine these rays to the places where they are useful and to protect operators against their harmful effects. Lead is likewise the best protection against radium. Lead bricks and sheet lead are used extensively in atomic energy plants to provide protection against dangerous rays.

Red lead paint is a standard protection for modern steel structures of many kinds and white lead is the basic paint pigment used in the protection and beautification of our homes.

Tetraethyl lead in gasoline has been a major factor in making possible the tremendous power of our airplane and automobile engines, while litharge is used to remove corrosive sulphur from motor fuel, which otherwise would shorten the life of these engines. Litharge and red lead are ingredients in synthetic rubber.

Use of lead and lead-alloy coatings to prolong the life of iron and steel is a development. They are being used on a variety of steel products from telephone pole-line hardware to sheets for duct work. Lead coated steel is ideal for products that must be formed because the lead acts as a lubricant in the dies. Lead added as an ingredient in steel is another development that has improved the machining properties of steel greatly, speeding production and increasing the life of tools astonishingly. Lead is also added to brass and aluminum alloys for the same reason.

Unusual Uses in Construction

In all sorts of building construction, lead has its part in the plumbing and water distribution systems and electrical installations. Sheet lead is used, too, for roofing, flashing and other waterproofing on many structures, including refrigerator room linings on ships. Lead is sometimes used for its non-sparking properties alone. Floors in plants where explosive substances are manufactured offer a good example. It is also used to insulate against vibration both under building and machinery foundations.

The plastic industry makes extensive use of lead as molds. These are made by several processes, including die-casting and dipping steel patterns into molten lead, the lead solidifying on the steel. Molds are used once and remelted.

Pulverized metallic lead is added to grease for heavy duty machinery. It provides lubrication at heavy loads and prevents the grease from being thrown off open gears at high rates of revolution.

Probably one of the least known uses of lead is in the manufacture of the highest grade glassware, lenses and in glazing pottery.

Lead Goes To War

All of the foregoing are wartime as well as peacetime uses, but here are a few that are of a little more direct value in a war. Bullet cores make use of lead's density and ease of fabrication. Lead provides the necessary ballistic characteristics, stability in flight, to small arms ammunition, that is, up to .50 calibre. It is used in ammunition for rifles, carbines, pistols, machine guns, submachine guns and other small arms. The lead is first extruded as rod, cut into short lengths, swaged to the approximate shape of the bullet core and then pressed into the jacket. Pure lead and antimonial lead containing up to 2½% antimony are employed.

Lead enters into ammunition in many other ways. Lead azide, a chemical compound of lead and nitrogen, is used as a detonator in explosives. Antimonial lead die-castings form the bodies of practice bombs, and frangible bullets made of lead powder and thermosetting plastics are used to train bomber gunners in actual firing at attacking planes. Lead gaskets are used in certain types of shells. Lead counterweights are employed in torpedo mechanisms.

Lead, for its weight alone, finds many war uses in addition to torpedo mechanisms. It is employed for counter-weights in many kinds of guns, large and small. Submarine and other naval vessels employ it for ballast. It is used to provide perfect balance in airplanes and gliders and in that case is usually applied in the form of strip. Depending upon shape and other conditions counter-weights are generally either cast, or extruded and cut to size.

Lead Used in Most Industries

There are numerous other uses of lead not included in the preceding discussion but, coupled with the fact that there is scarcely an American industry of any importance which does not use the metal in one form or another, the evidence is sufficient to give us a feeling of stability and a justifiable pride in an industry of which we of National Lead Company are such an important part.

NATIONAL LEAD COMPANY—ITS ACHIEVEMENTS

So much for the importance of the lead industry and the prominent role we play in it, but let's examine some of the reasons why National Lead Company with its beginnings in pre-Revolutionary times in the East and in Pioneer Days in the Frontier States, has made a record of achievement and courageous planning that few American companies even less venerable can match.

Faced Many Problems

During the first decade after incorporation, much of the management's efforts were devoted to the improvement of the existing properties, to the increase and betterment of production facilities and to the elimination of uneconomical units. This resulted in a reduction of operating costs and was financed entirely out of earnings or with the proceeds of property sold.

Diversified Products

Comparatively soon after the turn of the Twentieth Century, National Lead Company launched a program of expansion and diversification of products. This became a fixed policy of our company and has been brought to its present high state of effectiveness through research in our Laboratories, purchase of patents and through ownership of all or part of the capital stock

of other companies. An examination of the list of products at the back of this Manual will show how widely the policy of diversifying our products has been developed.

It was during the early 1900's that the Company acquired the United Lead Company, manufacturers of metallic lead and lead alloy products, thus broadening this field. In the same period was purchased the entire capital stock of Carter White Lead. This made available a new and quicker white lead process. Also added to the fold were the Magnus Metal Company, the United States Cartridge Company and Heath & Milligan, a concern making mixed paints and varnishes. The latter two companies were sold later.

Entered New Markets

New modern plants were erected in Chicago, Cincinnati, Philadelphia, Pittsburgh and St. Louis to replace eleven outmoded factories in these same cities. The National Lead Company of California was organized to take over manufacturing properties near San Francisco and our West Coast business was launched. Later this was further extended to include Morris P. Kirk & Sons, makers of metallic lead products, and the Bass-Hueter Company, mixed paint and varnish manufacturers. The latter products are now sold under the Dutch Boy trademark.

This policy of adding fields of operation and of experimenting with new products has continued throughout the years. It is a method that has always been conservatively exercised, however, and with minor exceptions the various companies have been so developed that they have added substantial profits to the Company's earnings.

Established Financial Stability

The resulting diversification of products has also aided the management to ride out successfully the various periods of poor business that have affected the United States since National Lead Company was incorporated. For example, in the 1931 Annual report there was a listing of the losses of various departments of the Company over business of the previous year. They ranged as high as 44% yet the average was only 17%, a direct advantage of not having all our "eggs in one basket." The Company's financing has, of course, kept pace with its expansion in holdings. In 1891 the authorized capital stock was $30,000,000. This was increased in 1905 to $50,000,000 and in 1927 to $100,000,000. Reserves have been built up and maintained to protect the interests of the Company and its employees.

The soundness of these policies, backed by conservative but effective merchandising, is best proven by the record of sales and profits, which, except during depression years, have advanced steadily.

New Products in Line with Experience

Among the more important products that have been added to the Company's line since its beginning in 1891 are titanium pigments, paints, special paint oils, special castor oils, traps, bends, valves and fittings, bearings, bearing metals, printers' metals, tellurium lead products, barytes products and brass bearings.

It should be noted that all these products are either made, wholly or in part, from lead or else they can be classified in a marketing sense as belonging to fields already served by some division of our Company. In this way full advantage has always been taken of our management's knowledge of a given market and the financial risks of venturing into the completely unknown have been largely eliminated.

Research an Important Factor

Research is another important activity of the Company that was started about a year after its incorporation and which has also had a great deal to do with product diversification. To research may be credited the development of new products as well as the improvement of existing products in all divisions of our activities. And progress through research is continually going on. Since 1892, when the late Dr. G. W. Thompson became Chief Chemist of the Company and

founded our General Laboratories, several millions have been spent in research to good purpose. Our Laboratories in Brooklyn, which in 1906 had grown to a staff of six employees, now employ over 100, and their work is supplemented throughout the Company by many other plant and division laboratories. Research has ever been a constantly growing force in the Company and an effective hedge against being left behind in the fast-moving procession of the day.

Kept Abreast of Industrial Development

The field now served by National Lead Company is greatly broadened since the Nineties when white lead was the chief product manufactured. From the narrow outlet represented by the limited paint market of that day it has spread to practically every major field including railroad, automobile, agriculture, rubber, glass, chemical, electrical and airplane manufacture. Some of those activities were, of course, unknown in 1891. Others were just in their early stages. So it can be said that the Company has grown with the country. It has kept abreast of the great industrial development during the period of its existence, retaining its important place financially and productively among the leaders of the day.

Stock Ownership Unique

Such is the National Lead Company today. Its owners may well be proud. And who are these owners?

Back in 1891 it could be said that fewer than 130 individuals represented the stock ownership of the original companies. Over the years, this small number has multiplied many times so that today there are upwards of 18,000 owners of National Lead Company.

The interesting fact about this group is not the number. Some concerns have stockholders running into the hundreds of thousands. But of the approximately 12,000 holders of National Lead Company's common stock about 65% are owners of 100 shares or less and the same is true of nearly 90% of the preferred stockholders. Another interesting fact is that approximately 47% of the total stockholders are women who own about one million shares of stock, including the preferred.

There is also a high representation of preferred stock holdings for trusts and estates due, naturally, to the investment rather than the speculative nature of the stock. Another healthy sign is that the employees of the Company, and particularly the rank and file, are well represented in the stockholding body.

Personnel Policies Progressive

The Company's policy toward employees has been one of the most enlightened among industrial concerns. Even back during the Company's beginning, in an era when little attention was paid to this phase of business management, there was a definite policy of fair treatment.

At first this took the form of safeguarding the workers' health. In this the Company was always ahead of statutory requirements. At considerable expense, factories were renovated to incorporate such improvements as showers, well-equipped washrooms, restaurants where good food could be purchased at low prices, rest rooms and separate lockers for the workmen. Other safety factors such as respirators and goggles were furnished and suction equipment for eliminating dust was installed. The Company was among the first in employing plant physicians.

But there is also a feeling for what might be termed the mental well-being of the employee, giving him the peace of mind and sense of security that makes for loyalty, efficiency and clear thinking.

Adopted Retirement Plan

As early as 1912 the Company established a formal pension system for taking care of the employees who had or were beginning to reach the retirement age. This system was continued with various revisions of detail until 1937, when the present Retirement Annuity Plan was started with the approval of the Company's stockholders.

Under this plan all employees thirty-five years of age and over may contribute toward the purchase of an annuity payable at the age of sixty-five. The Company, however, contributes two-thirds of the cost, thus giving the employees the annuity at a very low rate.

Also allowed for in this plan is credit for service prior to 1937 whereby the employee is to be paid at the rate of 1% of salary or wages received during 1936 multiplied by the number of years of service prior to 1937. This, of course, starts at the retirement date and is paid concurrently with the amount due under the Retirement Annuity.

Offered Welfare Plans

Since 1914 the Company has also carried life insurance for employees. In the words of the annual report of that year, "The intent of your Board of Directors is to convey the idea that our relation to those comprising our official family is not ended when the day's work is done or life's work is over, but extends to those dependent upon them." The present insurance plan offers employees a greater amount of insurance at less cost than that of practically any other large American Corporation.

At various times in the Company's history employees have been offered the opportunity of purchasing stock on a three-year payment basis. This was done to encourage thrift and also give the employee a sense of ownership in the company he served. These offerings were always well subscribed and that they had their desired effect is indicated in the present high percentage of employee stockholders. Stock can be purchased today on an installment basis by applying to the Treasurer of the Company through the respective Branch Manager.

The Profit Sharing Plan, launched in 1945, is an important addition to the Company's policy of continually giving consideration to the welfare of its employees.

Recognized Long Service

In 1940 there was inaugurated another recognition by the Company of the loyalty of its employees. Each employee who has completed twenty-five years in the service of the Company or its subsidiaries receives a suitably engraved gold watch to commemorate the occasion.

At the original presentation three hundred and ninety-eight watches were given out. Thirty-three of these were to employees who had served from forty to fifty years and three were over fifty years.

In October of 1940 the management announced that employees entering the U. S. Military Service, either as volunteers or in accordance with the National Guard Mobilization Act or the Selective Service Act, would receive reinstatement in the Retirement Annuity and Past Service Pension Plan when reemployed and also, while in service, the maintenance of insurance protection for one year. About 83 per cent of the returning veterans gave evidence of their loyalty to the Company by re-entering its employ upon being discharged from the armed forces of World War II.

In normal times the Company employs about ten thousand men and women in its various branches and subsidiaries. Of these there are over forty-five per cent who are thirty-five years of age and over, which is an indication of the low labor turnover which the Company has always enjoyed.

Directors Elected from Employees

Included among the employee group are the directors of the Company, all of whom are or have been connected with the Company's business as working executives of its various divisions. This has a two-fold advantage. An intimate working knowledge of our business gained through the marketing, financial and personnel problems of the division each represents. This, we believe, is rather a unique situation with a corporation of our size. So many times the directors represent outside interests rather than the direct business of the Company they manage. However, since its earliest days, National Lead Company has been run by the men in the Company. Their future was intimately bound up with the Company's future, a condition which has certainly helped to foster solidity and integrity.

The sound and forward-looking policies that have brought the Company through troublous times in the past are still alive today. They are not and never have been policies that change with every shift in the economic wind. But they are, as always, administered by resourceful men who have learned to adapt them to changing conditions.

In looking forward to the future, the Company is just as conscious as ever of the trust of its stockholders and the loyalty of its employees.

Company Met War-Time Demands

Since its incorporation National Lead Company's role in America's wars has been one of vital necessity to the prosecution of the undertakings.

This has been true especially during World Wars I and II. Thanks to the nature and diversity of its peace-time goods and services, National Lead Company has been able to join in each historic undertaking and to shoulder a share of the burden—not only in its familiar role as a manufacturer of essential metal and paint products, but also in numerous other fields of activity vital to the success of the war program.

For World War I

For instance, in World War I our Government needed more tin than was possible to import from England, to which country most of the ore from the Bolivian mines was shipped for smelting. National Lead Company, at the request of the Government, met the crisis by building and operating successfully a tin smelter of adequate capacity. Our Company also expanded materially the ammunition factories of the U. S. Cartridge Company, a then partially owned subsidiary. These projects were, of course, in addition to a greatly increased production of several metal, paint and pigment products of vital necessity to the war efforts.

For World War II

The same expanded demand for many of our peace-time products was met early in World War II and, at the request of the Government, our Company also assumed the responsibility for several special projects of great importance to the success of the war program.

Long before Pearl Harbor, America's mining industry was changing over from a peace to a war basis. The Government encouraged reworking long-abandoned ore deposits and the development of new mines to reduce imports and lighten the shipping burden. National Lead Company made several valuable contributions along these lines.

Developed Mining

A noteworthy example was the MacIntyre Development, a large mining project in the heart of New York State's Adirondack Mts. Begun in May 1941, and completed one year later, this mine produced annually several hundred thousand tons of ilmenite, a titanium-containing ore previously imported from India, as well as an even larger amount of magnetite iron ore, an essential to the nation's steel industry in its effort to meet war-swollen demands.

The Company also made important additions to the nation's stock piles of needed war metals by more intensive working of our lead and zinc mines in Missouri, Kansas and Oklahoma.

Salvaged Metal

As one of the country's largest peace-time buyers and processors of non-ferrous secondary metals, National Lead Company assisted the Government in the fullest exploitation of America's scrap resources salvaging tin, antimony, lead and zinc in our metal-recovery plants. Starting in 1942, our Company acted as agent for the Metal Reserve Company in the purchase and processing of non-ferrous metals from various sources.

Produced Magnesium

In addition to mining and metal-processing activities, National Lead Company contributed to the success of the nation's metal program by constructing and operating a plant for the production of magnesium and its alloys which were needed in the manufacture of aircraft parts, incendiary bombs, tracer bullets and flares. In response to the request of the Defense Plant Corporation of the Government, the plant was built in northern Ohio where there are extensive deposits of dolomite, a magnesium-bearing limestone. Ground was broken in July, 1942, and within four months a pilot plant was in operation. Within less than eight months, the main plant was brought into production.

A Record of Achievement

The genius of our management and the devotion to duty of our employees in meeting the extreme demands of war-time America have been responsible for a record of achievement of which we all may be proud.

THE DUTCH BOY—A BIOGRAPHY

No history of the early days of National Lead Company would be complete without the story of the development of the Dutch Boy Painter trademark.

This famous little fellow was created in 1907 for a definite purpose—to solve a specific merchandising problem. National Lead Company was at that time marketing twenty-one different brands of white lead—Anchor, Armstrong and McKelvy, Collier, Atlantic, Beymer-Bauman, Cornell, Brooklyn, Davis-Chambers, Shipman, Fahnestock, Lewis, Salem, Jewett, Morley, Phoenix (Eckstein), Red Seal Southern, Sterling, Union, Missouri and Bradley. Each of these brands was popular in some section of the country but none was sold nationally.

How best to advertise these brands was the problem. To continue advertising each separately in the locality where it was marketed would have been costly and inefficient. To have advertised them all together nationally would have been impractical because it would have been an unwieldly arrangement and also would have led to a conflict of brands in the minds of the consumers. Nor was it sound procedure to drop the local brands and substitute only one national brand. It would have meant sacrificing the prestige enjoyed by each local brand—a most valuable asset.

Local Brands Tied Together

The solution was the Dutch Boy trademark, which was placed on each package without interfering with the local brand it carried. Thus all the brands were tied together, the prestige of the local brands was retained and the power of national advertising supported all of them by the simple means of featuring the Dutch Boy.

The quality of the product and the power of National Advertising soon put the prestige of the Dutch Boy trademark in the ascendency over the various local trademarks. As soon as this was obvious, steps were taken to subordinate the local brands to the Dutch Boy. Local trademarks were relegated to the lids of white lead kegs and the Dutch Boy name and illustration was used prominently on the sides of the kegs. Today the Dutch Boy has replaced all local brands on the lids as well as on the sides of our white lead kegs.

What is more, the Dutch Boy became so well and favorably known to so many types of trade that he was put to work as a trademark on other National Lead products, both paint and metal.

Development of a Personality

Several factors contributed to the prestige of the Dutch Boy, such as advertising and the quality of the products which he represents, but his own gay, pleasing personality was also responsible for his quick rise to nation-wide popularity and his sustained hold on the buying public. The development of that lovable personality was no accident but was planned carefully and executed by one of the best portrait painters of the day. The story of the creation of the Dutch Boy

and his varied functions is one of the most unique and interesting in the history of American business.

The "daddy" of the Dutch Boy was O. C. Harn, then Advertising Manager of the National Lead Company, who gave specifications of his idea to a Dutch artist named Yook for the first preliminary sketches. The boy was intended at first only as an advertising character but later, when search began for a suitable national trademark, L. A. Cole, then President, suggested that the Dutch Boy Painter be adopted. This was done and one of Yook's pencil sketches was turned over to Lawrence Carmichael Earle, noted portrait painter, with a commission for an oil painting which would give the boy the breath of life. That was in 1907.

"Mike" Brady the Original

An interesting sidelight was that the boy who posed for the portrait was an Irish lad by the name of Michael Brady, a "regular feller" called "Mike" by his playmates and who, incidentally, became a well-known cartoonist.

The original oil painting of the Dutch Boy trademark is kept at Headquarters and is considered so valuable that it has never been loaned to lithographer or printer for reproduction purposes. They must do their work where it is hung.

Animated Trademark

So vivid a personality did the artist create that it was soon discovered the Dutch Boy could be recognized easily in postures other than the familiar trademark position. No matter whether he is depicted painting a house, taking part in various sports or even standing on his head, the Dutch Boy never loses his identity as the trademark of National Lead Company. This is unique in trademark history, the Dutch Boy being one of very few today that is shown in other than trademark position.

The Dutch Boy—Salesman

What is more important to the Company's interests is the fact that the Dutch Boy's warm, honest personality inspires confidence in his wares, which, once justified, increases many fold. He is welcome wherever he has served and there is no need to introduce himself where he hasn't been on the job. He's a great little salesman, as those who have used him to help make sales have discovered.

OUR FUTURE

The future of our Company looks bright. Its finances are on the soundest possible basis. Its reputation for quality products and fair dealing is of the highest. Its Management includes men of great ability, who are alive to competitive conditions and the need for continued progress in merchandising and product development. Its rank and file of employees are loyal, conscientious and have a feeling of security engendered by the Company's efforts in behalf of their welfare and best interests. All of which makes for continued success in our industry.

OUR COMPANY . . .

ITS FAR-FLUNG INTERESTS

The following paragraphs about corporations in which National Lead Company is interested through ownership of all or part of the capital stock make it clear how they help diversify our products and extend our markets, thus adding to our Company's financial stability.

American Bearing Corporation, Indianapolis
Manufacturers of precision bearings for diesel engines.

American Lead Corporation, Indianapolis
Smelters of secondary metals containing lead, tin and antimony.

Baker Castor Oil Company, New York
Manufacturers of castor oil, several types of which are used in paint making.

Canadian Titanium Pigments Limited, Montreal
Distributors in Canada of titanium pigments.

Evans Lead Corporation, Charleston, W. Va.
Distributors of lead oxides. When acquired in 1930 as the Evans-Wallower Lead Company, it added the fumed process to our method of manufacturing lead oxides.

Hoyt Metal Company of Great Britain, London
Manufacturers of anti-friction metals.

Morris P. Kirk & Sons, Inc., Los Angeles
Manufacturers of metallic lead products, lead and zinc alloys and lead oxides.

Magnus Brass Mfg. Co., Cincinnati
Manufacturers of locomotive specialities.

Magnus Metal Corporation, Chicago
Brass founders and manufacturers of railroad journal bearings and castings.

Master Metals, Inc., Cleveland
Smelters of secondary metals containing lead, tin and antimony.

National Lead Co. S.A. (Argentina), Buenos Aires
Manufacturers and distributors of paint and metal products in South America.

St. Louis Smelting & Refining Company, St. Louis
Miners, smelters and refiners of lead.

The Canada Metal Company, Ltd., Toronto, Montreal, Winnipeg, VanCouver
Manufacturers of lead products, brass and bronze, dross smelters.

Titanium Pigment Corporation, New York
Manufacturers and distributors of titanium pigments.

ABOUT RESEARCH and PRODUCTION

There is a close relationship between the Sales, Research and Production Departments. Certainly, therefore, every salesman would want to be well-informed about these departments upon which he depends for maintaining the superior quality of Dutch Boy products and for whose existence he is responsible to an important degree.

Quality products help assure successful selling, and successful selling and advertising help assure the continued employment of factory and laboratory workers. The social-minded salesman should therefore, get an added satisfaction out of his efforts in knowing that he is importantly responsible for the livelihood of so many of his fellow employees.

It is our belief that the salesman will find in the succeeding pages the information he wants to know about our Laboratories and Production Department. It should add greatly to his feeling of confidence in the Company and its products. It should increase his self-confidence materially.

OUR RESEARCH LABORATORIES

The Research Laboratories of National Lead Company were started in 1892, and since then have presented an interesting story of continued progress and development exemplifying the benefits that accrue from the cooperative efforts of management and research.

The first Laboratory was located in Adams Street, Brooklyn, and was under the direction of Dr. G. W. Thompson who, with only one assistant, undertook to handle all of the chemical problems arising in the various plants of the newly formed National Lead Company. At that time the principal functions of the Laboratory were to maintain the high quality of the Company's products through regular analyses of samples of the plants' output, and develop new products. Improvements in various manufacturing processes naturally resulted.

The original Laboratory was soon found to be inadequate and in 1899 a four story building at 129 York Street was purchased and converted to accommodate the growing staff. Within a very few years an addition was erected where metallurgical investigations were conducted. Practical tests were made on pigments, drying oils and paints in this same building.

LABORATORY BUILT

By 1925 the Laboratory staff numbered about fifty and the scope of investigations had increased to such extent that it was necessary to build another, even larger Laboratory. The present five story building at the corner of York and Jay Streets, Brooklyn, was erected at that time.

In all its history there have been only a few changes in the directorship of the Research Laboratories. Dr. Thompson, after his retirement in 1938, was succeeded by R. L. Hallett and a few years later when Mr. Hallett was appointed Chief Chemist of National Lead Company, Alex Stewart became Director of Research.

LABORATORIES DEPARTMENTALIZED

The organization of the Laboratories has been changed from time to time to meet changing demands. Special departments have been established to handle the various phases of the work. Each is under the guidance of a well-trained, experienced individual who is responsible for all of the activities of his department and who reports directly to the Director of Research.

ANALYTICAL: The General Analytical Department conducts periodical examinations of National Lead Company's various products, analyzes materials submitted by other departments in connection with research and service work and handles all analysis work submitted by our various branches.

RESEARCH AND SERVICE: The Paint and Pigment Research and Service Department comprises four divisions—Sales Service, General Paint Research and Service, Sayville Experimental and Test Division (atmospheric and marine exposures) and Metal Paint Research and Service.

METALLURGICAL: Metal problems including metal refining, improvement of metal products and processes, and general physical metallurgy are handled by the Metallurgical Department. This department is located in the new laboratory building and also operates a pilot plant at 129 York Street.

STORAGE BATTERY: The Storage Battery Department has been constantly increasing the scope of its activities. The lead acid storage battery is highly important in these days of automotive transportation and the number of problems handled by this group is increasing constantly.

ORGANIC VEHICLE: Problems concerning organic products are handled by the Organic Vehicle

Dutch Boy Wall Primer

This sealer and paint coat combined was designed to assure satisfactory white lead jobs on interior plaster surfaces. Some of its outstanding qualities:

1. Seals all porous surfaces.
2. Hides well over patched or discolored plaster.
3. Brushes easily.
4. Spreads far (average 800 square feet per gallon on smooth plaster).
5. Adheres firmly.
6. Forms the tenacious foundation required for long-time service under succeeding repaint coats.
7. Low in cost applied, because of its spread, hiding and ease of application.

TIPS ON USE

New Plaster

1. If finished job is to be colored, tint Wall Primer to the shade of the finishing coat paint.
2. Apply two coats of White Lead and Lead Mixing Oil paint over Dutch Boy Wall Primer on new plaster.
3. To overcome excessive porosity, use one part Wall Primer to three parts White Lead and Lead Mixing Oil flat in second coat.

