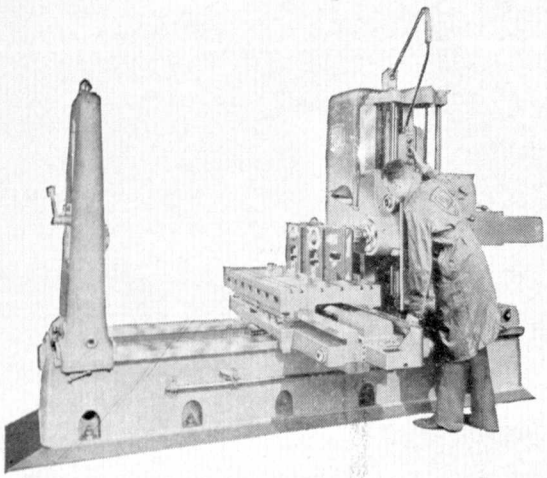
Spartan ENGINEER

JANUARY, 1951
VOL. 4, NO. 2
TWENTY CENTS

n this Issue -

The Story of Ransom E. Olds
AUTOMOTIVE PIONEER

Another page for **YOUR BEARING NOTEBOOK**



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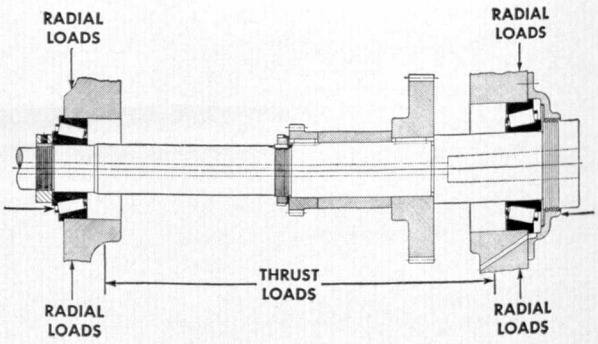

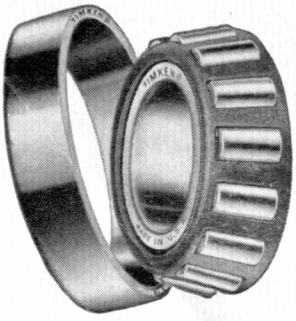

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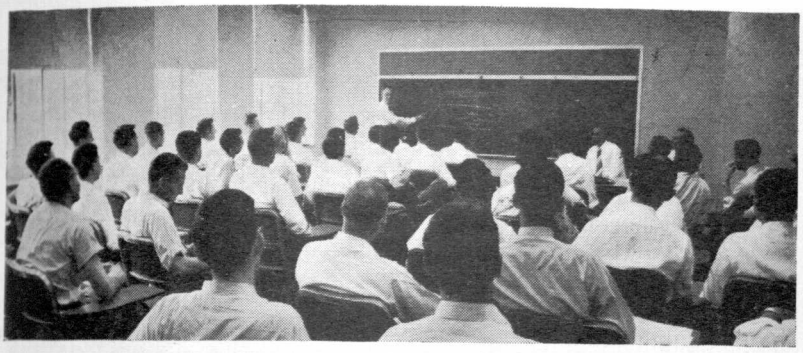
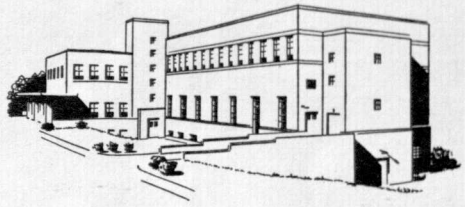
NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL ⓪ AND THRUST —⓪— LOADS OR ANY COMBINATION



Classroom work is combined with conferences and actual work assignments to help develop potential abilities.

Convenient facilities are provided for formal and informal gatherings at the new Westinghouse Educational Center. Bottom shows the terrace lounge portion of the rumpus room.



For Men WHO BELIEVE THERE'S ROOM AT THE TOP

Leaders come from men who devote their time to purposeful work, constructive study and thoughtful concentration . . . men who are willing to invest their time to prepare for an opportunity.

They must believe in themselves, and be prepared with a solid background of knowledge, experience and skill that qualifies them for greater responsibility.

Westinghouse management knows that men who invest their time in self improvement are good prospects for top positions. It accepts the responsibility for supporting these men in pursuing their ambitions by providing the latest facilities, graduate-level instruction and practical individual guidance.

With the opening of its new Educational Center, Westinghouse has taken another step in broadening its support of men who believe there is room at the top... and who will back it up with their own effort and enthusiasm. We believe it can only result in *more* room at the top . . . for those who believe in their own potentialities and have the will and courage to develop them. G-10117

YOU CAN BE SURE..IF IT'S Westinghouse

Strength factors of Long Life!

No pipe that is provably deficient in any of these strength factors should ever be laid in city streets

BURSTING STRENGTH — In full length bursting tests standard 6-inch cast iron pipe withstands more than 2500 lbs. per square inch internal hydrostatic pressure, which proves ample ability to resist water-hammer or unusual working pressures.

SHOCK STRENGTH — The toughness of cast iron pipe which enables it to withstand impact and traffic shocks, as well as the hazards in handling, is demonstrated by the Impact Test. While under hydrostatic pressure and the heavy blows from a 50 pound hammer, standard 6-inch cast iron pipe does not crack until the hammer is dropped 6 times *on the same spot* from progressively increased heights of 6 inches.