Repainting Plaster

1. One part Primer and three parts white lead flat paint also makes a superior first coat for two-coat work on old painted plaster.
2. On patched wall surfaces, spot paint new patches with Wall Primer before applying first paint coat.

Research Department. It is the duty of this group to develop new vehicles, improve present vehicles and the processes for making them and, in general, to investigate all problems involving organic chemistry. The rubber laboratory, for example, is part of this department. Investigation of organic by-products is an important part of the work.

MICROSCOPIC AND PHOTOGRAPHIC: Physical testing, microscopy, spectroscopy and photography are all handled under the direction of the Microscopic and Photographic Department. Problems concerning physical examination of paint materials and metal products are handled by this group.

NEW PRODUCT: In every research laboratory, there is one department which devotes its attention to pure scientific research. All departments are naturally on the alert for possible new products and processes but the actual research work involved is handled under the direction of the New Product Research and Development Department.

CORROSION: The function of the Corrosion Department is to study the various theories of corrosion, investigate corrosion testing methods, develop and investigate corrosion inhibitive systems. In general, it is the duty of this department to study corrosion from the broadest possible viewpoint.

ADMINISTRATIVE: The Administrative Department comprises the executive, purchasing, accounting and library divisions. The functions of the first two are self-evident. The library division in addition to its obvious activities, such as preparation of literature surveys, compilation of market data and reviewing of current technical publications, also assists in the preparation of patent applications.

MAINTENANCE: The Maintenance Department is responsible for the upkeep of the buildings and the general equipment. This is important, because the best efforts of the staff can be exerted only under proper working conditions.

All departments cooperate so that every detail of each problem is given adequate attention by competent individuals. Regular meetings of the department heads, with special meetings of certain groups as the need arises, are of considerable assistance in maintaining the necessary cooperation.

Other Laboratory Activities

The Laboratory activities are not confined to the Brooklyn building. Members of the staff regularly visit our various manufacturing branches in connection with their investigations. They also cooperate with various institutions where investigations are being conducted under industrial fellowships.

The Sayville Experimental Station, which was started in 1916, and our Fresh Water Test Basin at New Kensington, Pa., started in 1941, are really parts of the Laboratories. Our regular paint products and also new pigments and vehicles are subjected to exterior tests at these stations. Products are not released for the general market until they have been given suitable tests and have demonstrated their value fully in practical exterior exposure programs.

Achievements

The achievements of the Research Laboratories are reflected by the many diversified products which the company manufactures for home and industry. The Research Laboratories have contributed greatly to the development, manufacture and sales of these products and have been an important factor in establishing the Dutch Boy as the symbol of quality.

OUR PRODUCTION DEPARTMENT

It has always been Company policy to spare no expense or effort in producing products of the highest quality on the market. The constant research and study of our Laboratories and Production Department, backed by a progressive Management, have been responsible for many improvements in manufacturing processes and the development of new products. The salesmen, too, have had an important share in this record of progress, reporting, as they have done throughout the years, the demand for new and improved paint products.

The paints and paint products marketed by National Lead Company are manufactured in factories that are located strategically from a distribution standpoint in or near the cities of Chicago, New York, Philadelphia, St. Louis, San Francisco and Los Angeles. The product list in supplement No. 2 of this Manual will inform the salesman where each item is manufactured.

Improving Processes

Improved manufacturing processes and the production of new products have usually called for new and, oftentimes, especially designed equipment and machinery. Their purchase has been approved by the Management as the need has arisen, as have the expenditures for guarding the health and safety of our 3,500 or more factory employees. In the latter field the Company has always been in the foretront.

In addition to constantly improving our manufacturing processes and equipment, an equally important factor in assuring the high quality of our paint products is the careful and frequent testing by chemists during the various operations of production. In most cases the number of tests made to maintain quality exceeds materially the number of operations required in manufacture. This is true of our white lead and titanium pigments, as well as in the manufacture of white lead in oil, straight lead paints and multiple pigment paints.

Cutting Costs

While considerable time of our chemists, engineers and manufacturing experts has been concentrated on producing quality products, the cutting of costs to a minimum has by no means been neglected. So successful has been this effort that we have always been able to keep our price schedules in line with those of our competitors, despite the fact that in the case of most of our products the quality is superior.

Making Paints

One of our most interesting operations in manufacturing is that of our paint plants in or near Chicago, New York City and Los Angeles. These plants were erected in 1946 and 1947 in accordance with the most modern designs that could be devised to assure the greatest efficiency in manufacture. They were equipped with machinery of the latest design and some of them are amazing in performance. The manufacturing process was planned to achieve the maximum in mass production. In the description that follows we are confining ourselves to one plant, inasmuch as the three are fairly comparable in equipment and operation.

Gravity Flow Type

The plant is a gravity flow type, the raw materials being transported to the top floor of the four-floor building and then, by their own weight, flowing down floor by floor as soon as they are released after the different processing operations.

The fourth floor is devoted to paste mixing; the third to grinding; the second to paint finishing; and the first floor to filling, labeling and packing.

Pastes Mixed in Heavy-Duty Equipment

The different dry pigments used in our paints are transported to the fourth floor on a ten-ton elevator and the liquids necessary to paste mixing are pumped up through pipes from storage tanks. These raw materials are of course transported to the different mixing units where the first step is taken in processing the respective paints.

The paste mixing equipment is of an extremely heavy-duty type to assure thorough mixing. This is a very critical step in the manufacturing process, since proper mixing assures easier grinding and best ultimate pigment dispersion.

Machines Influence Gloss

When thoroughly mixed, the pastes flow down to the different types of grinding machinery on the third floor, which, in fact, is a mezzanine floor. If a high gloss paint is to be produced such as sash and trim colors, the proper paste mixture is ground in a machine especially designed for that purpose. If a moderate gloss is wanted, such as in a primer, another type of grinder produces the desired results with the proper paste mixture.

Pebble Mills Operate Economically

Suspended on a level with the mezzanine floor are pebble mills which can be operated at night without supervision, except a check-up by the night watchman on his rounds to preclude damage by over-heating or some other mechanical failure. Should such occur, the night watchman simply turns off the power and the necessary repairs to the pebble mills are made the following day.

When the pastes are ground to the satisfaction of the operator, they are released to flow down to their respective tanks on the second floor. Here is where the final steps in manufacture are taken and where there are some unusually interesting processes and equipment features.

Liquids Incorporated First

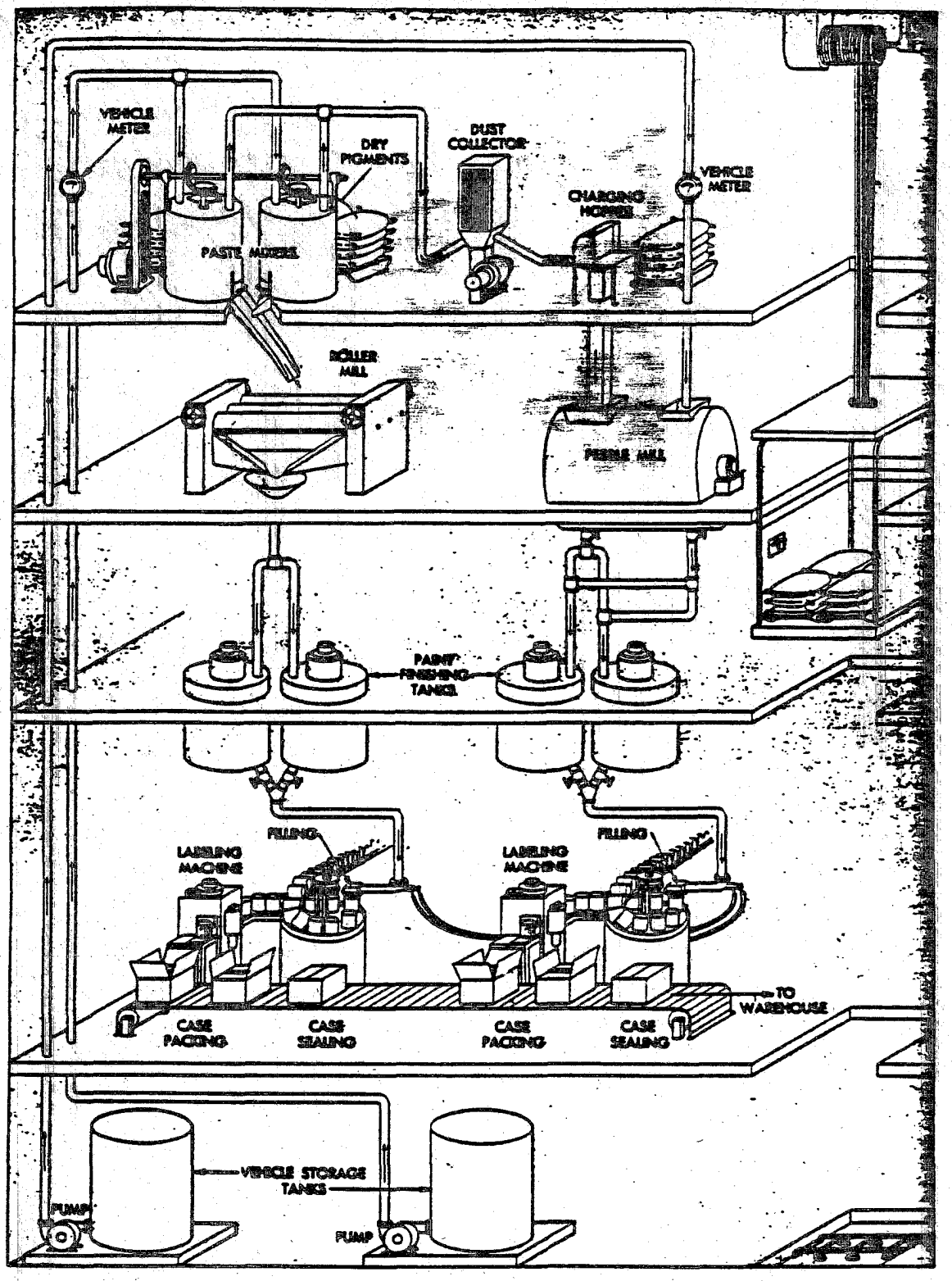
Contrary to the usual procedure in most paint factories, all the liquid ingredients used in our paints are introduced into the paint-finishing tanks before the paste mixtures are incorporated. By this procedure the agitator, which is started as soon as the paste mixture begins to flow in, is not required to stir heavy materials at any time during the process. This effects a saving in power, since a lower horse power motor can be used to operate the agitator than if it were required to mix pastes that are heavy until thinned with liquids.

The agitator is a turbine propeller type, which incorporates the liquid into the paste mixture much more thoroughly and quickly than does the more commonly used circulating type.

Liquids by Remote Control

Liquids are introduced into the paint-finishing tanks through an ingenious piece of equipment known as a remote-control switch system. The amount of each liquid needed in any particular batch is set on the respective meters in the same manner as one might punch an adding machine. Then switches are thrown and the vehicle pumps deliver the indicated amounts of liquids from their respective storage tanks through the meters to the paint-finishing tank. In many instances the particular oil or liquid is delivered at the rate of 50 to 75 gallons per minute.

A feature of this equipment is that the *same oil or liquid* can be delivered *at the same time* through a meter on the second floor to a paint-finishing tank and through a meter on the fourth floor to a paste-mixing tank.



PAINT PLANT FLOW CHART

Color Matching Lamps

Sash and trim colors and tinted paints are also finished on the second floor. The tinting materials are carefully measured and introduced. Since the exactness of shade of these paints is so very important, the Control Laboratory is equipped with the latest in color matching lamps in order to assure the desired results independent of the amount of daylight available at any time of the day or year.

Incidentally, but importantly, all manufacturing areas in the plants are equipped with the latest in fluorescent lighting.

Filling, Labeling and Packing Streamlined

After a paint batch has been checked and passed by the Control Laboratory, it is allowed to flow down to the first floor for filling, labeling and packing. After the containers are filled, they are transported on a conveyor belt on their sides to the labeling machine. When labeled, the containers are set up on end automatically and continue on the conveyor belt to the packer. The cases are sealed automatically and stacked on pallets for transportation to the warehouse on an electric fork truck.

"Palletizing" Saves Labor

The use of pallets on an electric fork truck is called "palletizing" and is a labor saving device in loading and unloading operations. The pallets look like two platforms, sturdily joined together, with sufficient space between them to permit the entrance of the fork on the electric truck. The truck is counterbalanced to permit carrying three pallets with a load weighing as much as two tons. A powerful elevator arrangement makes possible comparatively high stacking in the warehouse.

Paints the Same From Separate Plants

Paints manufactured in the East are formulated by our Research Laboratories in Brooklyn and then it is up to the Production Department to meet the specifications. A Control Laboratory is located in each factory and testing by the chemists starts with the raw materials before they are unloaded.

No finished batch of paint is released for packaging until it is approved by the Control Laboratory. Raw materials must meet four to six tests and each paint batch is subjected to seven to ten tests. In addition, our paints are under constant observation and testing by operators during each operation in the paint-making process. Moreover, due to central control in New York of both raw materials and finished products, paints from either Chicago or Perth Amboy factories will produce the same results, whether they are in white or color. The same careful control set-up is in force in the Pacific Coast paint factories.

All of which means that our salesmen can be confident that any product turned out under the Dutch Boy trademark is tops in quality.

OUR PAST PRESIDENTS

WILLIAM P. THOMPSON

President—December 8, 1891 to February 3, 1896

Upon the incorporation of National Lead Company on December 8, 1891, William P. Thompson was elected our first President.

Mr. Thompson had previously been an executive of the Standard Oil Company, which concern had helped finance the consolidation—an interest that later was absorbed by National Lead Company.

It was during Mr. Thompson's administration that the management devoted its efforts principally to the maintenance and improvement of the properties and business already acquired: to the increase of manufacturing capacity at plants best adapted to the most economical production and distribution; to the sale or other disposition of plants not so adapted; and to the standardization of methods and processes—all with a view to the reduction of operating costs and all financed out of earnings or out of proceeds of property sold.

Mr. Thompson was President until his death on February 3, 1896.

LUCIUS A. COLE

President—February 20, 1896 to August 25, 1910

Lucius A. Cole was elected the Company's first Treasurer upon its incorporation, which position he held until June 30, 1892, when he was promoted to a Vice-Presidency.

On February 20, 1896 Mr. Cole was elected President and served in that capacity until his death on August 25, 1910.

In addition to carrying on the reorganization policies of the preceding administration, the Company under Mr. Cole took its first important step in expanding its interests in the metal field by purchasing the United Lead Company and the Magnus Metal Company outright and 50 per cent of the capital stock of the United States Cartridge Company.

Other major accomplishments of Mr. Cole's administration were the purchase of the Carter White Lead Company, which added important patented and secret processes to the white lead manufacturing technique of the Company and which increased the business and profits in that product materially; the erection of a plant to manufacture steel kegs to replace the old-fashioned wooden kegs for white lead, red lead and oxides; the organization of National Lead Company of California (now our Pacific Coast Branch) to handle the Company's business West of the Rocky Mountains.

Incidentally but importantly, it was Mr. Cole who suggested that the Dutch Boy, which was created originally for use only as a character to advertise white lead, would make a good Company trademark.

WILLIAM W. LAWRENCE

President—September 15, 1910 to August 29, 1916

When the Sterling White Lead Company of Pittsburgh, Pa., was purchased in 1903, William W. Lawrence, its President, was elected Treasurer of National Lead Company on May 1 of that year. On May 2, 1907, he was made a Vice-President and on September 15, 1910, was elected President.

One of the early acts of Mr. Lawrence's tenure of office was the further expansion of the Company's white lead business by the purchase of the Matheson Lead Company, which concern since then has been dissolved.

However, probably the most notable decisions of his administration were those that interested the Company for the first time in foreign holdings and put us into the mixed paint business in a comparatively small way. These moves were accomplished by the purchase of 50 per cent of the capital stock of Williams Harvey & Co., Ltd. of England, the largest tin smelters in the world, and the acquiring of all the capital stock of the Bass-Hueter Paint Co., Pacific Coast manufacturers of varnishes and mixed paints.

Mr. Lawrence served as President until his death on August 29, 1916.

EDWARD J. CORNISH

President—September 21, 1916 to February 23, 1933
Chairman of the Board—February 23, 1933 to May 3, 1938

Edward J. Cornish entered the white lead business as the attorney for the Carter White Lead Company and on November 10, 1903 became its President. Three years later he negotiated the sale of the Carter Company to National Lead Company and on December 17, 1908 was made Manager of our Chicago Branch and a member of the Company's Board of Directors.

Mr. Cornish was elected President on September 21, 1916 and it was during his term of office that the Company made substantial progress in product diversification and in achieving sound financial standing.

The policy of product diversification has served to cushion loss of business in some fields with improved business in other fields. For example, during the 1930 Depression, the fact that we did not have all our "eggs in one basket" helped the Company materially in weathering the storm.

During Mr. Cornish's administration the Company also expanded its foreign holdings. The National Lead Company of Argentine was organized to develop our business in that important section of South America and to look after the Company's tin and tin smelting interests there. Important investments in foreign enterprises were made in England, France, Norway and Germany.

An example of astuteness just prior to the 1930 Depression was the refusal of the management to meet the demands of some stockholders for increased dividends during years when the Company earned several times the regular dividend on the common stock.

Mr. Cornish explained that the dividend rate should not be increased until the management was convinced that it could be maintained. Moreover, taking his stand practically alone among the business leaders of the day, Mr. Cornish prophesied the 1930 Depression and argued that the reserves being built up from surplus profits would be needed to continue dividends on stocks during the business slump. This promise to the stockholders was kept.

On February 23, 1933, Mr. Cornish resigned the Presidency and was elected Chairman of the Board of Directors, a position that was created for the first time in the history of the Company and which he held until his death on May 3, 1938.

FRED M. CARTER

President—February 23, 1933 to January 12, 1938

When Fred M. Carter was elected President on February 23, 1933, he brought to the position the most varied and broadest experience in the white lead business of any of his predecessors in the office.

On April 1, 1898, Mr. Carter took charge of the advertising and promotion of the Carter White Lead Company, having been induced by his uncle, Levi Carter, Founder and President, to make the change in employment from a middle-western agricultural machinery company.

In 1903 Mr. Carter was made General Manager of the Carter White Lead Company, in 1906 its Vice President and in 1910 its President. In addition to fulfilling his executive responsibilities, Mr. Carter from the first was keenly interested and unusually well-informed on manufacturing, painting and merchandising problems.

On December 21, 1911, Mr. Carter was started on his way to the Presidency of National Lead Company with his election to the Board of Directors. Then came a Vice Presidency on September 15, 1927 and six years later he succeeded E. J. Cornish, when the latter resigned as President to become Chairman of the Board.

As Director, Vice President and President, Mr. Carter was one of the staunchest supporters of research in the Company. It was due largely to his influence that our Laboratories are as well-equipped and ably-manned as they are today. The result has been the improvement of several of our old products and the addition of many new products that have contributed materially to the profits and stability of our Company.

Among several contributions that Mr. Carter's administration made to the welfare and security of the Company's employees was the establishment of an adequate pension system. Under this plan employees contribute a percentage of their salary toward the purchase of an annuity payable at the age of 65. The Company, however, contributes two-thirds of the cost, thus giving the employees the annuity at a very low rate and an adequate income at retirement.

Mr. Carter resigned the Presidency and went into retirement on January 12, 1938.

OUR CHAIRMAN OF THE BOARD

FLETCHER W. ROCKWELL

President—January 12, 1938 to April 17, 1947
Elected Chairman of Board of Directors April 17, 1947

It might be said of Fletcher W. Rockwell, Chairman of the Board of Directors, that he was born and raised in the lead industry, since his father of the same name was one of the founders, original incorporators and a Vice-President of National Lead Company, and also because he has devoted his entire business life to our Company.

Mr. Rockwell's first position of responsibility was assumed in 1896 when he was appointed Superintendent of the Southern White Lead Works in Chicago. Upon the consolidation of the Southern Company with the Shipman White Lead Works of Chicago in 1906 he became General Superintendent of the combined plants.

It was on May 20, 1920 that Mr. Rockwell was brought to New York to serve as Production Manager of the entire Company.

When he was elected to the Board of Directors on March 21, 1926, Mr. Rockwell had devoted 30 years to manufacturing problems, and it was this directorship, augmented by his appointment to the Executive Committee in 1927, that gave him the opportunity to become so well informed as he is today with *all* the activities and problems of the Company

Mr. Rockwell was elected a Vice-President on March 23, 1937 and upon the resignation of Fred M. Carter as President on January 12, 1938, he was chosen to fill the position. He was elevated to the chairmanship of the Board of Directors on April 17, 1947.

Almost from the start of Mr. Rockwell's administration as President the Company was faced with serious wartime problems, all of which were met successfully and patriotically. We can all be proud of the Company's wartime record.

OUR PRESIDENT

JOSEPH A. MARTINO

Elected President April 17, 1947

Probably the most outstanding example in our Company of what an American boy can accomplish through sheer ability alone is exemplified in the business career of our President, Joseph A. Martino.

Starting as an office boy with the United Lead Company, a subsidiary of National Lead Company, on February 24, 1916, when he was a few days short of sixteen years of age, Mr. Martino has since then held positions in our Company of a type and responsibility that have familiarized him with every phase of our business. His starting salary was $5 per week.

It was on January 1, 1927, that Mr. Martino was given his first title, that of Assistant Auditor of the United Lead Company, and about two years later was transferred to National Lead Company as Office Manager of the General Office Accounting Department.

Mr. Martino was made Assistant Comptroller in 1934 and it was while holding this position that in 1944 he was elected a Director and appointed to the Executive Committee. But it was after April 1945, when he was promoted to the Comptrollership, that he made his most rapid advance in positions of responsibility. He was honored with a Vice-Presidency in April 1946, made Executive Vice-President seven months later and elected President on April 17, 1947.

During the years following his transfer to National Lead Company, Mr. Martino served as Secretary of the Metal Sales Committee, Chairman of the Mining Committee, a member of the Manufacturing Committee, Vice-President and Director of the American Bearing Corporation, Director of the Magnus Metal Corporation and Assistant General Manager of the Magnus Bearing Division.

Mr. Martino also worked closely with Executives on various pigment and paint problems. His most important contribution in this phase of our business was Management's acceptance of his recommendation that the Company enter the mixed paint field.

It was due to Mr. Martino's advocacy that we have the profit-sharing plan, which is an important addition to the Company's policy of continually giving consideration to the welfare of its employees.

This background of wide experience and known ability, coupled with the obvious confidence in which he is held by our Board of Directors, make it certain that National Lead Company will continue to prosper under the leadership of Mr. Martino.

HEADQUARTERS EXECUTIVES YOU SHOULD KNOW

(Those Who Influence Paint Sales and Product Policies)

DAVID A. MERSON

Director

Manager of Paints, Oils and Pigment Sales

Sales Manager of Sales Development Department

Shortly after graduating from the Virginia Military Institute with a Bachelor of Science degree in chemical engineering, David A. Merson was employed on February 6, 1923 as a Chemist in our Laboratories.

Prior to his appointment in 1938 as Manager of Oxide Sales, Mr. Merson had had a thorough grounding in the Company's storage battery business, both in the Laboratories and in the field contacting battery manufacturers. The following year he was made Chairman of the Oxide Sales Committee and in 1946 was given the added responsibility of managing the Sales Development Department. This department has put on the market profitably a number of new products developed by our Laboratories.

During World War II Mr. Merson was General Manager of the Magnesium Reduction Company, the plant of which was designed, erected and operated by our Company at Luckey, Ohio, at the request of the Government. The plant was operated without profit as a contribution to the war effort and on February 6, 1944, the Magnesium Reduction Company and its employees were awarded the Army-Navy "E".

It was in 1947 that Mr. Merson was elected a Director of the Company and was appointed Manager of Paints, Oils and Pigment Sales, retaining also the position of Manager of the Sales Development Department. On January 27, 1948 he was elected a member of the Executive Committee.

HARRY C. WILDNER

Comptroller

When Harry C. Wildner was employed by National Lead Company as a traveling auditor on June 8, 1921, he had had several years of experience as a Certified Public Accountant with a number of different firms. His World War I service was with the Coast Artillery.

In 1929 Mr. Wildner was made Manager and Treasurer of the Newton Die Casting Corp., New Haven, Connecticut, a subsidiary of National Lead Company. When that Corporation was sold in 1932 to the Doehler Die Casting Co., he resumed his position as traveling auditor. Six years later he was appointed Assistant Comptroller of National Lead Company.

The years 1938 to 1941 were passed in visiting practically all of the Company's branches in the United States and Canada for the purpose of studying factory operations as well as sales and distribution methods. This background of experience has been applied constructively and helpfully to certain problems of the White Lead Sales Committee, to which Mr. Wildner was appointed in 1944.

It was on April 19, 1946, that Mr. Wildner was promoted to the position of Comptroller of National Lead Company and on January 27, 1947 he was elected a Director of the Company and a member of the Executive Committee.

FRED McCARTHY

Manager of Trade Sales

When Fred McCarthy came to New York from Cincinnati in 1943 to become Manager of Trade Sales and Chairman of the White Lead Sales Committee, he had been thoroughly trained for his new responsibilities by years of experience as a salesman and executive, both during and prior to his employment by National Lead Company.

Mr. McCarthy started his business career with Scripps Howard newspapers and after six years was National Advertising Manager of the Indianapolis Times. Then followed a number of years of employment with Proctor & Gamble's Bulk Products Division during which he was a salesman in several Middle-Western territories and for some time before leaving that Company was in charge of the Division's salestraining and sales promotion in the East.

Mr. McCarthy entered the service of National Lead Company on November 1, 1935, as a salesman for the Cincinnati Branch. After an intensive training course in paint technology in New York and a season of helping conduct painters' meetings, he was appointed Sales Promotion Manager. From then on his abilities were recognized with frequent and important promotions.

On January 1, 1937, Mr. McCarthy was appointed Sales Manager of the Cincinnati Branch. Two years later he was made Assistant Manager and then succeeded William A. Dail as Manager shortly after the latter's death on November 5, 1939.

WILLIAM KNUST

Advertising Manager

The story of William Knust's rise to the position of Advertising Manager of National Lead Company is one of which any American would be proud.

Employed as a stenographer and bookkeeper on October 25, 1909, Mr. Knust diligently and intelligently worked his way through every division of the Advertisement Department, under the competent tutelage of O. C. Harn, Manager. At one time or another he handled the Company's direct-by-mail literature, dealer helps, painter helps, etc., as well as general and trade paper advertising.

For several years prior to its disposal, Mr. Knust was in charge of the advertising campaigns of the United States Cartridge Company.

Upon the resignation of O. C. Harn, Mr. Knust was appointed Advertising Manager of National Lead Company on March 1, 1927. Mr. Knust has devoted a share of his time to advertising and paint association activities. For two years—1932 and 1933,—he was President of Controlled Circulation Audit, Inc., an organization that verifies magazine circulations. He is a member of the Public Relations Committee of the Paint, Varnish and Lacquer Association.

ALEX STEWART

Director of Research

During the years, starting in 1908, when Alex Stewart was working in our Brooklyn Laboratories as a boy, he was so ambitious to become a chemist that he devoted all his Summer vacations to studying his chosen subject. When he left the Laboratories it was to go to college and, after graduation in 1916, to accept his first position as a Chemist with the Wringwalt Linoleum Company, now the Nairn Congoleum Company.

Then followed years of broadening experience, during which Mr. Stewart was in charge of the technical department of the C. L. Constant Company, mining engineers, and was associated with several leading chemists of the country on special research projects.

In 1930 Mr. Stewart returned to the National Lead Laboratories as a research chemist and three years later was put in charge of the new products research and development department. In 1938 he was appointed Director of Research of the parent Company, which position was broadened in 1947 to include responsibility for research for the entire National Lead organization.

Among a number of developments of importance to National Lead Company that are credited to Mr. Stewart are lignin colloids, commonly called expanders and which are used in lead-acid storage batteries; 111 White Lead, an entirely new composition of matter; and acicular basic lead sulfate, the only acicular product of lead.

E. R. ROWLEY

Production Manager

It was September 29, 1933, that E. R. Rowley was employed by National Lead Company, joining the Mechanical Engineering Department of the Chicago Branch. Prior to then and after graduating from the Illinois Institute of Technology with a Bachelor of Science degree in mechanical engineering, he had had three years of experience in his profession, principally with Proctor & Gamble.

On June 1, 1939, Mr. Rowley became Assistant Production Manager of the Company and served in that capacity until he was appointed Plant Manager of the Magnesium Reduction Company, Luckey, Ohio, during its wartime operation by National Lead Company.

In September, 1945, he was made Production Manager of the Chicago Branch and on March 15, 1948, Mr. Rowley was promoted to Production Manager of the Company.

★ EXECUTIVES WITH WHOM YOU WORK ★

PRENTISS S. ORR

JAMES L. CARUTH

W. C. MINSINGER

H. E. MacCLEARY

W. P. PEDIGO

ERIC G. ORLING

RAY C. KRUEGER

DAN B. ROBERTS

HARRY S. IRWIN

K. C. SPECHT

ABOUT EXECUTIVES WITH WHOM YOU WORK

JAMES L. CARUTH

Manager

Years of experience as a paint salesman and executive was the training James L. Caruth brought to the Managership of the Pacific Coast Branch on January 1, 1943. Even his first job after leaving school was valuable experience, since it gave him a first-hand understanding of the problems of a paint store. He was employed by a wholesale and retail paint and wallpaper distributor in San Antonio, Texas for several years and served successively as bookkeeper, office manager, clerk and territory salesman.

Upon receiving his discharge in France after two years overseas service in the Army during World War I, Mr. Caruth had the unusual and valuable experience of serving under Herbert Hoover as Manager of Transportation in the American Relief Administration, covering the Balkan States with headquarters at Bucharest, Rumania.

It was on October 15, 1923 that Mr. Caruth was employed by the Carter White Lead Company as salesman covering Texas. Later his territory was extended to include Oklahoma, Kansas, Alabama, Georgia and Florida.

When National Lead Company absorbed the Carter Sales Force in 1929, Mr. Caruth was transferred to the Chicago Branch with headquarters in Detroit, Michigan. Mr. Caruth's first executive job with the Company was as Assistant Manager of the Cleveland Branch. This promotion came on January 1, 1936, and a year later he was made Branch Manager.

On March 1, 1942, Mr. Caruth was transferred to the Pacific Coast Branch as Assistant Manager and nine months later became Manager.

Mr. Caruth served as President of the Cleveland Paint, Varnish and Lacquer Association during the fiscal year of 1939-1940.

PRENTISS S. ORR

Manager, White Lead and Oxide Department

Starting as an office boy on November 28, 1916, Prentiss S. Orr, Sales Manager of the White Lead and Oxide Department of the Pacific Coast Branch, has devoted practically his entire business career in the service of National Lead Company.

During his first five years with the Company, excepting a year's service in the Navy during the first World War, Mr. Orr held various positions in the San Francisco office. In 1921 he was transferred to the Sales Department, handling white lead and oxide sales in the City and County of San Francisco.

When the Bass-Hueter Paint Company was merged with National Lead Company on April 26, 1930, Mr. Orr was given the additional duties of handling industrial and jobbing paint accounts and battery oxide sales.

Mr. Orr was promoted to the Managership of the White Lead and Oxide Department on September 1, 1945.

Among the honors that have come to Mr. Orr during his connection with our Company are the Presidency of the San Francisco Paint Salesmen's Club during the 1928-1929 fiscal year and election to the Executive Committee of the Golden Gate Paint, Varnish and Lacquer Association in 1945.

W. C. MINSINGER

Manager, Industrial Sales Department

Prior to his employment by National Lead Company as an industrial salesman on January 1, 1943, W. C. Minsinger had had several years of experience in the Portland, Oregon, territory which fitted him eminently for the position of Manager of Industrial Sales, to which he was promoted on July 1, 1947.

The Portland companies which Mr. Minsinger served approximately three years each and in what capacities follows: Union Oil Company, service station salesman and manager; Cress & Co., building material and paint salesman; C. D. M. Paint Company, a partner and salesman of paint for the industrial and painter trade; Rodda Paint Company, in charge of all industrial, Federal and State business.

H. E. MacCLEARY

Manager, Wallpaper and Sundries Department

Prior to his employment by the Pacific Coast Branch of National Lead Company on February 25, 1946, H. E. MacCleary had served for 18 years in various capacities in the Paint Department of E. I. DuPont de Nemours & Co. Probably his most valuable experience with that company was his Managership of Stores, to which position he was appointed in 1940. He was responsible until his resignation on December 31, 1945, for all store expansion programs and operations, including their locations in all sections of the country and seeing to it that they made money during the first year of operation.

It was on May 15, 1946, that Mr. MacCleary was appointed Manager of the Wallpaper and Sundries Department of the Pacific Coast Branch.

W. P. PEDIGO

Supervisor of Dutch Boy Paint Stores

Learning retail store merchandising and salesmanship the hard way for 10 years, had been the experience of W. P. Pedigo, when on February 18, 1929, he was employed as a salesman by the Bass-Hueter Paint Company, then a subsidiary of National Lead Company.

At the age of 17 Mr. Pedigo started his business career with a large general merchandise store in Fresno, California, in the humble capacity of keeping the basement clean, running errands and doing most of the store's odd jobs. In due course he became shipping clerk in the hardware department, floor salesman and buyer of builders' hardware, and in turn head of the crockery, sporting goods and paint departments. It was while he was serving in the latter capacity that Mr. Pedigo accepted a job as salesman with the Bass-Hueter Paint Company.

Mr. Pedigo's first promotion with National Lead Company came December 1, 1933, when he was made Manager of the Fresno Branch. On November 28, 1935, he was transferred to Sacramento as Branch Manager and on August 15, 1938, to Oakland where he was Manager of the Oakland, Berkley, Alameda and Fruitvale Branches. It was on January 1, 1945, that Mr. Pedigo was brought to the main office of the Pacific Coast Branch in San Francisco as Sales Manager of the Central Division. From this position he was promoted on June 1, 1946 to the Supervisorship of the Branch's Dutch Boy Paint Stores.

During his connection with National Lead Company, Mr. Pedigo has served as a member of the Executive Boards of the Builders Exchange and the Master Painters' Association in Fresno and as President and member of the Executive Board of the Oakland Paint, Varnish & Lacquer Association.

ERIC G. ORLING

Sales Manager, Central Division

Following his graduation from Ohio University with a Bachelor of Science degree in Chemistry in 1935, Eric G. Orling launched his career in the paint industry in the Sales Department of Eagle Picher Lead Company. Subsequently he was transferred to the Joplin, Missouri, research laboratories of that company for training in paint, storage battery, oil refining and rubber technology, preparing him as a salesman of lead and zinc pigments in the Southwest territory, with headquarters at Dallas, Texas.

Upon resigning his position with Eagle Picher, Mr. Orling started employment with National Lead Company on June 15, 1938 as a salesman in our Cleveland Branch. Four years later he was appointed Assistant Manager and on October 1, of that year was transferred to the Sales Department of the Pacific Coast Branch.

Receiving a leave of absence on February 22, 1943, Mr. Orling served the U. S. Maritime Commission for about 2½ years as an inspector of paint manufacturing methods in the Los Angeles and San Francisco areas, devoting time also to analyzing and testing paints, oils, chemicals and drugs.

It was on June 1, 1946, shortly after returning from Government service, that Mr. Orling was appointed Sales Manager of the Central Division of the Pacific Coast Branch. He is also Manager of Export Sales for the Branch.

Mr. Orling is a member of the American Chemical Society and is active in the National and Golden Gate Paint, Varnish and Lacquer Associations.

RAY C. KRUEGER

Manager, Seattle Division

Ten years in the sales departments and factories of manufacturers of paint and allied products was the background of experience that Ray C. Krueger, Manager of the Northern Division, brought to his first job as salesman with National Lead Company of California on July 1, 1918. This valuable experience was gained with the Standard Wallpaper Company, American Paint & Dry Color Company and the Pacific Coast Paint Corporation.

Mr. Krueger's first promotion with National Lead Company came on August 1, 1926, when he was put in charge of a warehouse that had been opened in Portland, Oregon. On January 1, 1932, about two years after the Bass-Hueter Paint Company was merged with National Lead Company, he was made Manager of the Portland Branch.

It was on April 15, 1935, that Mr. Krueger was promoted to the Managership of the Northern Division with headquarters at Seattle, Washington.

Mr. Krueger served as President of the Portland Paint, Oil and Varnish Club during the fiscal year of 1931-1932 and as President of the Puget Sound Paint, Varnish and Lacquer Association during the 1937-1938 fiscal year.

DAN D. ROBERTS

Manager, Portland Division

After a short business experience with the Matson Navigation Company, Dan D. Roberts was employed on September 1, 1921, in The San Francisco Order and Pricing Department of the then National Lead Company of California. During the next three years he also handled the duties of their Traffic Department. On April 1, 1925, he was transferred to Portland, Oregon as a salesman.

It was on March 1, 1943 that Mr. Roberts was promoted to Manager of the Portland Division of National Lead Company.

Mr. Roberts served as president of the Portland Paint, Varnish and Lacquer Association in 1940.

HARRY S. IRWIN

Manager, Southern Division

When the Bass-Hueter Paint Company was purchased by National Lead Company in 1916, Harry S. Irwin had been Manager of that subsidiary's Branch in Portland, Oregon, since 1909. Prior to his employment by Bass-Hueter as a salesman in the San Francisco territory during 1908, Mr. Irwin had worked seven years for the Otis Elevator Company, the last two years of which he had served as Manager of their Portland Branch.

On July 25, 1922, Mr. Irwin was appointed the Los Angeles Division Manager of the Bass-Hueter Paint Company, which was still operating as a separate organization. After consolidation with the Pacific Coast Branch he was made Sales Manager of the Company's Southern Division, Los Angeles, in July, 1930. Two years later Mr. Irwin became Manager.

Mr. Irwin was President of the Los Angeles Paint, Varnish and Lacquer Association during the 1933-34 fiscal year and for several years was Chairman of the Membership Committee of the National Association.

K. C. SPECHT

Assistant Manager, Southern Division

When K. C. Specht graduated from the University of California in 1931, having met his expenses by working for the Safeway Stores and the Electrical Products Corporation, he was unable to obtain employment in industry because of the depression. Nothing daunted, he met the situation by opening a gasoline service station, which he operated until he landed employment with National Lead Company as bookkeeper in the Los Angeles Branch.

On March 9, 1936, Mr. Specht was appointed Assistant Purchasing Agent and inside salesman. Three years later he was made an industrial territory salesman.

Mr. Specht was promoted to the Managership of the Industrial Sales Department of the Pacific Coast Branch on July 1, 1944 and three years later was transferred to the Southern Division as Assistant Manager.

SELLING DUTCH BOY PRODUCTS

The Dutch Boy's prestige has sales value that our salesmen should take advantage of at every opportunity.

National advertising for many years has made Dutch Boy known to millions of home owners, painters and other users and specifiers.

Dutch Boy's reputation for high quality has been carefully built up and even more carefully guarded during generations of use.

Thousands upon thousands of long-lasting, good-looking paint jobs testify to why users prefer Dutch Boy.

Such wide consumer acceptance is the basis of convincing sales points that salesmen can use in selling Dutch Boy.

SELLING DUTCH BOY TO DEALERS

Here are a few that are effective in contacting dealers:

1. The Dutch Boy cuts selling time. This is true of any product that has as wide consumer acceptance as Dutch Boy. Time thus saved can be devoted to customer service or sales of other items in the store.
2. The Dutch Boy helps build reputation for quality. Every successful dealer knows that quality merchandise, such as Dutch Boy, is the only sure foundation for a substantial and profitable business.
3. The Dutch Boy assures repeat business. Users of Dutch Boy are satisfied customers and, it naturally follows, are repeat customers. Most dealers consider satisfied customers as their stores' best advertisements, helping immeasurably to increase their business.
4. Dutch Boy attracts trade. It naturally follows that customers drawn to a store by Dutch Boy's popularity are also prospects for other profitable items.
5. The Dutch Boy draws volume business. Most painting contractors favor Dutch Boy and this is volume business—the mainstay of every successful paint store.

SELLING DUTCH BOY TO PAINTERS

Some of the foregoing sales points will also interest painters:

1. The Dutch Boy helps sell paint jobs. When the painter mentions he will use Dutch Boy, it is an important point in his selling effort that gets an immediate favorable response, so wide is Dutch Boy's consumer acceptance.
2. The Dutch Boy helps build reputation for quality. The slogan, "Dutch Boy is good paint's other name" is in the minds of thousands of property owners, so when the painter promises to use Dutch Boy, the prospect is more than half sold on the idea that the job will be a quality job.

The fact is, the Dutch Boy's reputation for quality products is a valuable sales asset in contacting *any* type of prospect.

TWO LINES OF DUTCH BOY PRODUCTS

Dutch Boy paint products are marketed in two separate lines—differing in package design, distribution policy and basic composition.

One line, since its package design is in black and yellow colors and since it includes only white lead, oxides and companion products, is commonly called "the black and yellow line" or "the white lead and oxide line."

The other line, since its package design is in blue and white colors and since it includes only multiple pigment paints, is commonly called "the blue and white line" or "the mixed paint line."

The black and yellow line is permitted a wider distribution than is accorded the blue and white line. However, in each case the selection of outlets must be made with great care to serve the best interests of both dealers and the Company, and in strict conformity with the national distribution policy which is entrusted to your Branch Management to enforce.

SALES POLICIES

In carrying out the national distribution policy, these points should be kept in mind in selling our two paint lines:

1. Dealers selected to handle the blue and white line should also be sold the black and yellow line or at least those items that will put them in a position to meet customer demand.
2. Dealers selected to handle the black and yellow line *only* should not, of course, be sold any items in the blue and white line.
3. Push the sale of our blue and white line of paints at every opportunity. Promote and demonstrate their advantages even to the prospect who continues to prefer white lead, being very careful, however, not to question his judgment in choice of products. If nothing else, this will familiarize the confirmed "white-leader" with the merits of the new line against the time when he may decide to change his type of paint. The same policy applies, of course, to our interior products, both in the black and yellow line and in the Wonsover line of flat wall paints.

In establishing the foregoing sales policy, there is naturally no intention of disparaging white lead in the slightest degree. White lead makes as satisfactory a paint today as it ever did. As always, it can be depended upon for unexcelled working qualities, adhesion, film integrity, and extreme durability. Where it suffers in comparison with modern-day mixed pigment paints is in appearance. These provide vastly greater hiding and also maintain a cleaner, brighter look over the years, which of course accounts for their wide acceptance and large sale.

The fact must not be overlooked that paint technology has advanced by leaps and bounds in the last couple of decades. New materials, new equipment, new processes have been developed. Old materials, old methods have been improved. Specifically, mention might be made of "titanium" (pioneered, incidentally, by National Lead Company). With the advent of titanium di-oxide pigments have come house paints possessing better coverage, whiteness, tint retention and self-cleaning ability. Then there are the newer vehicles, assuring improved sealing, leveling and wearing qualities.

Somewhere along the line, every salesman is bound to run into the question: "Which is better —the Dutch Boy Blended House Paint or white lead and oil?" Considering that we have been advocates of straight white-lead paint for so long, this question is inevitable. There is only one answer, if the question is met fairly and honestly. That answer, emphatically, is, "*the Blended Paint.*" And the reason why is that our multiple pigment paint, in addition to matching white lead's durability and other desirable qualities, outmatches it in the thing property-owners want most—maintenance of fine appearance.

Here are a few of the advantages that may be claimed for *our* multiple pigment exterior paints over single pigment, white lead paint:

1. Produce whiter white jobs, thus meeting the demands of the consumer.
2. Give tinted jobs that hold their color longer.
3. Provide greater hiding power, thus making possible one-coat repaint jobs in some cases. Also give more solid-looking jobs.
4. Produce harder films, thus minimizing dirt collection.
5. Each product in the line is especially designed for a particular purpose; thus is better suited for the job than any all-purpose paint.
6. More "fool-proof"; thus the inexperienced user is less likely to obtain an unsatisfactory job.

In conclusion, it might be pointed out that our new multiple pigment paints serve the best interest of all concerned—the property owner, the painter, the dealer, the salesman, and the Company. The property-owner gets more value for his paint dollar, particularly in appearance. The painter, in giving this greater value, builds his business on a sounder long-term basis. The dealer secures a larger and more profitable volume. Sales, likewise, are larger for the salesman and for the Company. Having a product perfectly in key with the trend of the times, both can look forward to an expanding instead of a shrinking market.

BLUE AND WHITE LINE

The blue and white line is composed of multiple pigment paints in white, tints, and sash and trim colors, for exterior use only; and one-coat flat wall finishes in white and tints.

To the dealer this means that with a comparatively small investment he has a line of the highest quality ready-to-use paints on the market to meet any exterior painting need of his customers, as well as the demand for one-coat interior wall jobs. Moreover, the profit margin is most attractive, turnover is rapid and the products are easy to sell because of the wide consumer acceptance of Dutch Boy.

To the painter who prefers ready-to-use mixed paints, the blue and white line not only meets his exterior paint and one-coat flat wall needs at a reasonable cost, but its use assures him the best possible results and, consequently, satisfied customers. Moreover, the Dutch Boy gets him customer approval when the question comes up as to what brand of products he will use.

When the blue and white line was launched we had and will continue to have certain general advantages, among which are:

1. The prestige of the Dutch Boy with painters, property owners, architects and other users and specifiers of paint products.
2. The outstanding reputation of our Company for integrity and as producers of time-tested, high-quality products.
3. The widely known fact that the Company has had long experience as a manufacturer of paint materials and products.
4. There is never any compromise with quality in the formulation of these paints. As producers of practically all the pigments they contain, we are thoroughly familiar with their characteristics and relative advantages. The blue and white line is therefore engineered without bias to meet the needs of the consumer.
5. The best equipped paint laboratories in the country, staffed by experts with years of experience and the reputation for leadership in advancing paint technology.
6. The latest and most efficient manufacturing equipment, operating on a scale not generally possible in the paint industry.
7. The most modern of control systems, taking full advantage of the type of manufacturing operation and using the latest methods and equipment.

The foregoing not only include some sales points but also assurances that Dutch Boy paints will continue to lead competitive products in quality and results.

Dutch Boy Primer-Undercoater

This product has exceptional merits:

1. Provides dense hiding and an even-sealing first coat on either new exterior wood or old painted surfaces.
2. Dries to a low sheen.
3. Drying time: overnight—can be recoated safely in 48 hours.
4. Ideal primer in two-coat system, using Dutch Boy Bright White or one of our tinted paints as a finish coat.
5. Dutch Boy Primer-Undercoater should always be used as received in the package.
6. Normal spreading rates—500 square feet per gallon on smooth unpainted wood: 600 square feet per gallon over old painted surfaces.

Dutch Boy Bright White

This is a non-tintable outside white paint and possesses outstanding qualities:

1. Gives exceptional hiding.
2. Produces a dazzling white exterior finish that *stays* white.
3. Presents a surface that continually renews itself, permitting rain to wash away dirt, thus keeping its fine appearance.
4. Has great durability, wearing down slowly and evenly to a satisfactory surface for repainting.
5. Especially designed as a white finish coat paint for use over Dutch Boy Primer-Undercoater, either on new unpainted wood or on old painted surfaces.
6. Will produce a satisfactory one-coat job over a previously painted surface that is in good condition.
7. A finish coat paint that should be applied in *white only* and as received in the package.
8. Spreading rate—600 square feet per gallon.

Dutch Boy House Paint in Color

Our line of colored house paints has a number of superior qualities:

1. Formulated to meet the demand for clean, sharp tints of excellent color retention under weather exposure.
2. Produce surfaces that not only look their best when freshly painted but that retain their brightness and cleanliness as time goes on.
3. Especially formulated to assure stability in color and uniformity in appearance.
4. Can be intermixed to produce intermediate tints.
5. Should be used just as mixed in the can over Dutch Boy Primer-Undercoater, which may be tinted to the approximate shade of the respective House Paint with colors-in-oil.
6. The number of tints available cover the range of light shades most commonly used on exterior surfaces.
7. Spreading rate—600 square feet per gallon.

Dutch Boy Sash and Trim Colors

This is not only a high quality line but it has a number of special uses:

1. Colors are true and retain their gloss and brilliancy for a satisfactory time, due to the high quality of the color pigments and paint oils used in their manufacture.
2. Remarkably durable, smooth as enamel and easy to apply.
3. Dry to hard, high-gloss finishes.
4. Can be intermixed to produce any number of intermediate colors, but should not be used as tinting materials in exterior paints.
5. Ideal for exterior use on parts of the home calling for strong colors, such as sash, shutters and doors, as well as for store fronts, fire escapes, fences, railings, signs, decorative metal work, lawn furniture and play equipment.
6. When used on new wood surfaces, the first coat should be Dutch Boy Primer-Undercoater, which may be tinted to a shade of the trim color selected.
7. Before applying to new or old weathered metal surfaces, all rust and scale should be removed and a coat of Dutch Boy Semi Quick-Drying Red Lead paint applied.
8. Should not be thinned, but used just as they come in the can.
9. The line includes the most commonly used colors, plus black and white.
10. Spreading rate—600 square feet per gallon.

Dutch Boy Wonsover

This line of one-coat wall finishes is outstanding in its field:

1. Dutch Boy Wonsover not only gives one-coat coverage but it is a real oil flat paint that can be washed like new.
2. It requires no priming coat. It goes on right over wall board, brick, aged unsized plaster, previously painted wall and woodwork surfaces and even wallpaper and water-mixed paints.
3. Dirt, fingermarks, smudges and even grease can be removed easily. They do not sink into the surface because Dutch Boy Wonsover is a real oil flat paint. Therefore it can be washed again and again with soap or a reliable wall cleaner.
4. Easily applied with either brush, roller or sprayer—flows and levels out to an even, rich-looking flat finish.
5. Sets dust free in a few hours—dries hard overnight.
6. Leaves no unpleasant after-odor.
7. The line includes the more popular present-day tints for interior walls, plus white.

PAINTING TIPS

1. Before painting with Wonsover, loose or scaling particles of the old finish coat should be removed.
2. Cracks should be filled with patching plaster and spot-coated with Wonsover.
3. Finer cracks or bad stains should receive a first coat of Wonsover a day before putting on the final coat.
4. The paint should be stirred thoroughly.
5. For spray application it may be necessary to add a small amount of mineral spirits or turpentine.
6. No glue size should be used on unpainted plaster or wallboard.
7. Freshly plastered surfaces should be allowed to age for a reasonable time in order to avoid "hot spots."
8. Allow about one gallon for each 500 square feet.

WARNING

Dutch Boy Wonsover should not be used on furniture. Neither is it designed as an undercoater for enamel although it is a perfect primer for interior gloss wall paint.

BLACK AND YELLOW LINE

The important items in this line are, of course, Dutch Boy Soft Paste White Lead and Dutch Boy Pure White Lead Paints, the latter including a ready-to-spread Exterior Primer and an Outside White. These are the greater volume and profit producers in the black and yellow line.

The supplementary Dutch Boy products in the line were designed especially to assure the best possible painting jobs with Dutch Boy Soft Paste White Lead. Moreover, these companion products make it possible for the painter who "mixes his own" to handle *any* painting job, exterior or interior, on *any* building material with the few items in the line. To the painter the black and yellow line in his shop means the economy of low inventories and practically no wastage of materials.

To the dealer the stocking of the black and yellow line means that with a small investment he can satisfy *any* painting need of his customers. Moreover, its high rate of turnover and satisfactory markup make the line attractive to the dealer from a profit angle.

In the following pages we will discuss the end-use advantages of each item in the black and yellow line of Dutch Boy products, many of which will be of sales value to the dealer in contacting his customers.

Dutch Boy Soft Paste White Lead

Constant experimental work by our Laboratories and resulting improved manufacturing methods and equipment make it possible for the salesman or dealer to include current improvements among the many end-use advantages of Dutch Boy Soft Paste White Lead:

1. Stepped Up in Whiteness
   a. Whiter white jobs.
   b. Cleaner, truer, tinted jobs.
2. Heavier and Better Body Than Ever
   a. Increased hiding.
   b. Smoother brushing.
   c. Solid, evenly hidden jobs.
3. Convenience
   a. Pours from the keg.
   b. Mixes readily with paint oils and varnishes.
   c. Easily made into paint.
4. All-Purpose
   a. Makes paint for *all* coats on *all* surfaces.
   b. White or easily tinted to exact color wanted.
5. Economy

   Figured by the gallon, by the yard, by the job or in years of service, paint made from Dutch Boy Soft Paste White Lead is high in quality and low in cost.

Dutch Boy Exterior Paint Oil

(LINSEED REPLACEMENT OIL)

Dutch Boy Exterior Paint Oil was developed during the last war to conserve linseed oil needed by the armed forces and for food purposes, but it proved to be so satisfactory when used with white lead for gloss finishes that it was decided to continue marketing it in peace times. The oil is a careful blend of pure linseed oil, mineral spirits and drier—nothing else. Part of the oil is heat-treated or polymerized. Important facts about the product are:

1. Added to paste white lead, it produces a typical white lead and linseed oil paint film—durable and economical.
2. It may be used any place where it has been the practice to use raw or boiled linseed oil in paint—to thin white lead, red lead, other pastes, paints, etc.
3. It is designed to give to paints the same general working properties as those formerly made with straight linseed oil.
4. There is ease of brushing and good hiding.
5. Leveling qualities are as good, if not better, than when paint is made with straight linseed oil.
6. Setting up is a little more rapid due to the higher volatile content but this has the advantage of reducing dirt collection during the drying period.
7. Since the product contains drier, none need be added.
8. Standard white lead painting formulas may be followed except for the finish coat. This requires a little less vehicle and should include a small amount of turpentine.

Dutch Boy Liquid Drier

Advantages in using Dutch Boy Liquid Drier in paints containing raw linseed oil:

1. Best insurance against poor drying tackiness, dirt collection and early chalking.
2. Especially made to avoid surface drying and resulting wrinkling of the paint.
3. Does not curdle or discolor white paint.
4. Economical because one pint to six gallons of white lead and raw linseed oil paint gives the best results.

NOTES

1. No drier needed in white lead mixed into paint with boiled linseed oil or Exterior Paint Oil (Linseed Replacement Oil).
2. No drier needed in Dutch Boy multiple pigment paints.

Dutch Boy Lead Mixing Oil

When used with white lead, Dutch Boy Lead Mixing Oil produces a glossless paint that has a number of advantages that appeal to the applicator and property owner:

1. Produces smooth, velvety, durable flat finish for interior surfaces—plaster, wallboard or woodwork.
2. Produces weatherproof, solid-looking flat finish for exterior surfaces—wood shingles, brick, stucco, concrete or stone.
3. A complete vehicle—nothing need be added.
4. Mixes, tints and applies easily.
5. Can be used for all coats on new plaster or wallboard—it seals as well as decorates.
6. Makes ideal enamel undercoater because of excellent sealing and flowing qualities.
7. Can be stippled to an attractive orange-peel effect.
8. Retains good appearance under repeated washings.
9. When tinted with Dutch Boy Colors-in-Oil, does not wash out or streak under repeated washings.
10. With white lead on exteriors it wears down slowly and evenly by gradual chalking.
11. With its superior spreading rate and durability, Dutch Boy White Lead and Lead Mixing Oil paint is low in cost when figured by the yard, by the job or in years of service.

Dutch Boy Flatting Oil

Among the important uses of Dutch Boy Flatting Oil are:

1. With Dutch Boy White Lead to make a sharp, well-defined, stippling flat paint.
2. This stipple has exceptional beauty of finish and because of its texture and hard matte surface is preferred by craftsman as a ground for decorative painting.
3. Dutch Boy Flatting Oil is used extensively for mixing decorative glazes with Dutch Boy Colors-in-Oil because it requires no varnish protective coat.
4. It mixes readily with oil colors to produce superior wood stains.
5. Dutch Boy Flatting Oil is widely used by painters for thinning interior paints.

Dutch Boy Colors-in-Oil

Here is what consumers get in Dutch Boy Colors-in-Oil:

1. High tinting strength—a little color tints a lot of paint.
2. True tone—they make clean, sharp tints true to shade or tone.
3. Quick-mixing—so soft and finely ground they disperse in paint easily and quickly without streaking.

And here is what they save:

1. Trouble—clear, clean tints.
2. Time—quick-mixing.
3. Money—less color needed.

TIPS FOR USERS

Here are some very practical hints you can pass along to customers who buy Dutch Boy Colors-in-Oil:

FRENCH OCHRE: A permanent, clear, brownish yellow. Produces attractive red brown or tan tints of good durability.

RAW SIENNA: A permanent brownish yellow. Widely used to produce light cream tints and tan shades with a soft green undertone. Used with Chrome Yellows in making distinctive creams. With Raw Umber it produces warm grays. Very effective as a glazing color.

BURNT SIENNA: This very permanent red brown color is used principally in glazes and oil stains, such as cherry and mahogany. In tinting, it is used to advantage to impart the warmth lacking in other coloring materials.

RAW UMBER: A permanent brownish gray. Used extensively for graying bright tints. Excellent as a glaze for antique finishes. Many users prefer it to lampblack for producing gray tints. It is often used alone or in combination with Raw Sienna to make oyster whites.

BURNT UMBER: A permanent reddish brown of gray cast. The permanency of the color makes it ideal for use in exterior stains such as those for shingles. Also used extensively in making pleasing shades of warm browns and grays. A most dependable color for glazing or graining purposes.

LAMPBLACK: The most permanent of all colors. An essential color for making gray shades. Also used in combination with other colors to impart gray effects.

C. P. CHROMIUM OXIDE: A grayed yellow green. The most permanent of the green colors. Thinned with the proper vehicle, it is often used alone as a sash and trim color. It is of course used in lighter shades when let down with white for the same general purposes.

C. P. CHROME GREENS: Bright, permanent, chemically-pure colors of very high tinting strength. Available in three shades—Light, Medium and Dark. Frequently used alone with a

suitable vehicle to produce sash and trim colors. A wide range of sharp, clear tints are obtainable with these colors.

CHROME GREENS: Reasonably permanent, bright, green colors available in three shades—Light, Medium and Dark. They are used for the same general purpose as the C. P. Chrome Green Colors, although a greater quantity is required to get a given tint.

C. P. CHROME YELLOWS: Bright, permanent, chemically-pure colors of very high tinting strength in three shades—Lemon, Medium and Orange. Most extensively used for tinting purposes. Produce a range of very clean yellow and orange tints of good permanence. The orange shade is often used as a straight decorative color.

PRUSSIAN BLUE: A strong blue most widely used for tinting and glazing. Its permanence is good on interior exposures.

DUTCH BOY BLUE: A clean, bright blue of good permanence. Especially designed to withstand exterior exposure. Used as a tinting color the tints obtained are pleasing blues of greenish cast. So formulated that when reduced with an equal volume of raw linseed oil, finished paint is obtained which is highly desirable for trim and shutters.

BULLETIN RED: A permanent red used extensively for store front signs, either by itself or intermixed with Indian Red or Black. Fairly permanent when used for tinting.

ROSE RED: A rich red intended for producing rose tints with white. Also a warm toner in combination with other colors in making tints.

VENETIAN RED: Very permanent. Used widely as the pigment part of finish coat paints for brick surfaces. An excellent tinting material in combination with other color materials for either interior or exterior paints.

TUSCAN RED: Fairly permanent. Produces soft grayed rose tints with white. Can also be used as a straight color with flat or gloss vehicles.

INDIAN RED: A permanent color. Makes a desirable maroon trim color for exterior use. Develops soft blue red tints when used with white. Used with Bulletin Red to make "India Red."

PART IV

PRACTICAL AND TECHNICAL INFORMATION

EXTERIOR HOUSE PAINT

Adapting Dutch Boy Products to PAINTABLE SURFACES

WHITE LEAD

OTHER WHITE HIDING PIGMENTS

COLORED PIGMENTS

WHITE BASIC LEAD SULFATE

RED LEAD

ORANGE MINERAL

ZINC CHROMATE (*Zinc Yellow*)

BLUE BASIC LEAD SULFATE

DRYING OILS

PAINT THINNERS

RESINS

EXTERIOR HOUSE PAINT

When the word "paint" is mentioned to a layman the chances are that in his mind a picture arises of a tin can containing a semi-viscous material or he thinks of a white or colored shiny surface. This is not a paint man's conception of paint or at least it should not be.

The fact that paint is fluid and put up in cans is incidental and temporary and paint does not perform its function in that form. Although paint is produced as a liquid, this only serves to allow application. It is as a film formed on the surface of an object that paint performs its services as a protective and beautifying agent.

Chemical Changes

Exterior house paint consists of a mixture of pigment which is solid and of drying oil which is liquid. After such a paint has been applied the conversion of the liquid coat into what is known as a dry film is due to chemical changes taking place within the oil and causing its solidification to the extent that a film is obtained. These chemical reactions do not stop after the paint has dried but continue until the film's final destruction. This, as well as the fact that a paint film may be subjected to other influences which may act chemically on the individual constituents of the film, explains the importance of a paint's composition.

Physical Structure

However, a paint film's behavior is not dependent alone on its chemical composition. Its physical structure is of equal importance. It must be borne in mind that a paint film is a three dimensional entity. It has length, width and depth, and occupies a volume. The manner in which the various ingredients are distributed physically and build up a film (in other words, its structure) may have important bearing on its performance. This may be illustrated by drawing comparisons with other more obvious structures. For instance a steel bridge may be weak because of faulty construction. On the other hand a wooden bridge may be strong because of sturdy construction. By the same token a paint film may be resistant notwithstanding the presence of a binder which by itself is easily destroyed, while it is possible to obtain weak films with practically indestructable pigments.

To sum up: a paint film's performance depends on its structure as well as on its composition. These factors are inter-related and therefore cannot be separated in explaining the performance of a film or in predicting its possible behavior.

PAINT FILM REQUIREMENTS

The requirements which a paint film on the exterior of wooden houses has to meet are many and varied. Such a film has to be opaque and smooth. It has to adhere to the surface on which it has been formed. It has to have sufficient thickness to provide adequate protection. In addition it has to have durability and maintain good appearance during its period of service.

In the past, films have been built up with three coats of paint. In the order of their application they provided:

1. Adhesion.
2. Hiding and film thickness.
3. Appearance and film protection.

In recent years paint systems have been developed in which two coats of paint produce a satisfactory film. The first coat of this type of system combines the properties of the first two coats mentioned under the older method of film construction.

TWO-COAT SYSTEM ADVANTAGES

Compared to the older three-coat system the two-coat system offers many advantages, one of the most important of which is its economy, due to the fact that the main cost of a paint job is labor for application. The following discussion will deal exclusively with the two-coat method of film construction.

It is obvious that since the two paint coats serve a different purpose their composition and structure must vary. However, they should be so constituted that they are mutually compatible. In order to formulate paint intelligently it is necessary to consider all factors involved in such a manner that a picture may be developed of the paint film's ultimate physical appearance. Without this it will not be possible to predict its probable behavior and determine its suitability for the purpose for which it is intended. Consideration should be given first to the structure of the film which a paint is required to produce. Then the individual ingredients may be introduced.

STRUCTURE

Since a paint film consists of solid materials (pigments) suspended in the solidified vehicle, the quantities of each of these major constituents to be used in a paint should be determined first. Variations in the proportions of these elements may produce marked differences in the physical appearance of a paint film and also differences in behavior and performance.

To illustrate some of the possibilities which may result, a comparison may be made between paint films containing higher or lower pigment content. In the former, enough pigment may be present so that some of the particles protrude through the surface and produce a flat finish. When the pigment concentration is low the pigment particles may all be covered by the oil content and form a continuous smooth surface producing a glossy finish. Naturally the behavior of films of different pigment concentration may differ substantially on outside exposure and in their resistance to the elements.

The following drawings give some idea of what such films might look like in cross section:

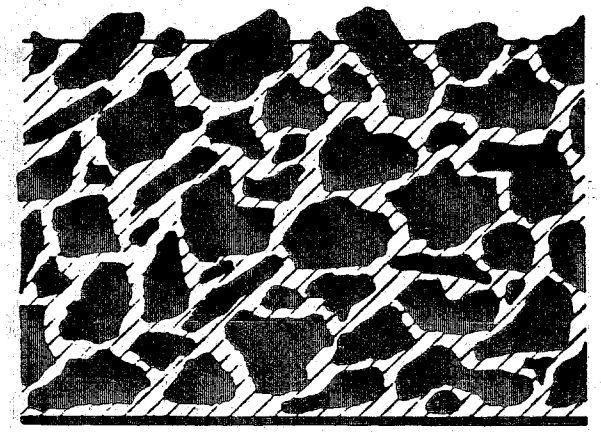


Figure 1

Cross Section of Flat Paint Film

Note that pigment content is sufficiently high to permit particles to protrude through the surface of the film and produce a flat finish.

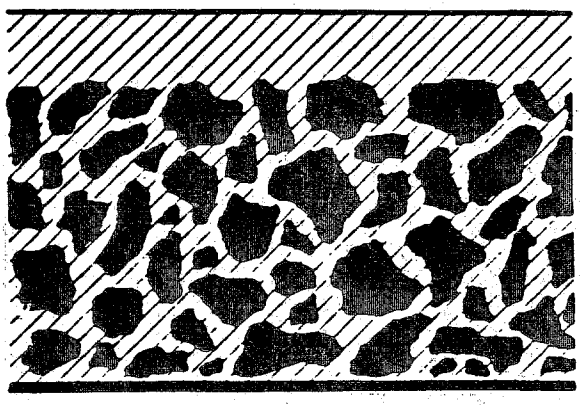


Figure 2

Cross Section of Exterior House Paint Film

Note that the lower pigment content allows the oil to cover the particles and form a glossy finish.

*Slanted lines represent oil content and irregular black spots the pigment particles.

In order to be able to draw the foregoing pictures the volume proportions occupied by pigment and vehicle have to be known. Since materials of such great difference in specific gravity are involved, weight figures would not supply the necessary information. For instance, a mixture of half pigment and half vehicle by weight would not give a paint film in which half the volume would be occupied by each. The average specific gravity of pigment is somewhere in the neighborhood of 4.50 and of vehicle *.900. This means that under those conditions 50% pigment by weight would equal only 16⅔% pigment by volume.

PV EXPLAINED

Naturally with each variation in specific gravity of one or more of the ingredients this volume figure would change, notwithstanding the maintenance of equal weight proportions. In order to avoid confusion and to obtain a mental picture of the film which a paint might produce, the proportion of pigment is often expressed in a percentage by volume calculated on the total non-volatile ingredients in a paint. The latter comprise all those materials which remain in the film after the paint has dried. They include the pigment and the non-volatile portion of the vehicle. This figure is designated as PV, indicating a pigment—non-volatile vehicle ratio. For instance, a paint having a PV of 30 means that 30% by volume of its film forming constituents is represented by pigment.

Since the primer of a two coat paint system is to provide among other things film thickness it should form a dense coat and a high pigment volume is required. Moreover, a large volume of pigment in such a paint can be used to obtain a flat or semi-flat finish which produces compatibility with the next coat and provides a good bond so that the two coats of the system may act as one film.

Successful PV's for Primers

The most successful pigment concentration for first coats seems to lie between PV's of 35 and 40. However, it is obvious that such pigment-non-volatile oil mixtures are of rather thick consistency and in order to be able to apply such paints, fairly large proportions of volatile are required to thin the paint to brushing consistency.

For the finish coat the requirements are different. This is the coat which provides the outer surface to a paint film, requiring resistance to the weather or other outside influences. In addition it contributes the beautifying qualities which demand sufficient hiding and most often a pleasing glossy finish.

Successful PV's for Finish Coats

The pigment is responsible for a major portion of these qualities. It provides protection but cannot continue to do so unless it is held in place by the binder, the non-volatile vehicle. A finish coat has to be so constructed that the binder will enable the pigment to perform its function. A larger proportion of vehicle is required, which at the same time produces the glossy finish. However, too large a proportion of oil introduces conditions which are detrimental.

Although the oil keeps the pigment in place the pigment protects the oil. In films with high oil content the pigment has a tendency to recede into the depth of the film and in so doing cannot be in close enough proximity to the surface layer of oil to protect it. A most effective balance in pigment and non-volatile vehicle for finish coats is between the general limits of PV 28 to 31.

*Specific gravity of water is 1.000.

Application of a priming coat followed by a finish coat of the structure described in the foregoing paragraphs will provide a continuous paint film with a solid base, sufficient thickness and a good smooth outer surface.

COMPOSITION

Within the limits set by the structural requirements, specific raw materials are introduced to obtain the desired physical structure and chemical composition of the paint film. These include pigments and vehicles which will be discussed in subsequent paragraphs.

PIGMENT

As hitherto stated a pigment can increase the durability of a vehicle. This increased strength may be due to either physical or chemical action or both.

Physical protection includes the ability of some pigments to shield a vehicle from the intense action of the destructive rays of the sun. This type of protective process is generally associated with colored pigments.

Chemical protection can be provided by those pigments which will react in specific ways with the vehicle and form more resistant compounds.

In white exterior house paint, the action of the pigment which contributes most substantially to the extension of the life of the vehicle is generally of a chemical nature. White pigments may be divided into two groups—reactive and non-reactive. The reactive pigments, by chemical combination, increase considerably the durability of the vehicle, which in outside house paint consists mostly of linseed oil. The reactive pigments include white lead and zinc oxide.

White Lead

In another chapter white lead's chemical reactivity and function in a linseed oil paint have been described. As it reacts with the oil it delays its ultimate destruction and also forms lead soaps which provide adhesion and flexibility to a paint film.

Zinc Oxide

This pigment also reacts with linseed oil forming soaps. These soaps have their own typical characteristics. In particular they are hard and for that reason zinc oxide forms hard and brittle films. Moreover, zinc oxide in a paint film will eventually form water-soluble derivatives which cause so-called "washing."

The non-reactive pigments have other functions to perform.

Titanium Dioxide

Titanium dioxide's most valuable asset is extremely high hiding power. In fact, in a multi-pigment paint, it is used mainly to build up the hiding to the required degree.

As titanium dioxide in its simplest form is entirely non-reactive it is easily subject to chalking. In the presence of zinc oxide which forms water soluble compounds, titanium dioxide provides a paint with so-called self-cleaning properties.

Extender Pigments

This generic name is applied to non-hiding pigments, such as barytes, magnesium silicate (asbestine) and whiting. Most of these are inert although a few are reactive. The reactivity of the latter, however, is very mild and hardly ever is it a consideration for their use.

The function of the extender is principally in filling up available space in the pigment phase to reach the required volume not occupied by the other pigments used. Extender pigments make it possible to do this economically, because their cost is very low. Moreover, extenders may act as plasticizers in the paint film. They usually produce soft films and their presence helps avoid excessive hardness.

The white pigments just mentioned are those generally used in formulating an exterior house paint. It must be added, however, that many modifications in each of these groups are available and that their correct choice may have important bearing on the performance of a paint as well as on that of the paint film.

VEHICLE

A vehicle can be divided into two parts: non-volatile and volatile. The first remains in the paint coat after it has reached the so-called "dry" stage and consequently must possess film-forming properties. The volatile leaves the drying paint by evaporation and is used to impart sufficient fluidity so that the paint may be applied.

Linseed Oil

Linseed oil is the most widely used material as the film-forming ingredient in exterior house paint. It is available in many modifications, each one being chosen for use in paint to meet particular circumstances and requirements.

The different grades of normal viscosity may vary in acid number. Oils of different acid number are selected in order to meet production requirements as well as to control soap formation.

Differences in viscosity are taken advantage of to give a paint body and gloss whenever necessary. Moreover, oils of heavy viscosity do not readily penetrate porous surfaces and can contribute to the sealing qualities ot a paint.

Volatile

The most widely known volatile in paint undoubtedly is turpentine. However, it is not the most generally used by the paint manufacturer. Most paints contain so-called mineral spirits as volatile thinners. They are petroleum derivatives which are produced in many grades varying in specific gravity and the speed with which they evaporate. These qualities may influence substantially the application properties of a paint and consequently the fact that so many types are available provides the paint manufacturer with another means of adjusting his products.

FORMULATING PAINT

Formulating a paint consists of the selection of the proper type of raw materials and the proportions in which they shall be used. Naturally many factors have to be considered. In addition to the purpose for which the point is designed, the conditions of application, etc., personal preference enters into the situation most prominently. Moreover, it should be understood that in general all ingredients contribute specific characteristics and the desire to accentuate one particular property in a paint of necessity results in a reduced opportunity to impart other qualities.

For that reason a paint formula of a high grade paint usually represents a compromise in ideas, the purpose being to design a paint which most completely suits the expected requirements. It is understandable that there are so many different paints of varying compositions on the market, since so many factors have to be considered and since opinions on their importance and the manner in which the many requirements may be met vary so widely.

It is always tempting to judge paints from the formulas given on the labels on the cans. However, as hitherto explained, it is impossible to obtain a picture of the structure and composition of the film from the weight figures usually given. Although translation into volume proportions would help, even that does not disclose full information.

The fact of the matter is that no one should ever venture to express an opinion of the quality of a paint while only the general formula is known. Only experts familiar with all details could take a chance at predicting a paint's behavior.

In selling paint, therefore, stress should not be laid so much on its composition as on its known performance, obtained from observation of its behavior under practical conditions.

WHITE LEAD

White lead, or basic lead carbonate, is a white opaque pigment consisting essentially of a double compound of lead carbonate and lead hydroxide. It is made by a number of different processes, in all of which metallic lead is combined with oxygen, carbon dioxide and water to form basic lead carbonate.

The commercial white leads made by the various processes show variations in chemical composition and, consequently, in physical characteristics.

Exposure of metallic lead to the influence of the atmosphere will form some white lead. This may be observed when a lead pipe or a sheet of lead has been out in the weather for some time. A very thin coat of a white substance will have appeared, and this is basic lead carbonate. Since this process of nature is corrosion and not erosion, there is no wearing away of the lead pipe or sheet lead and the action of the oxygen, carbon dioxide and water in the atmosphere on the lead stops as soon as the thin coat of basic lead carbonate is formed. Such coatings have been known to shield lead objects from further changes for centuries, demonstrating the unusual protective qualities of white lead.

Depending on nature to produce white lead, however, would take much too long and prove very costly. The formulation of white lead is speeded up by using acetic acid. In the presence of acetic acid, metallic lead, oxygen and water will form a compound called basic lead acetate which readily reacts with carbon dioxide to produce basic lead carbonate or white lead. Only a small amount of acetic acid is needed as it is not consumed and is not part of the final product. It is released when the basic lead carbonate is formed and thus can take part repeatedly in the reaction.

ALL PROCESSES BASICALLY THE SAME

All processes used for the manufacture of white lead are based on the foregoing principles. The various methods of production show differences in the form of the raw materials, the method of introduction into the process and the equipment employed.

The raw materials required are lead, acetic acid, carbon dioxide and water. The lead used is generally of a highly refined grade known as corroding lead.

The acetic acid used has varied through the ages. Many centuries ago sour wine was employed; later, vinegar was used. Nowadays, refined acetic acid of varying concentrations is used.

Carbon dioxide is formed as a gas when carbon compounds oxidize or burn which may take place under many varying conditions, from rapid combustion to slow fermentation processes. When sour wine or vinegar was used as a source of acetic acid, tan bark supplied the carbon dioxide. At present, carbon dioxide from burning coke is utilized in several manufacturing processes.

Water is present in all of the processes. The acetic acid solution contains water. Where carbon dioxide gas is used which has been generated in a coke fire, the water is added as such or as steam. Finally, in some processes the reaction actually takes place in water.

In the different processes for manufacturing white lead the equipment is adjusted to the form in which the raw materials are introduced and the way the chemical reactions are produced.

Dutch Process

The Dutch Process is one of slow corrosion generally requiring 100 to 120 days. Lead buckles or perforated discs of lead are placed in corroding pots, resting on a narrow ledge or shoulder part way up the inside wall of the pot. In the bottom, a small amount of dilute acetic acid is placed. These pots are placed in rows on a floor covered with spent tanbark which has been wet down thoroughly. Planks are laid on top of the pots and another layer of pots containing buckles

and acetic acid is placed on top of these planks and the procedure is containued until a stack of 10 or more layers has been built up. In these stacks, the fermentation process of the tan-bark supplies the heat and the carbon dioxide. The heat is sufficient to volatize the acetic acid which in conjunction with air and water forms basic lead acetate, which is in turn converted to basic lead carbonate by the action of the carbon dioxide from the tan-bark.

This method of manufacture, as well as the product it produces, was considered standard for many years. However, new processes have been developed, short descriptions of which follow.

Carter Process

In the Carter Process the white lead is formed in large, slowly rotating cylinders. The lead is introduced in the form of fine powder. Carbon dioxide is admitted through the head of the cylinder in the form of gas and a weak solution of acetic acid is sprayed into the cylinder at intervals. As the cylinder revolves, finely divided lead is carried up on the inside wall and rolls to the bottom so that new particles are continually exposed to the action of the corroding agents. Thus, the entire batch reaches a completely corroded state in from 12 to 14 days. In addition to the saving in time the process lends itself better to the exercise of closer control.

Thompson-Stewart Process

Metallic lead is subjected first to an oxidation process. The resulting product, made into a water slurry, is placed in a tank. After treatment with air and carbon dioxide in the presence of small quantities of acetic acid, white lead is precipitated.

This process is National Lead Company's most recent development. It is very fast and permits strict control. The operation is flexible and different types of white lead, each of particular uniformity, can be manufactured in this way.

Euston Process

Metallic lead is melted and run into water where it forms a mossy, spongy mass of "feathered" lead. This spongy lead quickly oxidizes and when lead acetate solution is added, the oxide is dissolved and the basic lead acetate is formed. This lead acetate solution is clarified and treated with carbon dioxide to form basic lead carbonate.

Sperry Process

This is an electrolytic process which is carried out in a concrete cell having a lead anode and iron cathode separated by a porous diaphragm. The lead anode is immersed in sodium acetate solution and the iron cathode in sodium carbonate solution. Under the influence of the current, basic lead carbonate forms near the surface of the lead anode. The solution flows continuously from the anode removing the white lead as it is produced and depositing it in regular settling tanks.

Finishing Processes

After the white lead has been formed by any one of these processes, it must be carefully washed, screened and in some instances, ground. It is then in the form known as white lead water pulp.

The white lead water pulp may be either dried and ground for delivery to the paint maker, ceramic manufacturer or other user as dry white lead, or it may be mixed with linseed oil and made into white lead paste. When linseed oil is added directly to the white lead water pulp, the white lead has such great affinity for the oil that the latter displaces the water. It is not necessary to first dry the white lead to make white lead and oil.

COMPOSITION OF WHITE LEAD

The manufacturing processes in use today for the production of white lead make it possible to produce a number of types varying in physical properties as well as composition. Most commercial white leads have a lead carbonate content within the range of 62 to 70 per cent, well within the limits allowed in Federal and A. S. T. M. specifications.

OTHER WHITE HIDING PIGMENTS

Titanium Pigments

Titanium dioxide (TiO_2), although known as early as 1790, did not become important commercially as a pigment until the 1920's.

Titanium pigments are made in different types and grades. Those known as "pure pigments" may vary in hiding power, whiteness, chalking resistance, etc., due to differences in crystal structure and from the addition of very small quantities of certain chemicals. A group of composite types are also available. They consist of mixtures of 30 percent titanium dioxide with 70 percent of either barium sulphate, calcium sulphate or magnesium silicate.

Titanium pigments are characterized by high brightness and whiteness. The straight titanium pigments are very opaque and have the highest hiding power of any of the white pigments. The effective hiding power of titanium oxide in paints depends on the manner in which it is used, i.e., type of paint, concentration of pigment, etc. The introduction of titanium dioxide furnished the paint industry with a pigment that was five to seven times stronger in hiding power than the more common white pigments. The hiding power of titanium dioxide is sufficiently high, so that when used in composite pigments to an extent of 30%, the resulting pigments have greater hiding power than other white pigments with the exception of pure zinc sulphide.

Titanium dioxide is unreactive chemically and resistant to attack by acids and alkalies, and to discoloration by gases. For the same reason titanium dioxide does not react chemically with paint vehicles. This means that the pure untreated types, of which the original characteristics have not been changed by the addition of chemicals, do not form soaps with the oil in exterior paints. Titanium dioxide in combination with zinc oxide imparts self-cleaning properties to an exterior house paint.

The high opacity, brightness and whiteness, as well as the non-reactivity, of titanium pigments have led to their wide use in interior and exterior paints and enamels, paper, rubber, ink, oil cloth, rayon, linoleum, plastic and other products. They also are used in ceramics and welding rod coatings for their chemical properties rather than their physical characteristics.

Zinc Oxide

Zinc oxide is one of the oldest white opaque pigments and is made by two processes. In one process, known as the French process, metallic zinc is heated in a special furnace and vaporized. The zinc vapor on contact with air forms the zinc oxide. In the other process, known as The American process, zinc oxide is made directly from zinc ore by roasting a mixture of ore and coal in a special furnace. French process zinc oxide particles are rounded or spherical. American process zinc oxide is available with either rounded or acicular particles predominating.

In the paint industry zinc oxide is used chiefly in white and light colored exterior house paint in combination with titanium dioxide and white lead. Zinc oxide provides a cleaning action in the mixed pigment paints so that the paint sheds accumulated dirt. About 10 to 20 per cent zinc oxide in the pigment portion will provide this cleaning action. Larger amounts of zinc oxide are to be avoided because of the tendency of zinc oxide to cause cracking and scaling. Zinc oxide is a basic pigment and reacts with most paint vehicles. If the zinc oxide content of paint is high or if the vehicle is especially reactive with zinc oxide, the excessive amount of reactive products formed cause the film to be hard and inelastic which results in cracking and scaling on exposure to the weather. Small percentages (5 to 10%) are also used in white industrial coatings to prevent yellowing.

Leaded Zinc Oxide

Leaded zinc oxide is a white pigment which is composed of basic lead sulphate and zinc oxide. It is made either directly from a lead and zinc containing ore by a process similar to the American zinc oxide process or by mechanically blending zinc oxide and basic lead sulphate pigments. The pigment produced by the first mentioned process is termed "calumed" and by the latter process "blended."

The lead zinc ores as they are mined are best suited to producing a pigment containing about 35% basic lead sulphate and about 65% zinc oxide. The 35% grade of leaded zinc oxide is therefore sold in greatest quantities. However, a 5% grade and a 50% grade are commercially available.

Practically the entire production of leaded zinc oxide is used in exterior house paints as a source of both lead and zinc pigments where low cost is of primary importance.

Zinc Sulfide Pigments

Lithopone is the oldest and most widely used zinc sulfide pigment. It is composed of about 28% zinc sulfide and 72% barium sulfate. It is made by forming these compounds by the interaction of zinc sulfate and barium sulfide solutions. When the two solutions are combined the insoluble zinc sulfide and barium sulfate are precipitated together.

Lithopone is used in interior oil and emulsion paints and in enamels. Its use in exterior paint is limited to the cheaper grades as it does not have good weathering properties. The use of lithopone in interior paints is decreasing constantly with the increased use of titanium pigments.

The production of pure zinc sulfide as a pigment was a later development. It is a very opaque pigment and has greater hiding power than any of the white pigments except titanium oxide. Pure zinc sulfide is used in interior paints and enamels.

Zinc sulfide barium pigment and zinc sulfide magnesium pigment contain about 50% zinc sulfide. The zinc sulfide barium pigment is made by chiefly adding zinc sulfide to Lithopone and is used in interior paints. Zinc sulfide magnesium pigment is made by blending zinc sulfide and selected magnesium silicate and is used to some extent in the cheaper grades of exterior paints.

Antimony Oxide

Antimony oxide, Sb_2O_3, is a white pigment which is used chiefly in white and light colored industrial coatings to increase the durability of the coating, particularly to decrease chalking. Antimony oxide is also used in fire-retarding coatings in combination with chloride compounds. Under heat, antimony chloride is formed which tends to retard combustion.

Physical Properties

Certain physical properties of white lead are shown in the following table:

Bulking Values	
Pounds per solid gallon	56 to 57
% Light Reflection	92
Oil Absorption	8 to 15
*Tinting Strength	100 to 220
Hiding Power	
Sq. Ft. per lb. over black	15 to 23

WHITE LEAD IN PAINT

As is well known white lead is used extensively in paint, particularly in exterior house paint. Usually this type of paint is a mixture of pigment which is solid and of linseed oil which, of course, is liquid. The drying of a paint takes place when the liquid portion solidifies. This is caused by chemical changes, mostly oxidation, which are induced by the atmosphere. However, this oxidation reaction does not just stop when the paint is dry but keeps on going. Continued oxidation of any organic material such as linseed oil eventually causes it to break down.

Films consisting of linseed oil alone fail quite rapidly. In fact, it is not possible to make a linseed oil paint of reasonable durability if nothing is done to reduce the rate of destruction to which the oil is subject.

In order to retard the failure of the oil, white lead is used. White lead is reactive, that is to say, it combines with linseed oil forming more stable compounds, thus delaying the destruction of the oil.

Some of these compounds are lead soaps which, in addition, serve other purposes. They possess a unique particle structure and consist of a series of radiating rods growing from a central core. They are flexible and interlaced in a paint film, they provide strength and flexibility as well as adhesion.

Another result of white lead's affinity for linseed oil is that they mix very readily. This is important in the paint factory where it contributes to the ease of making paint.

White Lead's Contributions to Paint

White lead also possesses substantial hiding power and excellent whiteness. The fact of the matter is that white lead adds more desirable qualities required in a good paint than any other white pigment can provide. The properties which white lead contributes to a paint may be summed up as follows:

1. Mixing and grinding ease
2. Package stability
3. Hiding
4. Brushability
5. Leveling
6. Drying action
7. Whiteness
8. Film strength
9. Flexibility
10. Tint retention
11. Adhesion
12. Gloss
13. Weather resistance
14. Fool-proofness

All these qualities add up to what may be termed "fool-proofness," a contribution of major importance to paint. Moreover, it explains why white lead is the only white pigment which by itself, with a suitable vehicle, will produce a paint of outstanding quality.

Other Uses

White lead is used for other purposes. They include the manufacture of pottery, colors, caulking compounds, putty, heavy duty greases and special adhesives and cements.

*Based on standard sample Dutch White Lead 100

COLORED PIGMENTS

The colored pigments used in paints may be divided into two classes, natural pigments and chemical pigments. The natural pigments are produced by processing colored crude ores and this consists of grinding to reduce particle size, drying to remove moisture and in some cases calcining to dehydrate and oxidize the ores. The chemical pigments are made by combining chemicals to form the desired pigments.

The following table lists the more common colored pigments, shows whether they are natural or chemical and indicates the manufacturing process used to produce them.

ORANGE		
Chrome Orange C	Chemical	Precipitation of basic lead chromate.
Orange Mineral	Chemical	Roasting white lead or litharge.
RED		
Indian Red	Chemical	Calcining ferrous sulfate.
Red Iron Oxide	Chemical	Precipitation of iron hydroxide and calcining.
Toluidine	Chemical	Precipitation of organic coal-tar compounds.
Venetian Red	Chemical	Co-precipitation of hydrated iron oxide and calcium sulfate, followed by calcining.
BLACK		
Bone Black or Drop Black	Chemical	Burning bones.
Carbon Black	Chemical	Burning gas.
Iron Ixoide Black	Natural	Grinding magnetite.
Graphite	Chemical	Heating coke to high temperature.
Lampblack	Chemical	Burning oil.
Precipitated Black Oxide	Chemical	Precipitation of iron oxide followed by oxidation.
BLUE		
Phthalocynine	Chemical	Roasting copper and phthalonitrile.
Prussian	Chemical	Precipitation of ferric ferrocyanide.
Ultramarine	Chemical	Calcining siliceous materials.
GREEN		
Chrome Green	Chemical	Precipitation of chrome yellow with prussian blue.
Chromium Oxide	Chemical	Roasting potassium dichromate.
Phthalocyanine	Chemical	Chlorination of phthalocyanine blue.
YELLOW AND BROWN		
Burnt Sienna	Natural	Calcination of raw sienna.
Burnt Umber	Natural	Calcination of raw umber.
Chrome Yellow	Chemical	Precipitation of lead chromate.
Hydrated Iron Oxide	Chemical	Precipitation of iron hydroxide, followed by oxidation.
Ocher	Natural	Grinding ore lower in iron content.
Raw Sienna	Natural	Grinding ore higher in iron content.
Raw Umber	Natural	Grinding ore containing iron and manganese.
Van Dyke Brown	Chemical	Precipitation of iron hydroxide followed by oxidation.

Colored pigments are sold as dry powders or are ground into paste with linseed oil or some other vehicle. The linseed oil pastes are called "colors in oil." If the color is ground in a Japan varnish, the paste is called "Japan color" or "superfine color."

Colors in oil are used principally by painters for tinting or for making colored paints. Dry colors are used by manufacturers of paints, inks, linoleums, calcimines and other water paints. Japan colors are used by sign painters, and, to a limited extent, by painters for tinting enamels.

WHITE BASIC LEAD SULFATE

Commercial white basic lead sulfate is a pigment used widely in mixed pigment paints. It is known also as "basic sulfate white lead" and "sublimed white lead."

The commercial product is not a single compound; it is a composition of basic lead sulfate and uncombined, or free, normal lead sulfate. The various grades are distinguished both by method of manufacture and the lead monoxide (PbO) content.

White basic lead sulfate is made by fume processes and also by a chemical process.

Two Fume Processes

In one fume process, lead sulfide ore (galena) is subjected to a high temperature in an oxidizing atmosphere. In another process, molten lead is sprayed into a jet of ignited fuel gas in the presence of sulfur dioxide gas. In both processes the basic lead sulfate is formed in furnaces as a fume, which is drawn through a cooling system to a bag room, where it is collected.

Chemical Process

In the chemical process, metallic lead is first atomized. The finely divided, partially oxidized lead is then mixed with water. Sulfuric acid is then added to form white basic lead sulfate.

Depend on Method of Manufacture

The physical and chemical properties of white basic lead sulfate depend upon the method of manufacture and the PbO content of the pigment. The chemical process basic lead sulfate is higher in PbO content, whiter, higher in hiding power and produces thicker paints than the fume process basic lead sulfates. It has needle-like, or acicular, particles.

Compared with basic lead carbonate, white basic lead sulfate has a lower specific gravity and therefore a higher bulking value. The typical chemical composition is as follows:

	Fume Type	Chemical Type
Lead sulfate ($PbSO_4$)	85%	72%
Lead monoxide (PbO)	15%	28%

Physical Properties

Physical properties of white basic lead sulfate, of both general types, are as follows:

	Fume Type	Chemical Type
Specific Gravity	6.3	6.4
Bulking Values		
Pounds per solid gallon	52	53
Oil Absorption	9–12	14
Tinting Strength*	85–100	130
Hiding Power (Sq. ft. per lb.)	10–13	16

IN EXTERIOR PAINTS

Practically all of the commercial white basic lead sulfate made is used, in combination with other pigments, in prepared exterior paints. In most instances, it is used only as part of the lead pigment portion, the balance being white lead carbonate.

*Based on standard sample Dutch White Lead 100.

When used in paints, white basic lead sulfate exhibits properties somewhat similar to those of white lead carbonate. It is not as effective, however, as may be deduced from its inability to produce a single pigment paint suitable for exterior use.

Effect on Films

The paint films produced with white basic lead sulfate are softer, and chalk more readily and more heavily than those produced with white lead. This means that although dirt is shed more readily by the basic lead sulfate film, the tint retention is poorer, and the durability is lower.

The lead monoxide content of basic lead sulfate is an important index of its quality, since it indicates the relative proportions of basic lead sulfate and normal lead sulfate. The latter has little value as a pigment and should be kept at a minimum. The chemical process is preferred to the fume processes because it permits production of white basic lead sulfate with a lead monoxide content of 25 to 28 per cent at which the most satisfactory pigment properties are exhibited.

RED LEAD

Red lead is a brilliant orange red pigment used widely in metal protective paints. It is an oxide of lead and its chemical formula is Pb_3O_4 (4 parts of oxygen to 3 parts of lead). Technically, it may be called trilead tetroxide.

Commercial red lead contains some litharge, or lead monoxide (PbO), and is generally graded according to the "true red lead," or Pb_3O_4 content. Thus there are four grades—85%, 95%, 97% and 98% red lead, all of which are used commercially for various purposes.

Red Lead is made by heating litharge (PbO) in a furnace at a temperature of from 900° to 950° Fahrenheit. Within this temperature range the litharge takes on additional oxygen from the air and becomes red lead. The reaction starts at a rapid rate, but as the litharge acquires a layer of red lead, its active surface is decreased and the reaction slows down. It takes about 24 hours to make the 85% grade, but a longer time—48 hours or more—is required for the higher grades.

The kind of litharge used influences the oil absorption, paint thickening power, particle size and other properties of the red lead produced. Red lead of higher oil absorption and paint thickening power is obtained when fume litharge is used. This type is called fume red lead.

Character and Properties

The essential properties and functions of a metal protective primer that will provide maximum protection are: (1) the inclusion of a constituent which inhibits and stifles corrosion by preventing the reactions causing corrosion; (2) the formation of a continuous film to exclude from the metal the environment which can cause corrosion; (3) the maintenance of flexibility in the film so that it can conform with the stresses set up by temperature changes; and (4) the retention of good bonding properties so that adhesion of the paint film will be maintained, not only initially but for a maximum period of time.

STANDARD OF PROTECTIVE PAINTS

Red lead, used either as a single pigment or combined with other paint pigments, possesses properties which enable it to fulfill the requirements of each one of these specifications. It ranks high as an inhibitor pigment and it also imparts additional qualities to a paint which promote adhesion, toughness, and elasticity in the paint film. In fact, red lead's durability and long service under difficult conditions has become a generally accepted standard of performance for metal protective paints the world over.

Authorities agree that, for the priming coat or coats, a paint should be rust inhibitive if it is to give satisfactory performance.

There have been many tests conducted, both in the field and in the laboratory, to show very definitely and conclusively that red lead is an inhibitive pigment and its presence, therefore, imparts important protective qualities to a paint for metal.

Forms Tough Films That Adhere

When mixed with linseed oil or other suitable paint vehicles red lead has the ability to form tough, elastic and tenacious paint films which remain on the metal, as a closely adhering, unbroken coating for a long period of time. This is due in large measure to the fact that the red lead reacts with the fatty acids in the vehicle, forming lead soaps which strengthen both the paint film and the bond between the film and the surface.

Another factor that contributes to the excellent rust inhibitive properties of red lead is its alkaline nature which creates an alkaline environment over the metal surface on which the red lead paint is used. It is well known that iron and steel do not corrode in an alkaline environment.

The oxidizing properties of red lead also influence its ability to inhibit corrosion.

Red lead is readily mixed with linseed oil and other paint vehicles. Paints made with it, according to generally accepted formulas, show excellent brushing qualities.

Fume Red Lead

Fine particle size is another characteristic of red lead. Fume red lead is even finer in particle size than regular furnace red lead. It shows somewhat higher oil absorption, and has greater paint-thickening power; in other words, it is particularly suitable for use when it is desired to prepare a full-bodied paint with a minimum amount of pigment.

The bright orange red color of red lead has led some individuals to inquire concerning its suitability for use as a finishing coat, or as the base for deeper reds such as brick red. Red lead upon exposure tends to fade rather quickly, because the surface of the film carbonates, due to reaction with the carbon dioxide and moisture in the air. The carbonate is white, and this in many instances makes it unsuitable to use red lead as a finishing *color*, though it does not detract in the least from the durability and protective value of the film.

TYPES AND PHYSICAL PROPERTIES OF RED LEAD

Type Red Lead	*% True Red Lead Pb_3O_4*	*Lbs. Per Solid Gallon*	*Oil Absorption*
85% Regular	85—87	75.0	5.0—7.0
95% Regular	95—96	74.0	5.0—7.0
95% Fumed	95—96	74.0	7.0—9.0
97% Regular	97—98	74.0	5.0—7.0
97% Fumed	97—98	74.0	7.0—9.0
98% Regular	98—98.7	73.5	5.0—7.0
98% Fumed	98—98.7	73.5	7.0—9.0

The 85% grade of red lead should be kept in dry form. It should not be mixed with the paint vehicle until just before the paint is to be used. The 95% grade, mixed into paste with raw linseed oil, can be stored for about a month before it begins to harden. When paste is to be stored for longer periods of time, it should be made with the 97% or 98% grades.

USES

Approximately a third of all the red lead manufactured is used in metal protective paints, either alone or in combination with other pigments. It is available in three forms; dry, paste and paint.

For many years the only vehicle used with red lead was linseed oil—raw, boiled or a combination of the two. Concurrent with the development of synthetic resin vehicles, however, special quick drying red lead paints were formulated and have given excellent results.

Engineers usually specify the composition of red lead-linseed oil paint on the basis of the number of pounds of dry red lead used with one gallon of linseed oil. Standard high quality red lead-linseed oil paint contains 33 pounds of red lead to the gallon of oil. This has given excellent results for many years and is still being used to a considerable extent. However, even lighter paints have been found thoroughly satisfactory for use on structural steel.

Quick Drying Red Lead

Quick drying red lead paints are in considerable demand for marine painting and also for certain industrial operations where time is a vital factor. Alkyd resin and phenolic resin varnish, properly selected so as to avoid excessive reaction with the red lead, may be used in the vehicles of such paints. Only the more highly oxidized red leads—the 97% or the 98% grades—should be used for such paints.

ORANGE MINERAL

Orange mineral is identical with red lead in composition. However, it is somewhat brighter in color and finer in texture.

The manufacture of orange mineral differs from the manufacture of red lead in only one respect. Whereas, in the latter instance the process starts with litharge, the manufacture of orange mineral starts with basic carbonate white lead. White lead is roasted or calcined in a reverberatory furnace, where it releases water and carbon dioxide and takes on oxygen, yielding a red lead of high Pb_3O_4 content—95% or more.

Character and Qualities

Orange mineral is very similar in character and qualities to red lead. Its outstanding quality is its color, which is a very clear orange red, and is very uniform. Orange mineral is finer in pigment particle size than ordinary red lead, though some regular type red lead equals it in this respect.

HOW USED

Orange mineral is used principally in the manufacture of vermilions and printing inks. Its excellent tone, high degree of purity of color, fineness, fluffiness and high degree of oxidation make it particularly desirable for these purposes.

ZINC CHROMATE (ZINC YELLOW)

Zinc chromate (zinc yellow) is a greenish yellow pigment that is most frequently used as a corrosion inhibitive ingredient in the manufacture of metal protective paint primers.

It is made by mixing a solution of potassium dichromate with a soluble zinc compound, such as zinc sulphate or zinc chloride. The mixing in a tank equipped with an agitator continues for about twelve hours when zinc chromate is formed. After several washings to reduce the soluble sulphates or chlorides to a minimum, the resulting solution is filtered, dried and ground, whereupon the zinc chromate is ready for the market in dry form.

Physical Properties

The particle size of zinc chromate is very small and among its other physical properties are the following:

Specific Gravity	3.4
Bulking Value	
Pounds per solid gallon	29
Color	Greenish Yellow
Color Retention	Excellent
Tinting Strength	Poor

USES

When used in the manufacture of metal protective paint primers, zinc chromate is usually combined with other pigments, such as iron oxide and silicates.

Zinc Chromate's effectiveness as a corrosion inhibitive pigment is due, primarily, to its soluble chromate compounds which result in the formation of a protective film on the surface of the metal. It is usually mixed with a resin type vehicle rather than straight linseed oil. This is necessary because zinc chromate needs the added control in its rate of solubility that is provided by a resin type vehicle.

Zinc chromate is also used in the formulation of bright green sash and trim paints, which are mixtures of zinc yellow and a blue pigment.

BLUE BASIC LEAD SULFATE

Blue basic lead sulfate, sometimes called "blue lead" or "sublimed blue lead," is a slate gray pigment obtained by heating lead ore in special furnaces which are a development of the Scotch hearth furnace used to produce metallic lead.

Blue basic lead sulfate is composed of a mixture of basic lead sulfate, lead sulfide, lead sulfite and carbon. It may also contain a small percentage of zinc oxide. The slate gray color is derived from the lead sulfide and carbon content. The product may vary in composition due to differences in the ore from which it is made.

Properties

Blue basic lead sulfate chemically inhibits corrosion and is an anti-corrosive pigment. In this regard, however, it is less effective than red lead. Blue basic lead sulfate has good paint making properties in that it grinds and mixes well with linseed oil and other paint vehicles. It is of fine particle size and has good hiding power.

The physical properties of blue basic lead sulfate representative of overage production are shown in the following table.

Color	Slate Gray
Bulking Value	
Pounds per solid gallon	34
Oil Absorption	
Pounds of oil per 100 pounds pigment	9.0

USES

The use of blue basic lead sulfate is almost entirely limited to structural metal priming paints, particularly the lower priced gray primers. It does not hold its gray color sufficiently well to be satisfactory for use in finish coat paints. Blue basic lead sulfate has higher bulking properties and sells for less per pound than red lead, which make it a lower cost inhibitive pigment. However, the amount of blue basic lead sulphate used is only about one tenth the amount of red lead used for metal protective paints.

DRYING OILS

As is well known, paints and varnishes are fluid materials. They are used to provide protection and/or decoration to innumerable objects. Applied in thin coats and exposed to the atmosphere, they undergo changes which cause them to solidify to the extent where they form "dry" films. This transformation from "wet" coat to "dry" films is called drying. Drying may be due to different causes. In general it results either from evaporation or from chemical conversion while in many cases a combination of both takes place.

Drying by evaporation is simple. It occurs when solutions are used, for instance a resin solution such as shellac and alcohol. Applied in thin coats and exposed to the atmosphere, the alcohol will evaporate and deposit the solid resin as a dry film.

Drying by chemical conversion is more complex. However, the reaction which may be considered as contributing most to the desired effect is one of oxidation. This occurs when liquid materials are used which have the ability to absorb oxygen from the atmosphere and in so doing are transformed into a solid state producing "dry" films.

Products which possess the characteristic of being able to absorb oxygen are commonly called drying oils. Of these there are many different types varying in drying, as well as in other properties.

IN PAINT AND VARNISH INDUSTRY

Drying oils may be vegetable oils or fish oils. Their use in the paint and varnish industry is extensive. Each individual type has particular characteristics which are not limited to variations in drying capacity.

These special properties are important because oil does not only function as an agent to convert a "wet" coat into a "dry" film but it also may contribute specific qualities to a film to meet definite requirements.

In general oils are a combination of glycerine and fatty acids. Glycerine is a somewhat thick, sweet tasting, colorless liquid. It has a variety of uses and is employed in manufacture of cosmetics, medicines, plastics, explosives. Fatty acids are substances which when combined with lye or any other such material will make soap, including the ordinary laundry variety.

The differences in performance of the oils depend greatly on the types of combined fatty acid they contain and the proportion of each kind present. The acids vary a great deal in their ability and capacity to absorb oxygen.

Subjected to Many Tests

In order to identity an oil or to examine its qualities for particular purposes, many physical and chemical tests have been devised. They include such determinations as specific gravity, color, viscosity, acid number, iodine number and a host of others.

Of these the iodine number is probably the most widely known constant. It represents the result of a test designed to obtain some insight into an oil's drying power. Since oils dry mainly by oxidation, the amount of oxygen which an oil takes up might be interpreted as a measure of its ability to dry. To simplify and speed up matters in laboratory tests, oxygen is replaced with iodine. Hence "Iodine Number," which expresses the number of miligrams of iodine absorbed by one gram of oil. Although the result of such a test can provide valuable information, one should never judge the quality of an oil by this constant alone.

In addition to tests on oils, methods to examine the character of resulting films have been developed. They include gloss, hardness, flexibility and many other determinations.

OILS GROUPED AND THEIR USES

The combined results of years of testing and experimentation seem to justify the grouping of vegetable and fish oils into three categories:

Drying Oils
Semi-Drying Oils
Non-Drying Oils

The drying oils may be divided into

Hard Drying Oils
Soft Drying Oils

The paint and varnish industry is interested in the hard and the soft oils and also in the semi-drying oils.

The hard oils dry to a hard film. They are used mainly in varnishes and in enamel vehicles. In most cases these oils also show good water and alkali resistance which makes them particularly suitable in industrial finishes for use on iceboxes, automobiles, etc.

Soft oils produce a softer film than the hard oils. They are consequently more flexible. For that reason they are useful in making coatings for materials which are subject to substantial expansion and contraction. Moreover, this type of oil shows good resistance against the normal influence of the atmosphere, particularly in combination with some reactive pigments. Naturally the oils in this group are widely used in house paint.

The semi-drying oils, as the designation implies, take a long time to dry. They also form soft films. However, they do find a place in the industry. Their slow drying is due to their composition. The proportion of high oxygen absorbing constituents is low. This offers the advantage that they are less subject to yellowing. Moreover, some of the oils in this group are obtainable at reasonable prices.

Here follows a more detailed description of the best known and most used varieties of drying oils.

LINSEED OIL

The oil which is most widely used for making paints and varnishes, particularly the former, is linseed oil.

Linseed oil is a vegetable oil obtained from the seeds of the flax plant. Flax is grown in many parts of the world. The largest sources of supply in the order of their importance are:

South America (Argentina and Uruguay)
North America (U. S. A. and Canada)
Russia
India

There are many other places which produce smaller quantities. Since there are so many countries with such great variations in crop conditions, and since differences in demand may be considerable, it is understandable that prices are subject to sudden and substantial fluctuations. This places flaxseed and linseed oil among the most speculative of commodities.

The oil is separated from the seed in hydraulic presses, or in expellers and more recently by solvent extraction. The product is yellow in color and of characteristic taste and odor.

Linseed oil is one of the better known drying oils which in its raw state can be used in paint. In other words, *raw linseed oil* has good film forming properties. It belongs to the soft drying oils and consequently produces flexible films.

May Be Treated

Raw linseed oil may be refined and otherwise treated. This is done to accentuate one or more of its particular characteristics, to instill properties it does not possess in its raw state and in general to adapt it to meet specific requirements.

Raw linseed oil dries in from 72 to 96 hours. Although the addition of pigment, notably reactive lead pigments, will speed up the drying process substantially, drying agents are generally used with all drying oils, including linseed oil. These drying accelerators consist of metal compounds, mostly lead, cobalt and manganese derivatives. They are dissolved in a volatile solvent and marketed as "*liquid driers.*"

Boiled

In order to simplify matters for the user, particularly the painter who mixes his own paint and to meet consumer preference in some parts of the country, linseed oils to which driers have been added are available. These products are known as "*boiled oils.*" They are made by dissolving metallic drying compounds directly in the oil at elevated temperatures.

Bleached

Raw linseed oil may be subjected to a number of refining processes. The simplest is the bleaching earth treatment. This results in *bleached oils* which are very pale in color, a desirable property for making both varnishes and white and light tinted paints.

Acid Refined

Linseed oil may be treated with acid. These *acid refined oils* possess excellent wetting qualities. They are particularly useful in the paint factory as this property helps to reduce the mixing and grinding time of many paint products. Moreover, in paints in combination with reactive pigments, acid refined oils have a tendency to produce larger quantities of soap which may be beneficial to the performance of a paint film.

Alkali Refined

Linseed oil may also be treated with alkali. *Alkali refined oils* are practically neutral. When subjected to high heat treatments they can be converted into excellent products. For that reason they are very popular in the varnish industry.

Naturally these refining processes may be applied with variations. Moreover, an oil can be treated chemically in addition to being bleached. Under those circumstances it is understandable that many different types of refined oil are available.

Needs Pigment

A linseed oil film by itself is not too resistant under atmospheric influences. However, the length of its useful life may be extended or its durability increased by either adding reactive pigments or by effecting changes in the chemical structure of the oil.

The use of pigments in the making of paint and the performance of this latter product are discussed elsewhere in this Manual. The changing of an oil's chemical structure may be the result of treatments to which it has been subjected.

Heat Bodied

When linseed oil is heated at fairly high temperatures for any length of time *heat bodied oils* are produced. In the process an increase in viscosity is effected, that is to say they have taken on body. This is due to the chemical changes resulting from the treatment.

Heat bodied oils possess good durability; they also have better wetting qualities and improved flow and gloss as compared to raw linseed oil. Moreover, due to their heavy body, they do not readily penetrate porous surfaces and so provide sealing and minimize absorption of subsequent coats.

Heat bodied oils are extensively used in varnishes. They are combined with resins in different proportions so that the desired properties such as hardness, gloss, durability, etc., are obtained. The resin hardens the oil but it is also true that the oil plasticizes the resin.

This, of course, also depends on the exact type of raw material used. The resin oil solution is further dissolved in a volatile thinner, resulting in a varnish. Special paint and enamel vehicles are made in very much the same way.

New Processes

In recent years new processes have been found or are in a fairly advanced stage of development which promise to make the oil adaptable for many other uses.

For instance, chemical conversion called conjugation permits the production of a type of linseed oil which could be reasonably classed in the lower brackets of the group of hard drying oils.

Moreover, methods are being developed whereby the glycerine in an oil may be removed and replaced with products of a similar chemical character but possessing different qualities. This opens up a wide range of possibilities of which the future importance cannot yet be predicted to its fullest extent.

From the foregoing it is quite obvious that linseed oil is a most flexible raw material. It can be adapted for many uses, and as it is usually readily available, it is understandably a most popular material in the paint and varnish industry.

TUNG OIL

Tung Oil, also known as China Wood Oil, is a vegetable oil obtained from the nuts of the tung tree. This tree, of which there are many varieties, is native to China and Japan. A number of years ago it was imported into our own country where it now grows in some of the Southern states.

The main sources of supply are of course the Asiatic countries, but care in its production have made the American variety of wood oil of greater uniformity and more reliable quality.

Raw wood oil is an amber colored liquid. At reduced temperatures (around freezing point) it solidifies into a yellow wax-like material. Cooking the oil at about 500° F. destroys this property.

Properly treated tung oil belongs in the class of hard drying oils. It rapidly forms hard films which show excellent water and alkali resistance. For that reason it is used extensively in quick drying finishes such as furniture varnishes, floor paints and in some types of baking enamels.

Incidentally tung oil offers an example where an "iodine number" might be misleading, as referred to previously. Notwithstanding the fact that wood oil dries extremely fast its iodine number is relatively low.

SOYBEAN OIL

Soybean oil is extracted from soybeans. The soy plant is grown in many parts of the world including the United States, where each year a substantial acreage is given over to it.

Soybean oil belongs to the semi-drying oils. In paint it cannot be used as the only oil of the vehicle. However, it can be successfully blended with more rapid drying types.

Soybean oil films possess good resistance to yellowing. With the development of new refining process it shows promise of more extensive use and a more prominent place in the paint and varnish industry.

DEHYDRATED CASTOR OIL

Raw castor oil, which is extracted from the castor bean, is a non-drying oil. However, its chemical composition permits its conversion into a drying oil, which is dehydrated castor oil.

This oil is very pale and belongs in the group of soft drying oils. As far as its other qualities are concerned it may be classified in between tung oil and linseed oil.

Because of its good color it is especially suitable for making pale varnishes and widely used in white enamel vehicles.

PAINT THINNERS

In all types of paint and enamel, liquids that evaporate after the film is applied are often used to reduce the consistency without changing the predetermined proportions of pigment and non-volatile vehicle. These volatile liquids are commonly called "paint thinners."

The most important function of the thinner in a paint is to regulate the brushing or spraying consistency without affecting the composition of the finished film. In the priming coat on new work and the first coat on repaint work, the thinner performs an additional function—it assists in the penetration of the oil vehicle and insures better mechanical anchorage of the paint film.

TURPENTINE

There are four types of turpentine: gum spirits of turpentine, steam distilled wood turpentine, sulfate wood turpentine and destructively distilled turpentine.

Gum spirits and steam distilled wood turpentine are produced in greatest quantities and are used by the consumers of paints and enamels. They are sold in paint stores in bulk or in sealed cans. Gum spirits of turpentine is produced by distillation of the crude gum obtained from pine trees. Steam distilled wood turpentine is made from pine wood, which is subjected to live steam in a digestor.

Sulfate wood turpentine, used to a very limited extent in paints, is obtained in the preparation of wood pulp by alkaline treatment. The pulp is boiled with a mixture of various chemical compounds and the steam evolved contains turpentine and other compounds.

Destructively distilled wood turpentine, obtained by the direct destructive distillation of pine and fir wood has a pungent, penetrating odor that limits its use in paints.

PETROLEUM SPIRITS

"Petroleum spirits" is the general name applied to the various types of volatile petroleum products used in the paint industry. The two types most widely used are mineral spirits and V.M. and P. naphtha (varnish makers' and painters' naphtha). Mineral spirits has a rate of evaporation similar to turpentine. It is widely used in the manufacture of house paints and is also carried by stores for consumer use. V.M. and P. naphtha is more volatile than mineral spirits, and is used by the manufacturer of paint and varnish, rather than by the painter.

The manufacture of these products is a highly specialized procedure involving distillation and refining. Petroleum contains various mixtures of hydrocarbons which are first separated according to boiling point into the five main groups. The low boiling point thinners naturally evaporate first. As the temperature is raised gradually, the higher boiling point hydrocarbons evaporate. Ingenious equipment makes it possible to control, very critically, the separation of the different portions.

Petroleum spirits of various types are available in considerable variety, and can be obtained from most manufacturers to meet specifications submitted by the consumer.

RESINS

The word "resin" is used as a group name for a multitude of organic compounds of complex composition. Since the term "resin" includes a wide variety of materials, such as varnish resins, plastics and rubbers, a simple definition covering the entire range can not be given.

Resins most useful in the protective coating industry in general answer the following descriptions.

Varnish resins are transparent or translucent solids or semisolids, usually yellowish to brown in color. Many of them soften and melt when heated and, with a few exceptions, they are soluble in oil or volatile organic liquids (solvents).

Resins may be of natural origin or artificially synthesized (built up). The natural products may originate from tree exudation as in the case of Kauri gum and ordinary gum resin. Others, such as shellac, find their origin in insect secretion. Also some natural resins have been formed by plant decomposition of which some types of asphaltum are examples. Many different types are found in each of these classes.

The synthetic resins cover an even wider field than the natural materials and as time goes on they are becoming more numerous with further development.

The most generally known synthetic resins are phenolics, which include Bakelites. They are, to a considerable extent, condensation products of phenol and formaldehyde. Other much used synthetic resins are the alkyds which are reaction products of glycerine and phthalic anhydride.

Resins are combined with oils and volatile solvents to produce varnishes or enamel vehicles. The use of natural resins was prompted by a desire for better gloss and greater hardness than could be obtained with oil alone.

The synthetics more recently developed also provide faster drying and generally better durability to enamel and varnish films.

There are great variations in the different resins in their ability to impart certain specific properties. Their value and usefulness depend on their solubility, color, hardness, chemical resistance and numerous other characteristics.

To the painter, the phenolics and the alkyds are of greatest interest. The use of phenolics has markedly increased the durability of spar varnishes. The alkyds have made it possible to produce improved architectural enamels and trim paints. In addition, synthetic resins find wide application in industrial finishes, such as those used on automobiles, refrigerators and other manufactured products.

SUPPLEMENT ONE

THE FOUNDERS—*A Tribute*

THE FOUNDERS

A Tribute

In the first chapter of this Manual we concentrated on the policies that have made our Company great in peace and war times and that have been responsible for maintaining its leadership in the lead industry. But of interest and significance are the humble "beginnings."

As in the biography of any great man, credit is given to his parentage and antecedents for many of his qualities of greatness, so should this Manual pay tribute to the rugged individualists who founded National Lead Company. The companies which they brought into the newly founded national organization were, many of them, pioneers in white lead manufacture in their respective communities. Several could lay claim to upwards of a half century of successful white lead business, and the history of one of the founding companies stems back to Revolutionary days.

When incorporated in 1891, with W. P. Thompson as its first President, National Lead Company included about 25 concerns, the most important and strongest of which had their headquarters in nine large cities—Boston, Buffalo, Chicago, Cincinnati, Cleveland, New York, Philadelphia, Pittsburgh and St. Louis.

The historical sketches on the following pages are confined mainly to founding companies about which we have been able to locate interesting material. The order in which they appear was determined by the age of the founding companies in the respective cities.

PHILADELPHIA

Back to Revolutionary Days

While still the brilliant British red-coats swaggered through the streets of Colonial Philadelphia and shortly before the first Continental Congress met in Carpenter's Hall, a certain young gentleman, one Mordecai Lewis, was duly taken into the firm of Neave and Harmon, changing its name to Neave, Harmon and Lewis—importers of white lead, red lead and other merchandise. That was in 1772.

This was the first step in the creation of the business which now bears the name of John T. Lewis & Bros. Company—our Philadelphia Branch—a business that expanded beyond the dreams of its founders.

Thus was established in business the founder of a family of able executives who have not only guided the destinies of the Lewis Company but have had an important part in the development of National Lead Company.

Has Oldest Bank Account

In addition to its being the oldest of the founding companies of National Lead Company, John T. Lewis & Bros. Co. has another claim to longevity honors in its possession of the oldest bank account in the oldest bank in the United States. The account was opened January 16, 1781, in the bank of North America, which was chartered by an Act of Congress only nine days previously, and has been kept open continuously since then.

By 1781, the year the British Commander, Lord Cornwallis, surrendered and the Colonies became an independent nation, Mordecai Lewis assumed full control of the firm, changing its name to Mordecai Lewis & Company.

An interesting memento of the times is an original bill dated May 1, 1787, which discloses the sale of "twelve hundred-weight of ground white lead" to the Pennsylvania Hospital at 90 shillings per hundred weight or 21½ cents per pound.

When Mordecai Lewis died in 1799 the business was carried on under the old name by his sons, Mordecai and Samuel Neave Lewis. In 1806 they formed a partnership, M. & S. N. Lewis, who acted as independent selling agents for Mordecai Lewis & Company.

White lead and oxides were first manufactured in 1820 and shortly afterwards linseed oil and colors, setting a rigorous standard for purity that has never been lowered since.

John T. Lewis Incorporated

It was in 1856 that John T. Lewis, grandson of Mordecai Lewis, consolidated the Mordecai Lewis and M. & S. Lewis concerns under the firm name of John T. Lewis and Brothers, which in 1888 was incorporated.

Edward F. Beale, son-in-law of John T. Lewis, entered the Company in 1875 and was elected President in 1889. Financial control passed to National Lead Company when it was organized in 1891 and Mr. Beale was elected as a member of its first Board of Directors.

The other founding company located in Philadelphia was the Western White Lead Company, about which little is known today.

NEW YORK

First Incorporation and a Mystery

The Brooklyn White Lead Company, one of the four strong New York companies that helped found National Lead Company, was incorporated in 1825, thus becoming the first white lead business in the United States to take advantage of this form of organization. But probably its most important claim on our interest is based on the unique characters who were among the incorporators. Even a mystery is disclosed in the lives of two of the founders. All were men of prominence in their day, public spirited and strong individualists.

The venture which led to the formation of the Brooklyn White Lead Company originated about 1800 when two chemistry professors, Dr. Federal Vanderbergh of Albany, N. Y. and Dr. Josiah Noyes of Clinton, N. Y., began experimenting in the manufacture of white lead and chemicals.

By 1823 the experimental work had included actual manufacturing of white lead in a small way and it was on June 13 of that year when a co-partnership agreement was signed by Augustus Graham, David Leavitt and Elijah Humphreys with Josiah Noyes & Company. Two years later Augustus Graham and Mr. Leavitt bought out their associates in the Noyes firm and incorporated under the name of The Brooklyn White Lead Company, with an authorized capital of $100,000 of which only $52,800 was issued. David Leavitt was elected president, a position he held until his death in 1879.

Failure of the company's efforts to manufacture a product equal in quality to the white lead imported from England, this country's chief source of supply at that time, finally moved August Graham to study English methods first hand. He went there in 1832 and got the information he sought while employed as a workman in one of the best factories in England. Upon his return to America the English methods were adopted, to the immediate improvement in the company's white lead and its profits.

Outdid Damon and Pythias

Among the most interesting of the strong personalities who founded the Brooklyn White Lead Company were John B. and Augustus Graham, whose successful and honorable careers were made unique with mystery, romance and a business and personal relationship that outdid that of Damon and Pythias. The "brothers" Graham were not related and their names were not Graham. John Graham was born John Bell somewhere in the North of Ireland in 1784 and came to America at

the age of nineteen, obtaining employment with a Frederick, Md., merchant by the name of August King. The friendship between the two men became so deeply affectionate and mutually trustful that at the suggestion of Augustus they assumed the role of brothers, under the name of Graham, united their capital and launched a business and personal relationship that lasted until death separated them.

When the Brooklyn White Lead Company was incorporated in 1825, John Graham accepted stock of none too promising value at that time in payment of a substantial loan he had made previously to Augustus without security. Further evidence of their mutual faith was the fact that they never kept separate accounts, took funds each needed from a common purse and when final settlement was made, divided their joint holdings without the slightest disagreements.

Leavitt Met Financial Crisis

David Leavitt, the first President of the Brooklyn White Lead Company, was probably the greatest financial genius in the early history of the white lead industry.

In addition to maintaining a sound financial policy for the Brooklyn White Lead Company, Mr. Leavitt served as President of the Fulton Bank from 1826 to 1837 when he was elected to the Presidency of the American Exchange Bank of New York, which became one of the most powerful banks in the city.

It was in 1843 that he faced a severe test of his ability as a financial organizer. He and his bank were heavily invested in State of Illinois Canal bonds and a large additional amount of money was needed to complete the project and protect the investment. After a long bitter fight the Illinois legislature finally voted to pledge the credit of the State and Mr. Leavitt made two trips to London to supplement local assistance with loans from two of the great banking houses of that city. At that time Thomas Ford was Governor of Illinois and later in his "History of Illinois" he gave Mr. Leavitt credit for the success of the negotiations.

The Brooklyn White Lead Company became largely a family organization and when their father died, first Edward Leavitt and then at his death Sheldon Leavitt took the Presidency, but Reginald P. Rowe was the real manager from about 1885 until it was merged into the National Lead Company.

Atlantic Branch Formed

On April 3, 1890 the Jewett White Lead Company, the Bradley White Lead Company and others were consolidated with the Brooklyn White Lead Company under the name of the National Lead and Oil Company of New York. On December 8, 1891, all of these properties were acquired by the National Lead Company and were operated as the National Lead and Oil Works Branch with R. P. Rowe as Manager. On that date Mr. Rowe was also elected a member of the first Board of Directors of National Lead Company.

Meanwhile the Atlantic White Lead and Linseed Oil Works had also been made a branch of the National Lead Company and on July 1, 1893, the business of the two branches was consolidated into the Atlantic Branch with Romulus R. Colgate as Manager. He also had been elected in 1891 to National Lead Company's first Board of Directors. Mr. Rowe was made Manager of the Atlantic Branch in 1901 and was elected Vice-President of National Lead Company in 1904, holding both positions until his death.

Jewett Uses Whale Oil Factory

Next to the Brooklyn White Lead Company, the oldest manufacturer of white lead among our founding companies in the New York area was The Jewett White Lead Company, first organized as John Jewett & Sons. In the Atlantic Branch office is a large bottle filled with white lead and labeled, "Sample of the First White Lead Made at the Jewett Works, June 1830."

The Jewett family established their first white lead mills in an old whale oil factory, which had its origin in Revolutionary days. During the Civil War the main building of the Jewett Works was used as a barracks to train Federal soldiers.

The organizers of the white lead concern were John Jewett, John Jewett Jr., James R. Jewett and George W. Jewett. The business was managed successfully for about 50 years when all the members of the original family having died, it was reorganized in 1882 with only the treasurer, Charles H. Jewett, bearing the family name.

When the company was absorbed by National Lead Company its plant had a capacity of 3500 tons of high quality white lead annually.

Atlantic Most Successful

The "Atlantic White Lead and Linseed Oil Company," incorporated in 1866, was probably the most successful financially and manufactured products most widely accepted by the trade of any of our founding companies in the New York area.

Almost from its incorporation, the company paid substantial dividends to its stockholders, often over 20% on its capital stock.

Robert Colgate was the first President of the Atlantic White Lead and Linseed Oil Company and its principal stockholder, owning 330 of the 500 shares issued of $1,000 each. Edward Austin owned 140 shares, A. W. Colgate 25 shares and S. J. Colgate 5 shares.

Almost immediately after incorporation, the Robert Colgate & Company, founded in 1845, was appointed general sales agents of the Atlantic White Lead and Linseed Company with an annual commission of 2½ per cent on all sales and 1½ per cent on "all receipts and disbursements made for account of the Company." This arrangement was cancelled effective January 1, 1886, due to the death of Robert Colgate during the preceding year. The business was conducted thereafter in the name of the Company instead of through the agents, Robert Colgate & Company.

Paid Secretary $6,000 in 1885

When Samuel J. Colgate was elected President on October 30, 1885 all the capital stock was owned by the Colgate family, but at the subsequent annual meeting George W. Fortmeyer, a long-time employee and who many years later was to become Manager of the Atlantic Branch and a Director of National Lead Company, was elected Secretary of the Company at an annual salary of $6,000.

In the early days of his employment, Mr. Fortmeyer was practically a one-man business. In the morning he would hitch up his horse and buggy and call on the trade. In the afternoon, he would pack, bill and deliver the products for which he had orders.

With the exception of the Cornell Lead Company of Buffalo, little of historical interest is known of the other New York State founding companies, which included the Bradley White Lead Company, the Ulster Lead Company and the Union White Lead Manufacturing Company.

BUFFALO

First Buffalo White Lead Manufacturer

It was early in the year 1840 that a young chemist by the name of Henry Roop left his home in Buffalo for a visit with friends in New York City and vicinity. While making a few business calls in Brooklyn, he took advantage of an opportunity to inspect a white lead factory, asking a number of questions to satisfy the natural curiosity of a budding young scientist.

Returning to Buffalo he immediately began an intensive study of the practical and scientific phases of white lead manufacture with the idea in mind of entering the business.

When he considered himself sufficiently informed to take the risk and with borrowed capital of $3,000 he built a small wooden shop and started the manufacture of white lead. This was in 1841 and Henry Roop became the first manufacturer of white lead in Buffalo.

The product was fair in quality, considering the rather primitive method of manufacture. For instance, he had two sets of stones which were driven by horses.

Buffalo Mayor Invests

The infant business survived the first year and at that time attracted additional capital amounting to $9,000. The business began to make money and shortly afterwards got the attention of Sheldon Thompson, who was the first mayor of Buffalo to be elected by popular vote. He added $20,000 to the capital and in 1844 the plant was expanded and equipped with the latest machinery of the day.

Shortly after getting into operation, all the new buildings were completely destroyed by the historic gale of 1844. With no break walls to protect it, the entire lower city was submerged by the huge waves whipped up from Lake Erie by the high winds.

Undaunted by the catastrophe, the company moved all the machinery that could be salvaged to a new location, where an even larger and better equipped factory was built. Prosperity followed, according to an old account, which stated that "the concern made money as fast as any factory ought to."

During this period in white lead history, the principal source of supply of pig lead was the "Galena District" in northern Illinois and Southern Wisconsin. An interesting custom of the times was the auction of pig lead held daily by the smelters. Sheldon Thompson's son, A. P. Thompson, was his father's buyer for many years, often riding to and from the mines on horseback. The lead was carted by oxen to Milwaukee and brought down the lakes in sailing vessels.

When Mr. Roop retired from active business because of ill health, the firm's name was changed to Thompson & Company and was taken over by Sheldon Thompson and his son, A. P. Thompson, and his son-in-law, Edward Warren. Sheldon Thompson died in 1851 and Mr. Warren in 1863, the business being carried on by A. P. Thompson.

Katherine Cornell's Ancestor Enters Business

It was in 1852 that Mr. Roop, his health recovered, again entered the white lead business. With Gibson T. Williams and Samuel G. Cornell he formed the Niagara White Lead Company. Mr. Cornell, it is interesting to know, was the great-grandfather of the famous American actress, Katherine Cornell.

In the early 1860's Mr. Roop again retired because of ill health and the Niagara White Lead Company passed into the hands of Samuel G. Cornell and his son, S. Douglas Cornell. At the same time they purchased Thompson & Company, abandoned the latter's plant and consolidated the two companies under the name of S. G. Cornell & Son.

About two years later A. P. Thompson bought back a half interest from the Cornells and in 1867 the Cornell Lead Company was incorporated. Samuel G. Cornell died in 1879 and his son in 1910.

When the company was sold to National Lead Company, it became known as our Buffalo Branch, and A. P. Thompson served as Manager and as one of the first elected Directors until his death in 1911.

BOSTON

Historical Salem Contributes

Perhaps when you think of Salem, Mass., you recall the infamous witch trials there in the early days of our Country, but the Old Town made other more civilized contributions to history. One that is of special interest to us of National Lead Company was the incorporation in 1868 of The Salem Lead Company, one of our founders and destined to be the cornerstone of our Boston Branch.

Almost from its incorporation, the Salem Lead Company had offices in the "Hub City" so in effect it was a Boston concern practically throughout its existence.

When the company was absorbed by National Lead Company, it was operated as a subsidiary of the latter under the name of National Lead Company of Massachusetts. Walter Tufts was Treasurer and General Manager and later became one of the Directors of National Lead Company.

Boston Lead Company Has Ups and Downs

There is an interesting bit of industrial history back of the name under which our Boston Branch conducted its business from 1928 to December 20, 1945; namely, the National-Boston Lead Company. It is the story of a company that tenaciously retained its corporate name—Boston Lead Company—despite a failure, a reorganization, an amalgamation and the final consolidation with the National Lead Company of Massachusetts.

It was in 1829 that the Boston Lead Company was incorporated, the first white lead business in New England and the second in the United States to adopt that form of organization. There were 25 stockholders subscribing to 52 shares at $1,000 each. From the start the company manufactured lead pipe, sheet lead, red lead, litharge and white lead.

It was in 1863 that the company suffered a disastrous fire, but the directors voted to rebuild.

By 1872 the capital stock had been increased to $500,000 and the company prospered until reverses came in 1878 when it failed. The following July it was reorganized as the Boston Lead Mfg. Company and that same year, J. H. Chadwick, one of its executives, left the Company to organize the Chadwick Lead Works.

National-Boston Organized

Both companies prospered, but in 1901 they consolidated under the name of the Chadwick-Boston Lead Company. The Company was purchased by the United Lead Company, which in 1926 became a subsidiary of National Lead Company. It was not until 1928 that the Chadwick-Boston Lead Company was consolidated with the National Lead Company of Massachusetts under the name of The National-Boston Lead Company. On December 20, 1945 the name of our Boston Branch became officially The National Lead Company of Massachusetts.

From the Boston Lead Company came one of the Directors of National Lead Company—A. H. Broderick, who started with that company in 1876, was President of the Chadwick-Boston Lead Company and upon the latter's consolidation with the National Lead Company of Massachusetts was made Manager, which position he held until his death.

CINCINNATI

Oldest Founders in Midwest

Turning to the white lead manufacturing history of the Middle West, we find that the first of our founding companies to be organized in that section of the country were located in Cincinnati, Ohio. These were the Anchor White Lead Works and the Eckstein White Lead Company, which also have the distinction of being the first *successful* white lead concerns to be established in Cincinnati.

While not one of Cincinnati's pioneer manufacturers, the first successful white lead concern was established in 1828 by Roy MacChandless, a Scotsman who had been connected with the manufacture of white lead in Scotland and Richard Conkling, a Cincinnati painting contractor. Later this concern became the Anchor White Lead Company.

Anchor as a Trademark

The two men formed a co-partnership under the firm name of MacChandless & Conkling. They erected a small factory and lead bins on a site later used for the United States Post Office. They adopted an anchor as their brand and stenciled this trademark on their kegs.

Since there was no tanbark available at that time, the German process of manufacture was employed, corroding in spent manure. The vinegar used in corroding was made by the founders in their own plant from apples and beech shavings. The pig lead was cast into thin sheets in a pan, then rolled in spirals and placed in pots similar to those used in the Dutch process. The sheets were about eighteen inches long and six inches wide. The minimum time of corrosion was about forty days; the maximum sixty days.

Rival Enters Field

MacChandless and Conkling enjoyed their monopoly in the Cincinnati market for about eight years. Then, in 1836, a rival plant was erected by Townsend Hills. This concern later became the Eckstein Company.

During the next thirty years the Hills concern underwent a few changes while its rival underwent many. MacChandless had died in 1838 and the firm carried on under the name of Richard Conkling & Bros. It continued as such until 1842 when a new factory was erected and a new name adopted, Richard Conkling & Company.

In 1856 Conkling sold the business to a Robert Hogue who operated it under his name for about a decade.

Anchor Company Incorporated

In Cincinnati in 1866 the Hogue concern was purchased by A. T. and A. O. Goshorn and became known as Goshorn Bros. Eight years later, the firm was incorporated. Another member of the family, E. C. Goshorn, was taken into the firm and the name Anchor White Lead Company was adopted. In the following year a new factory, larger and with more up-to-date equipment, was erected.

Eckstein Company Incorporated

In 1865 Frederick Eckstein secured an interest in the plant founded in 1836 by Townsend Hills. This firm operated for several years under the name Eckstein, Hills & Company, and was finally incorporated in 1880 as the Eckstein White Lead Company. Three years later a modern plant was erected on the west side of Freeman Avenue between Seventh Street and the C. H. & D. Railroad, now a division of the Baltimore & Ohio Railroad.

When in 1891 the Eckstein White Lead Company became a part of National Lead Company A. T. Goshorn was elected First Vice President of our Company. The Deer Creek plant of the Anchor White Lead Company was purchased at this time, but it was operated for only a year and then closed down, all subsequent manufacturing being concentrated at the Eckstein Freeman Avenue factory.

Goshorn Made Director and Manager

In 1895 E. C. Goshorn was elected a director of National Lead Company in succession to his brother, A. T. Goshorn, and served in that capacity and as manager of the Cincinnati Branch until his death in 1924.

The business of the Cincinnati Branch of National Lead Company increased to the point where expansion was necessary so the erection of larger buildings was begun in 1907 and completed in 1914.

ST. LOUIS

Had Four Strong Founders

Lead and pelts were the two most important articles of barter and commerce for several years after St. Louis was founded in 1764, money not being in common use.

In the 1800's the manufacture of white lead, red lead and other lead products, together with lead mining, became an important industry in the St. Louis area. It was quite natural, therefore, that St. Louis should have produced four of the ten or twelve stronger companies which organized the National Lead Company. They were the Collier, Missouri, Southern and St. Louis Lead and Oil Companies.

The pioneer of our St. Louis founding companies began operations in 1837 on Clark Street, between Ninth and Eleventh, which was later to become the Collier Works. This plant was sold to Joseph Charless and Henry T. Blow in 1842.

Editor Sells White Lead Interest

Mr. Charless had founded "The Missouri Gazette" in 1808, a weekly newspaper that was the first to be published west of the Mississippi River. He sold his interest in the white lead business to Mr. Blow in 1844. The Blow Factory was unfortunately in the path of the great fire of 1849, with the following results as reported in the Fire Department records:

> "The extensive white lead, castor and linseed oil and vinegar manufactory of Henry T. Blow, on the corner of Tenth Street and Clark Avenue, was almost entirely consumed. The loss was $100,000; insured for $48,000."

Mr. Blow rebuilt the plant in 1850 and the company was reorganized taking the name of Collier Works, apparently because George Collier, although not actively engaged in manufacturing, furnished most of the capital.

Collier Incorporated

The Collier White Lead and Oil Company was incorporated on September 1, 1851, with a capital stock of $150,000, to carry on the business of "manufacturing, buying and selling of white lead, red lead, litharge, castor oil, linseed oil and vinegar."

Mr. Blow was President until 1861, when he resigned and Colonel Thomas Richeson succeeded him in the office. During his connection of many years with the Collier Works, Colonel Richeson invented and put into use many improvements which lowered the cost of manufacturing.

The annual production of the Collier Works about 1883 was 4,000 tons of white-lead-in-oil, 100 tons of red lead, 100 tons of litharge, 100,000 gallons of linseed oil and 100,000 gallons of castor oil.

In 1881 fire again brought serious damage to the Collier Works, causing a loss of $167,250 on May 28 and $85,825 on September 21. However, the destroyed buildings were rebuilt and the business was flourishing when the Collier White Lead and Oil Company was incorporated in the National Lead Company in 1891.

St. Louis Lead and Oil Launched

The next member of the St. Louis group of National Lead founding Companies to organize was the St. Louis Lead and Oil Company, which took over the business in the State of Missouri, with a capital stock of $300,000. The charter contained this interesting clause:

> "This corporation shall pay into the State Treasury one per cent per annum on all net earnings for use of Soldiers' Orphans Home Fund."

In an advertisement in the 1865 edition of the St. Louis Directory, the newly organized company announced the purchase of the O'Fallon business, listed the products they had for sale and stated that "having facilities unsurpassed by any company in the United States, we solicit the patronage of wholesale cash buyers."

In the Spring of 1865 a plant was erected at a cost of about $200,000 on the site of the O'Fallon Plant. The plant produced white lead, litharge, linseed oil, castor oil and cotton-seed oil. Its annual consumption of raw materials in 1880 was 1,000 tons of pig lead, 50,000 bushels of castor beans, 100,000 bushels of flaxseed and 40,000 bushels of cotton-seed.

In 1892 a new plant was erected at the site of our present factory, 5548 Manchester Avenue, and the property at Second Street and Cass Avenue was sold in 1893 to the Pennsylvania Railroad for $200,000. In 1911 manufacturing was concentrated in the then greatly enlarged and modernized Manchester Avenue plant and later discontinued in both the Southern and Collier Works.

The St. Louis Lead and Oil Company supplied one of the first elected directors of National Lead Company—George O. Carpenter, who later became Vice President of our Company.

Southern in St. Louis and Chicago

In 1862 Henry Platt and Robert Thornburgh formed a partnership to engage in the retail drug business, abandoning the line shortly afterwards to merchandise paint, oil and glass.

In 1865 the firm built a white lead factory at Main and Lombard Streets under the name of Platt, Thornburgh and Company. Two years later it was incorporated as the Southern White Lead and Color Company with a capital stock of $120,000 for the purpose of manufacturing white lead, red lead, litharge, castor oil, linseed oil and acids, and the grinding and mixing of oils, paints and colors.

Among the executive officers of the newly incorporated company were names destined to become well known in the paint industry. William H. Gregg was elected President; Henry S. Platt, Vice President; F. W. Rockwell, Secretary; James Johnston, Superintendent. Mr. Rockwell was elected Second Vice President of National Lead Company on the day of its incorporation and years later Mr. Gregg's son, Norris B. Gregg, held a Vice Presidency until his death. Fletcher W. Rockwell was born in St. Louis when his father was Secretary of the Southern Company and was elected President of National Lead Company on January 12, 1938.

On February 9, 1876, the State Legislature granted a change in the name to the "Southern White Lead Company."

About 1880 the consumption of lead was 1,200 tons annually.

In 1887 the McBirney and Johnston White Lead Company of Chicago was absorbed by the Southern White Lead Company and from that time on the Company sold lead from both factories under the Southern Company brands.

Manufacturing in the company's factory was discontinued in 1912 when the city of St. Louis took the Southern corroding yards for a bridge site.

Missouri Lead Company Organized

The Missouri Lead and Oil Company was incorporated on March 2, 1872 with William H. Thompson as President and who was destined to become another St. Louis man to be elected to membership on the first Board of Directors of National Lead Company.

All records examined failed to give any information as to the location and capacity of their manufacturing plant. Their business address was 421-425 Main Street.

William H. Thompson resigned the Presidency in 1884 and the Missouri Lead and Oil Company was absorbed by National Lead Company in 1891. The Missouri Company brand was used for many years.

CHICAGO

Branch Included Two Founders

When National Lead Company was incorporated in 1891, there were two Chicago concerns listed as founding companies; namely, the D. B. Shipman White Lead Company and the Southern White Lead Company.

Mention of Mr. Shipman's election to National Lead Company's first Board of Directors is the only historical item that could be dug up about these two founding companies. However, we do know that the Chicago Branch from its inception has supplied able executives and strong members of the Board of Directors and has contributed substantially to the continued success of National Lead Company.

PITTSBURGH

Forming National Lead & Oil Co. of Penna.

According to available records, Pittsburgh had a white lead factory as early as 1813, operated by Anthony Beelen with J. J. Boudier, a Frenchman and owner of a laboratory, as his superintendent.

Through the years many white lead manufacturing ventures were launched, but it was not until 1849 that there was established the forerunner of one of the successful companies which became the founders of the National Lead & Oil Company of Pennsylvania, our Pittsburgh Branch. This was B. A. Fahnestock & Company, a wholesale drug house that also manufactured and sold white lead and which eventually became the Fahnestock White Lead Company. It is recorded that in the year 1849 this firm's white lead sales amounted to $65,000 and that 500 tons of lead, 1,820 barrels of vinegar and 15,000 gallons of linseed oil were consumed.

Became Industry Leader

Simon Beymer, destined to be one of the outstanding figures in the early days of the Pittsburgh white lead industry, came to that city in 1852 and took employment with B. A. Fahnestock & Company. Five years later he became a partner of B. L. Fahnestock and in 1867 he organized the white lead manufacturing firm of Beymer, Bauman & Company. Upon the death of Reuben F. Bauman in 1885, Mr. Beymer bought the estate's interest and organized the Beymer-Bauman Lead Company, of which he was President and his son, Hervey W. Beymer, Manager.

The Fahnestock White Lead Company, which, as has been mentioned, had its roots in B. A. Fahnestock & Company, was organized and incorporated in 1872 by B. L. Fahnestock, Benj. F. Vandecort and Benj. S. Fahnestock. It was operated successfully until its sale to National Lead & Oil Company of Pennsylvania in 1891.

It was in 1884 that the Davis-Chambers Lead Company purchased the white lead factories and properties of Barclay Preston, but nothing else historically is known about this founding company.

Supplied First President

While we lack historical data on the Armstrong-McKelvy Lead & Oil Company other than that it was organized by John H. McKelvy and Thomas M. Armstrong we do know that this founding company had the distinction of supplying the first President of the National Lead & Oil Company of Pennsylvania (our Pittsburgh Branch). This was Mr. McKelvy and he also was elected as one of the first directors of National Lead Company. He was succeeded by Charles F. Wells, Sr.

Another strong Pittsburgh man who came to National Lead Company in its early days was W. N. Taylor. He had been Vice President of the Scottdale Iron & Steel Company until elected President of the Davis Lead Company in 1904, which office he held until the concern was purchased by National Lead Company in 1907. It was then that Mr. Taylor headed the Pittsburgh Branch and became a Director of National Lead Company.

Pittsburgh supplied another member of the first Board of Directors of National Lead Company—Simon Beymer.

CLEVELAND

J. H. Morley Heads Business

The J. H. Morley Lead Company of Cleveland was incorporated May 20, 1887, purchasing the white lead manufacturing business, including buildings and real estate, of J. H. Morley & Company for $200,000, which represented the entire capital stock of the new corporation.

The J. H. Morley & Company were the successors of Morley & Cary, a firm organized in 1862. Mr. Morley and his associates obviously had had considerable experience in the white lead business, if we are to judge from the success with which the concern was operated before and after it was absorbed by National Lead Company. The Minutes of a Directors' meeting in 1890, for instance, disclose a dividend of 10% which, while not of "melon cutting" size common to the times, was an indication of substantial business.

J. R. Morley was elected the first President of the newly incorporated business, but resigned in six months and was succeeded by J. H. Morley. The latter continued to head the concern for several years after it became the Cleveland Branch of National Lead Company.

A Family Project

J. R. Morley Lead Company was a family project. J. H. Morley owning 875 shares and F. H. Morley, C. H. Morley and J. R. Morley owning 200 shares between them, or a total of 1,075 of a total capitalization of 2,000 shares. The officers until C. H. Morley died in 1889 were: J. H. Morley, President; C. H. Morley, Vice President; and F. H. Morley, Secretary and Treasurer.

There are interesting salary items in the Minutes of the Corporation. In 1887 the President received $5,000 and the same salary was accorded to F. H. Morley, Secretary and Treasurer. Two years later the President's salary remained the same, but the Directors voted $2,100 to the Vice President and Treasurer and $2,200 to the Secretary.

OUR FIRST BOARD OF DIRECTORS

In the preceding historical sketches of our founding companies mention was made of practically all the white lead pioneers who as officers and directors of the newly incorporated National Lead Company faced the numerous problems of this enormous combination. As a further tribute to these rugged individualists who so ably launched our Company on its road to success and as an added note of interest, our first officers and directors and their respective home cities are listed below:

OFFICERS

W. P. Thompson, President, New York
A. T. Goshorn, First Vice President, Cincinnati
F. W. Rockwell, Second Vice President, St. Louis
Chas. Davison, Secretary, New York

DIRECTORS

E. F. Beale, Philadelphia
Simon Beymer, Pittsburgh
George O. Carpenter, St. Louis
R. R. Colgate, New York
J. H. McKelvy, Pittsburgh
R. P. Rowe, New York
D. B. Shipman, Chicago
A. P. Thompson, Buffalo
W. H. Thompson, St. Louis

SUPPLEMENT TWO

PRODUCT LIST

PRODUCTS

SOLD AND MANUFACTURED BY NATIONAL LEAD COMPANY AND ITS BRANCHES, DIVISIONS AND AFFILIATED COMPANIES

Occasionally our salesmen are asked whether National Lead Company manufactures certain products, other than paint and, if so, where can information and prices be gotten.

Such inquiries can be answered easily by reference to the product list on the following pages.

The inquiry should be passed along to the nearest office selling the product, either by the salesman or the prospect, whichever the latter prefers.

Such service has its good-will value, as well as serving the best interests of the Company.

HOW TO USE

It will be observed that the products are classified into the following five groups and in each case are arranged alphabetically:

METAL PRODUCTS
PAINT PRODUCTS
DRY PIGMENT PRODUCTS
OIL PRODUCTS
MISCELLANEOUS PRODUCTS

When a product is located, the next step is to note the numeral or numerals adjacent to it in the column headed "By Whom Sold." Then turn to the "Key" for the name and address of the office or offices handling the product under consideration. The same procedure, of course, applies in the case of the "By Whom Made" column.

KEY FOR CHECKING WHO MAKES AND SELLS PRODUCTS LISTED

A. National Lead Company (Headquarters) 111 Broadway, New York, N. Y.

NATIONAL LEAD COMPANY BRANCHES

1.	**Atlantic** National Lead Company	111 Broadway, New York, N. Y.
2.	**Baltimore** National Lead Company	214 Henrietta Street, Baltimore, Md.
3.	**Boston** National Lead Co. of Mass.	800 Albany Street, Boston, Mass.
4.	**Buffalo** National Lead Company	116 Oak Street, Buffalo, N. Y.
5.	**Chicago** National Lead Company	900 West 18th Street, Chicago, Ill.
	Detroit	1627 West Fort Street, Detroit, Mich.
	Milwaukee	744 North Fourth Street, Milwaukee, Wis.
6.	**Cincinnati** National Lead Company	659 Freeman Avenue, Cincinnati, Ohio
	Atlanta	Bishop Street, Atlanta, Ga.
	Louisville	1320 Heyburn Building, Louisville, Ky.
7.	**Cleveland** National Lead Company	1213 West Third Street, Cleveland, Ohio
8.	**Pacific Coast** National Lead Company	2240—24th Street, San Francisco, Calif.
	Los Angeles	932 Wilson Street, Los Angeles, Calif.
	Portland	1211 N.W. Glisan Street, Portland, Ore.
	Seattle	973 John Street, Seattle, Wash.
	Spokane	N. 908 Howard Street, Spokane, Wash.
	Tacoma	1013 A Street, Tacoma, Wash.
9.	**Philadelphia** John T. Lewis & Bros. Co.	Widener Building, Philadelphia, Pa.
10.	**Pittsburgh** National Lead Co. of Pa.	1376 River Avenue, Pittsburgh, Pa.
11.	**St. Louis** National Lead Company	722 Chestnut Street, St. Louis, Mo.
	Dallas	959 Terminal Street, Dallas, Texas
	Kansas City	1406 West 13th Street, Kansas City, Mo.
	New Orleans	516 Tchoupitoulas Street, New Orleans, La.
	Omaha	2810 A Street, Omaha, Neb.
	St. Paul	102 West Fairfield Avenue, St. Paul, Minn.

AFFILIATED COMPANIES AND DIVISIONS

12.	American Bearing Corporation	429 So. Harding Street, Indianapolis, Ind.
13.	American Lead Corporation	1600 East 21st Street, Indianapolis, Ind.
14.	Blatchford Co., E. W. (Branch)	63 Park Row, New York, N. Y.
15.	Canada Metal Company, Ltd.	721 Eastern Avenue, Toronto, Canada
16.	Combined Metals Reduction Co. (No N. L. ownership)	Stockton, Utah
17.	Evans Lead Corporation	Charleston, West Virginia
18.	Kirk & Son, Inc., Morris P.	2717 South Indiana Street, Los Angeles, Calif.
19.	Magnus Metal Corporation	721 Railway Exchange Building, Chicago, Ill.
	New York	111 Broadway, New York, N. Y.
20.	Master Metals, Inc.	2850 West Third Street, Cleveland, Ohio
21.	National Lead Company, S/A	Avenida Presidente Roque Saenz Pena 567, Buenos Aires, Arg., S.A.
22.	Titanium Pigment Corporation	111 Broadway, New York, N. Y.
	Boston	34 Midway Street, Boston, Mass.
	Chicago	104 S. Michigan Avenue, Chicago, Ill.
	Cleveland	Room 617, Penton Building, 1213 West 3rd Street, Cleveland, Ohio
	Los Angeles	2475 Enterprise Street, Los Angeles, Calif.
	Philadelphia	Widener Building, Philadelphia, Pa.
	San Francisco	350 Townsend Street, San Francisco, Calif.
	St. Louis	Carondelet Station, St. Louis, Mo.
23.	Titanium Division, National Lead Company	111 Broadway, New York, N. Y.

For information about the Baker Castor Oil Company, the Baroid Sales Division and the DeLore Division, see Page 10. Products identifying the lines handled by these organizations are also included under the product group headings.

PRODUCTS	BY WHOM SOLD	BY WHOM MADE

METAL PRODUCTS

Acid Concentrating Plants (Simonson-Mantius Vacuum Process)		
Chamber Acid	1	1
Sludge Acid	1	1
Spent Acid	1	1
Acid Separating Plants (Simonson-Mantius Vacuum Process)		
Sludge Acid	1	1
Alloys, Die Casting		
Lead	1-2-4-5-6-7-9-10-11-13-15-18-20	1-2-4-5-6-7-9-10-11-13-15-18-20
Tin	1-2-4-5-6-7-9-10-11-13-15-18	1-2-4-5-6-7-9-10-11-13-15-18
Zinc	1-4-5-6-7-10-11-15-18	1-5-7-11-15-18
Alloys, Slush Mold Casting	1-5-7-9-10-13-15-18-21	1-5-7-13-15-18-21
Alloys, For Aircraft Industry (See Kirksite)		
Aluminum Alloy Ingot	18	18
Aluminum Ingot	18	18
Antimonial Lead	1-2-3-4-5-6-7-9-10-11-13-15-18-20-21	1-2-3-5-6-7-9-10-11-13-18-20-21
Babbitt Metals		
Dutch Boy Trademarked	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-4-5-6-7-9-10-11-21
Others—any formula	1-2-3-4-5-6-7-9-10-11-13-15-18-20-21	1-2-3-4-5-6-7-9-10-11-13-18-20-21
Satco Ingot	19	
Bar Tin	1-2-3-4-5-6-7-9-10-11-14-15-18-21	1-2-3-4-5-6-7-9-10-11-18-21
Bars, Lead	1-2-3-4-5-6-7-9-10-11-13-15-18-20-21	1-2-3-4-5-6-7-9-10-11-13-18-20-21
Battery Grid Metal	1-2-3-5-6-11-12-15-18-20-21	1-2-3-4-5-6-11-12-18-20-21
Battery Straps	1-2-6-9-11-21	1-6-11-21
Bearings		
Armature	11	11
Bronze		
Finished	19	19
Rough	15-19	15-19
Bronze Backed, Babbitt Lined	12-19	12-19
Die-Cast	11-15-19	11-19
Journal	19	19
Satco Lined	12-19	12
Bends		
Flanged	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-4-5-6-10-11-15-21
Hardlead	1-2-3-4-5-6-7-9-10-11-15-21	10-11-15-21
Lead	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-4-5-6-10-11-15-21
Reducing	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-4-5-6-10-11-15-21
Blatchford Base (Printers)	5-14	
Block Tin Pipe	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-5-7-9-10-11-15-21
Britannia Metal	1-2-4-5-6-7-9-10-11-15-21	1-9-11-21
Bullet Core Bar Lead	1-2-3-4-5-6-7-9-10-11-15-18-20-21	1-2-3-5-6-7-9-10-11-15-18-21
Burning Lead	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-4-5-6-7-9-10-11-15-21
Bushings, Rough and Finished	19	19
Caulking Lead	1-2-3-4-5-6-7-9-10-11-13-15-18-20-21	1-2-3-4-5-6-7-9-10-11-13-15-18-20-21
Cames, Lead		
Antique	1-2-4-5-7-10-11-15	1-11-15
Plain	1-2-4-5-6-7-9-10-11-15	1-2-4-5-6-7-9-10-11-15
Reinforced	1-2-4-6-7-9-10-11-15	1-7-11-15
Rustic	1-4-6-7-10-11	1-11
Smooth Faced	1-2-4-6-7-10-11	1-2-7-10-11
Casket Trimming Metal	1-2-5-6-7-9-10-11-13-15-18-20-21	1-2-5-6-7-11-13-15-18-20-21
Castings, Non-Ferrous, Rough and Finished	19	19
Chemical Apparatus, Special Lead Lined	1-5-15-21	1-5-15-21

PRODUCTS	BY WHOM SOLD	BY WHOM MADE
Cinch Anchors (See Expansion Bolts)		
Clock Weights	1-3-6	1-3-6
Cocks		
Bibb	1-21	1-21
Hardlead	1-15-21	1-15-21
Plug	1-15-21	1-15-21
Coils		
Lead Covered Copper	1-21	1-21
Lead Lined	15-21	15-21
Special Built-Up, Lead	1	1
Copper Aluminum Hardener	18	18
Counterweights	1-2-3-5-6-7-9-10-11-20-21	1-2-3-6-7-9-10-11-20-21
Discs for Collapsible Tubes		
Antimonial Lead	1	1
Tin Coated	1	1
Electro Cases	1-11-18	1-11
Expansion Bolts		
Cinch Anchors	1	1
Cinch Cylinders	1	1
Cinch Lead Screw Anchors	1	1
Ferrules, Combination	1-2-4-5-6-7-9-10-11-15-21	2-5-6-10-11-15-21
Fittings		
Flanged or Screwed	1-9-15-21	1-15-21
Hardlead Flanged	1-9-15-21	1-15-21
Lead Lined	9-15	15
Lead Lined Soil Pipe	1-9	1
Tin Lined	1-9	1
Flux	5-7-14-21	5-14-21
Fuse Wire	2-3-4-5-7-10-11-15-21	2-3-5-7-10-15-21
Gaskets		
Composition	1-2-3-7-10-11-15	1-2-10-11-15
Lead	1-2-4-5-6-7-9-10-11-15-21	1-2-5-7-9-10-11-15-21
Tin	1-2-5-7-9-15	1-2-5-7-15
Guards, Metal (Bearers)	1-5-10	1-5
Hammer Metal	1-2-3-4-5-6-7-9-10-11-13-15-18	1-2-3-5-7-9-10-11-13-15-18
Hammers		
Babbitt	1-2-4-6-7-10-11-15-18	1-2-4-7-10-11-15-18
Lead	1-2-4-6-7-10-11-15-18	1-2-4-7-10-11-15-18
Hardening Lead	1-2-3-4-5-6-7-10-11-15-21	1-2-3-4-5-10-11-15-21
Homogeneous Bonded Lead Lined Equipment		
Agitators	1-15-21	1-15
Digestors	1-15	1-15
Drums	1-15	1-15
Mixing Equipment	1-15-21	1-15-21
Plating Equipment	15	15
Tank Cars	1-15	1-15
Tanks—Others to Specification	1-15-21	1-15-21
Hoyt's No. 11 Babbitt Metal	1-2-4-5-7-10-11-15-18-21	1-7-10-11-15-21
Impellers	1	1
Impression Lead, Hoyt's		
Plain	1-2-5-6-7-10-11-18-21	1-11-21
Ready to Mould	1-2-5-6-7-10-11-18	1-11
Tin Coated	1-2-5-6-7-8-10-11-15-18	1-11
Ingot Lead	1-2-3-4-5-6-7-9-10-11-13-15-18-20-21	1-2-3-4-5-6-7-9-11-13-15-18-20-21
Key Leads	1-2-3-5-6-7-9-10-15	1-2-3-5-9-10-15
Kirksite "A" Alloy		
"A" Wire	1-2-3-4-5-6-7-9-10-11-15-18	1-5-11-15-18
Kettle-Koater	1-2-3-4-5-6-7-9-10-11-15-18	
Pig	1-2-3-4-5-6-7-9-10-11-15-18	1-5-7-11-15-18
Rolled	1-2-3-4-5-6-7-9-10-11-15-18	

PRODUCTS	BY WHOM SOLD	BY WHOM MADE
Lead Angles	1-2-3-6-7-10-11	1-2-3-10-11
Lead Anodes	1-2-4-5-6-7-9-10-11-15-21	1-2-5-7-9-10-11-15-21
Lead Balls	1-2-4-6-7-10-11-15-21	1-11-15-21
Lead Construction	1-21	1-21
Lead Counterweights	1-2-3-4-6-7-9-10-11-20-21	1-2-3-6-7-9-10-11-19-21
Lead Covered Equipment		
Copper	1-5-21	1-5-21
Non-Ferrous Alloy Pipes	5-6	5-6
Steel	1-5	1-5
Lead Discs	1-2-3-4-5-6-7-9-10-11-21	1-2-3-5-6-7-9-10-11-21
Lead Headed Nails	4-6-9-10	
Lead Lined Chemical Equipment		
Autoclaves	1-5-9-15-21	1-5-9-15-21
Stills	1-5-9-15-21	1-5-9-15-21
Sulphonators	1-5-9-15	1-5-9-15
Lead Plates	1-2-4-6-7-9-10-11-15-21	1-2-6-7-9-10-11-15-21
Lead, Pulverized	1-2-3-4-5-6-7-9-10-11-18-21	1-2-5-18-21
Lead Sinkers	1-2-3-5-6-7-10-11	2-3-5-11
Lead Sleeving	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-5-6-7-9-10-11-15-21
Lead Spacers	1-2-4-5-6-7-9-10-11	1-2-3-5-9-10-11
Lead Wire	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-4-5-6-7-9-10-11-15-18-21
Lead Wool	1-2-3-4-5-6-7-9-10-11-15-18-21	1-5-15-21
Mold Metal, Rubber	1-9	1-9
Music Plates	1-2-5-6-7-10-11-18	1-11
Needle Metal	1-2-9-11-15-21	1-9-11-15-21
Net Leads	1-3-5-6-9-11-15	1-3-5-9-15
Nickel-Bronze	11-15	11-15
Organ Pipe Metal	1-3-5-6-7-10-11-15-21	1-3-5-11-15-21
Ornaments, Lead	1-3-15	1-15
Pewter	1-2-4-5-6-7-10-11-18	1-11
Phosphor Bronze Castings	15	15
Phosphor Tin	1-4-5-6-7-11-15-21	1-11-15-21
Pig Lead	1-2-3-4-5-6-7-9-10-11-13-15-18-20-21	1-3-13-15-18-20-21
Pig Tin	1-2-3-4-5-6-7-9-10-13-15-18-21	1-3-13-15-18
Pinking Blocks	11	11
Pipe		
Block Tin	1-2-3-4-5-6-7-9-10-11-15-18-21	1-5-7-9-10-11-15-21
Brass, Lead Lined	1	1
Brass-Lined Steel	1	1
Brass, Tin Lined	1	1
Copper Lined Steel	1	1
Lead		
Antimonial	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-5-6-7-10-11-15-21
Chemical	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-4-5-6-7-10-11-15-21
Common	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-4-5-6-7-10-11-15-21
Composition	1-2-3-5-7-9-10-11-15-21	1-2-3-5-7-10-11-15-21
Tellurium	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-5-6-7-10-11-15-21
Lead, Tin Lined	1-3-15	1-3-15
Soil, Lead Lined	1	1
Steel	1	1
Steel, Lead Lined	1-15-21	1-15-21
Steel, Tin Lined	1	1
Printers Metals (See Type Metals)		
Pulverized Tin	1-2-3-4-5-6-7-9-10-11-18-21	1-2-5-21
Pumps		
Hardlead Centrifugal Acid	1	1
Lead Vertical Acid	1	1
Tin Lined Hardlead Centrifugal Acid	1	1
Reducers (Lead)	1-2-3-4-5-6-7-9-10-11-15-21	10

PRODUCTS	BY WHOM SOLD	BY WHOM MADE
Ribbon		
Composition	1-2-3-7-9-10-11	1-2-3-7-9-10-11
Lead	1-2-3-4-6-7-9-10-11-15-18-21	1-2-3-4-6-7-9-10-11-15-21
Tin	1-2-4-6-7-9-10-11-15-18	1-2-7-9-10-11-15
Roof Flanges	1-2-3-4-5-6-7-9-10-11-15-18	3-5-11-15
Roofing Sheets, Hardlead	1-2-3-4-5-6-7-9-10-11-15	1-3-11-15
Sash Weights, Lead	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-4-5-6-7-9-10-11-15-21
Screens, Perforated Lead Plates	1-3-6-7-9-10-11	1-9-11
Screws, Brass Trap	1-5-6-7-10-11-15-21	15-21
Sheet Lead		
Antimonial	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-11-15-21
Chemical	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-5-7-10-11-15-21
Common	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-5-6-7-10-11-15-21
Composition	1-3-5-7-9-10-11-21	1-3-5-11-21
Crawlproof	1-4-6-7-9-10-11-15	1-10-11-15
Tellurium	1-2-3-4-5-6-7-9-10-11-21	1-2-3-5-6-7-11-21
Sheet Roofing Metal, Hardlead	1-2-3-4-6-7-9-10-11-15	1-3-11-15
Sheet Tin	1-2-3-4-5-6-7-9-10-11-15-18	1-5-11-15
Shot, Lead (All Sizes)	1-2-3-4-6-7-9-10-11-18-21	1-11
Shrapnel Balls	1-5-6-7-10-11-15	1-11-15
Simonson-Mantius Acid Recovery Plants	1	1
Sink Drains	1-3-7-10-11-15	1-3-11-15
Soil Pipe—Lead	1-3-6-7-9-10-11	1-3-6-7-9-10-11
Solder		
Acid Core	1-2-3-4-5-6-7-9-10-11-18	1-9
Bar (All Sizes)	1-2-3-4-5-6-7-9-10-11-13-15-18-21	1-2-3-4-5-6-7-9-10-11-13-15-18-21
Cake	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-4-5-6-7-9-10-11-15-21
Capping Bar	1-2-3-4-5-6-7-9-10-11-13-15-18-21	1-2-5-6-7-9-10-11-13-15-18-21
Drop	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-5-6-9-11-15-21
Fusible Bar	1-2-3-4-5-6-7-9-10-11-15-18	1-2-3-5-6-7-9-10-11-15
Fusible Wire	1-2-3-4-6-7-9-10-11-15-18	1-2-3-7-9-10-15
Hard	1-3-4-7-10-11-18-21	1-3-7-10-11-20
Ingot	1-2-3-4-5-6-7-9-10-11-13-15-18-21	1-2-3-4-5-6-7-9-10-11-13-15-18-21
Meter Bar	1-2-3-4-5-6-7-9-10-11-13-15-18-21	1-2-3-5-6-7-9-10-11-13-15-18-21
Paste	21	21
Pig	1-2-3-4-5-6-7-9-10-11-13-15-18-20-21	1-2-3-4-5-6-7-9-10-11-13-15-18-20-21
Pulverized	1-2-3-4-5-6-7-9-10-11-15-18-21	1-5-15-18-21
Radiator Bar	1-2-3-4-5-6-7-9-10-11-13-15-18-21	1-2-5-6-7-9-10-11-13-15-18-21
Ribbon or Tape	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-5-7-9-10-11-15-18-21
Rosin Core	1-2-3-4-5-6-7-9-10-11-18-21	1-9-21
Segment (Cut Wire)	1-3-4-5-6-7-9-10-11-18-21	1-5-6-9-11-21
Sheets	1-3-4-5-6-7-10-11-15-21	1-5-11-15-21
Slabs	1-2-3-5-6-7-9-10-11-15-18-21	1-2-4-5-6-7-9-10-11-15-21
Tinners' Bar	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-4-6-7-9-10-11-15-18-21
Triangular Bar	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-4-5-6-7-9-10-11-15-18-21
Wire	1-2-3-4-6-7-9-10-11-15-18-21	1-2-3-4-6-7-9-10-11-15-18-21
Sounding Weights, Lead	1-2-3-4-6-7-9-11-15-18	3-9-11-15
Special Aeroplane Body Pattern Alloys (See Kirksite)		
Special Apparatus	1	1
Spelter	1-2-4-6-7-10-11-15-18-21	1-18
Stamping Metal	1-3-5-6-7-9-11-18	1-3-7-11
Strip Tin	1-2-3-5-6-7-9-10-11-18	1-2-5-7-9-10-11
Tank Connections		
Lead Covered	1-15-21	1-15-21
Lead Lined	1-15-21	1-15-21
Tanks		
Homogeneous Lead	1-15-21	1-15-21
Tin Covered	1-21	1-21
Tin Lined	1-5-15-21	1-5-15-21
Tape, Lead	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-5-6-7-9-10-11-15-21

PRODUCTS	BY WHOM SOLD	BY WHOM MADE
Tellurium Lead	1-2-3-4-5-6-7-9-10-11-15-21	1-2-6-9-10-15-21
Tempering Lead	1-2-3-4-5-6-7-9-10-11-21	1-2-4-5-9-10-11-21
Tin Anodes	1-2-4-5-6-7-9-11	1-2-5-7-9-11
Tin Bars	1-2-3-4-6-7-9-10-11-13-15-18-21	1-2-3-4-6-7-9-10-11-13-15-18-21
Tin Pipe	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-5-7-9-10-11-15-21
Tin Wire	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-5-6-7-9-10-11-15-18-21
Tinning Compound	1-3-4-5-6-7-9-10-11-15-18-21	1-2-5-15-18-21
Tint Plates	1-5-6-7-11	1-2-11
Traps, Lead	1-2-3-4-5-6-7-9-11-15-21	1-2-3-5-6-11-15-21
Tubes		
Lead	1-2-3-4-6-7-9-10-18-21	1-2-3-4-6-7-9-10-21
Lead Covered	1	1
Lead Lined	1-3	1-3
Tin	1-2-3-6-7-9-18	1-2-3-7-9
Tin Covered Brass	1-4	1
Tin Covered Copper	1	1
Tin Covered Steel	1	1
Tin Lined Brass	1	1
Tin Lined Copper	1	1
Tin Lined Steel	1	1
Tubing		
Antimonial	1-2-3-4-5-6-7-9-10-11-15	1-2-3-5-6-7-9-10-11-15
Block Tin	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-5-7-9-10-11-15-21
Composition	1-2-3-5-6-7-9-10-11-21	1-2-3-5-7-9-10-11-21
Hardlead	1-2-3-4-6-7-9-10-11-21	1-2-3-6-7-9-10-11-21
Lead	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-5-6-7-9-10-11-15-21
Tellurium	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-5-6-7-9-10-11-15-21
Type Metals		
Autoplate	1-2-5-6-7-14-18-21	1-2-5-7-11-13-18-21
Electrotype	1-2-5-6-7-11-13-14-15-18-21	1-2-5-6-7-11-13-15-18-21
Intertype	1-2-6-7-9-10-11-13-14-15-18-21	1-2-7-9-10-11-13-15-18-21
Linotype	1-2-5-6-7-9-10-11-13-14-15-18-21	1-2-5-6-7-9-10-11-13-15-18-21
Monotype	1-2-5-6-7-9-10-11-13-14-15-18-21	1-2-5-6-7-9-10-11-13-15-18-21
Stereotype	1-2-5-6-7-9-10-11-13-14-15-18-21	1-2-5-6-7-9-10-11-13-15-18-21
Typograph	1-2-7-10-11-13-14-18	1-2-7-10-11-13-18
Valves		
Lead Lined Acid	1-21	1-21
Tin Lined Acid	1	1
United Hardlead	1-15-21	1-15-21
Washers, Lead	1-2-3-4-5-6-7-9-10-11-18-21	1-2-5-9-10-21
Wedge Lead	1-2-3-4-5-6-7-9-10-11-15-21	1-2-3-4-5-6-7-9-10-11-15-21
Wire		
"A" Wire (See Kirksite)		
Iron, Lead Coated	1-9	1-9
Lead	1-2-3-4-5-6-7-9-10-11-18-21	1-2-3-4-5-6-7-9-10-11-18-21
Solder	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-4-5-6-7-9-10-11-15-18-21
Tin	1-2-3-4-5-6-7-9-10-11-15-18-21	1-2-3-5-6-7-9-10-11-15-18-21
Zinc		
Special High Grade	1-3-4-5-7-10-11-15-16-18	1-16
High Grade	4-5-7-10-11-15-16-18	16
Prime Western	1-2-4-5-6-7-10-11-15-18-21	1-18
Zinc Base Alloys		
Die Casting	1-5-7-10-11-15-18	1-5-7-11-15-18
Gravity Casting	7-10-11-15-18	7-11-15-18
Kirksite	1-2-4-5-6-7-9-10-11-15-18	1-5-7-11-15-18
Slush Casting	1-5-7-9-10-11-15-18-21	1-5-7-11-15-18-21

PRODUCTS	BY WHOM SOLD	BY WHOM MADE

PAINT PRODUCTS

Colors-in-Oil (Full Line)	1-3-4-5-6-7-8-9-10-11-21	8-9
Painting Equipment		
Brushes, Ladders, etc.	8 (Sold only by Pacific Coast Branch)	
Putty	8-9	9
Ready Mixed Paints		
Enamels	8-21	8
House Paints (Exterior and Interior)	1-3-4-5-6-7-8-9-10-11	1-5-8
Industrial Paints	8-21	8
Lacquers	8-21	8
Sundries	8-21	8
Varnishes	8-21	8
Red Lead—Paints		
Liquid Red Lead No. 1—No. 5 (Black Finish Coat)—Marine		1-8-9-11
Metal Primer No. 050		1-8-9-11
Quick Drying		8-9-11
Semi Quick-Drying	1-3-4-5-6-7-8-9-10-11	9-11
No. 25		1-8-9-11
Paste in Oil		1-8-9-11
Wall Primer	1-3-4-5-6-7-8-9-10-11	1-8
White Lead		
Paints—Pure White Lead		
Exterior Primer	1-3-4-5-6-7-8-9-10-11	8-9-11
Outside White	1-3-4-5-6-7-8-9-10-11	1-5-8
White Lead in Oil		
Heavy Paste	1-3-4-5-6-7-8-9-10-11-21	1-5-8-9-11
Soft Paste	1-3-4-5-6-7-8-9-10-11-21	1-5-8-9-11
Pulp	1-5	1-5

DRY PIGMENT PRODUCTS

Barium Sulphate	See Baroid Sales Division & DeLore Division	Page 10
Barytes	See Baroid Sales Division & DeLore Division	Page 10
Blanc Fixe	See DeLore Division	Page 10
Calcium Carbonate	See DeLore Division	Page 10
Extender Pigments	See DeLore Division	Page 10
Fillers	See DeLore Division	Page 10
Lead Silicates		
Bisilicate	1-6-7-10-17	17
Monosilicate		
Litharge		
Color Makers		1-5-8-9-11-17-18
Fumed		11-17
Glass Makers		1-8-9-11-17-18
Insecticide	1-3-4-5-6-7-8-9-10-11-17-18	1-8-9-11-17-18
Oil Refiners		1-8-9-11-17-18
Regular		1-8-9-11-17-18
Storage Battery Oxides	1-3-4-5-6-7-8-9-10-11-17-18-21	1-8-9-11-17-18
Varnish Makers	1-3-4-5-6-7-8-9-10-11-17-18-21	1-8-9-11-17-18
Mineral Primers	See DeLore Division	Page 10
Orange Mineral	1-3-4-5-6-7-8-9-10-11-17	1-9-11-17
Red Lead		
Barton		1-9-11-18
Fumed		11-17
Furnace		1-8-9-11-17-18
Glass Makers	1-3-4-5-6-7-8-9-10-11-21	1-8-9-11-17-18
Regular		1-8-9-11-17-18
Storage Battery		1-8-9-11-17-18

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PRODUCTS	BY WHOM SOLD	BY WHOM MADE
Titanium Pigments		
"Titanox"—A (Anatase)	22	23
"Titanox"—RA (Rutile)	22	23
"Titanox"—B 30 (Barium Pigment)	22	23
"Titanox"—C (Anatase—Calcium Pigment)	22	23
"Titanox"—RC (Rutile—Calcium Pigment)	22	23
"Titanox"—L (Lead Titanate)	22	23
Titanium Sulphate Cake	22	23
White Lead		
Basic Lead Carbonates		
Carter and HTS	1-3-4-5-6-7-8-9-10-11-21	1-5-8
No. 111		8-9-11
No. 333		8-9-11
Basic Lead Silicate		
45X	1-3-4-5-6-7-9-10-11	9
Basic Lead Sulphates		
Blue	1-3-4-5-6-7-9-10-11	
Dutch Boy (White)	1-3-4-5-6-7-9-10-11	11
Whiting	8-21 See DeLore Division	Page 10

OIL PRODUCTS

Castor Oil, its derivatives and specialties	See Baker Castor Oil Co.	Page 10
Flatting Oil	1-3-4-5-6-7-8-9-10-11-21	1-8
Lead Mixing Oil	1-3-4-5-6-7-8-9-10-11	1-8
Linseed Oils		
Blown	1-5-6-9	1-5-9
Boiled	1-3-4-5-6-7-8-9-10-11	1-5-9
Dutch	1-4-5-6-9	1-9
Heat Bodied	1-5-6-9	1-9
Raw	1-3-4-5-6-7-8-9-10-11	1-9
Refined	1-5-6-9	1-9
Refrigerated	1-5-6-9	1-9
Special Processed	1-5-6-9	1-9
Liquid Drier	1-4-5-6-7-8-9-10-11	1

MISCELLANEOUS PRODUCTS

Copperas (Iron Sulphate)	23	23
Copper Sulphate	18	18
Hyposulphite of Lead (black and white)	1-9	9
Lead Acetate	1-6	
Lead Formate	A	9
Linseed Meal	1-9	1-9
MacIntyre Magnetite (Iron Ore)	23	23
Molspray	1-6	1
Oil Well Drilling Muds and Materials	See Baroid Sales Division	Page 10
Plumb-O-Sil (Precipitated Lead Silicate)	A	9
Pyrites Cinders	23	23
Sodium Sulphide—60% Flaked and Solid	23	23
Sulphuric Acid	23	23
Tribase (Tribasic Lead Silicate)	A	9
Zinc Chloride Solution (Chromated Solution)	18	18
Zinc Sulphate		
Solution	18	18
Flake	18	18

BAKER CASTOR OIL COMPANY

120 Broadway, New York, N. Y.

Products: The following list does not include all the castor oils, their derivatives and specialties, manufactured and sold by The Baker Castor Oil Company, but does cover their main lines:

Baker's Castor Oil
- Baker's AA Cold Pressed
- Baker's Crystal "O" Cold Pressed
- Baker's No. 3 Castor Oil

Baker's Castung Oils (Dehydrated Castor Oils for Varnishes and Lacquers)
- No. 103
- No. 403-101—G to H Body
- No. 403-101—Z and Z3 Body
- No. 504—U to V Body
- No. 504—Z3 Body

Baker's Processed Oils (Solvents and Plasticizers for Nitro Cellulose Esters and Ethers)
Baker's P Line Alkyl Ricinoleates (To impart flexibility to pyroxolin compounds)
Baker's AN Series (For plasticizing water finishes—glue, casein, shellac)
Baker's Ricinoleic Acids (Raw Materials for Alkyd Resins)

BAROID SALES DIVISION

NATIONAL LEAD COMPANY

830 Ducommun Street, Los Angeles, Calif.
1113 Second National Bank Building, Houston, Texas
502 Tulsa Building, Tulsa, Okla.

Products: The following list is representative of the products handled by this Division:

- Anhydrox
- Aquagel
- Baroid
- Baroco
- Barium Sulphate
- Barytes
- Bentonite
- Fibertex
- Glass Makers Barite
- Impermex
- Micatex
- Smentox
- Stabilite
- Zeogel

DE LORE DIVISION

NATIONAL LEAD COMPANY

Carondelet, St. Louis, Missouri

Products: The following list is representative of the products handled by this Division:

- Barium Sulphate
- Barytes (Refined Water Ground)
  - Foam-A
  - Baryta-White
- Blanc Fixe
- Calcium Carbonate
- Extender Pigments
- Fillers
- Mineral Primers
- Whiting
  - Verablanc
  - C-C-O-White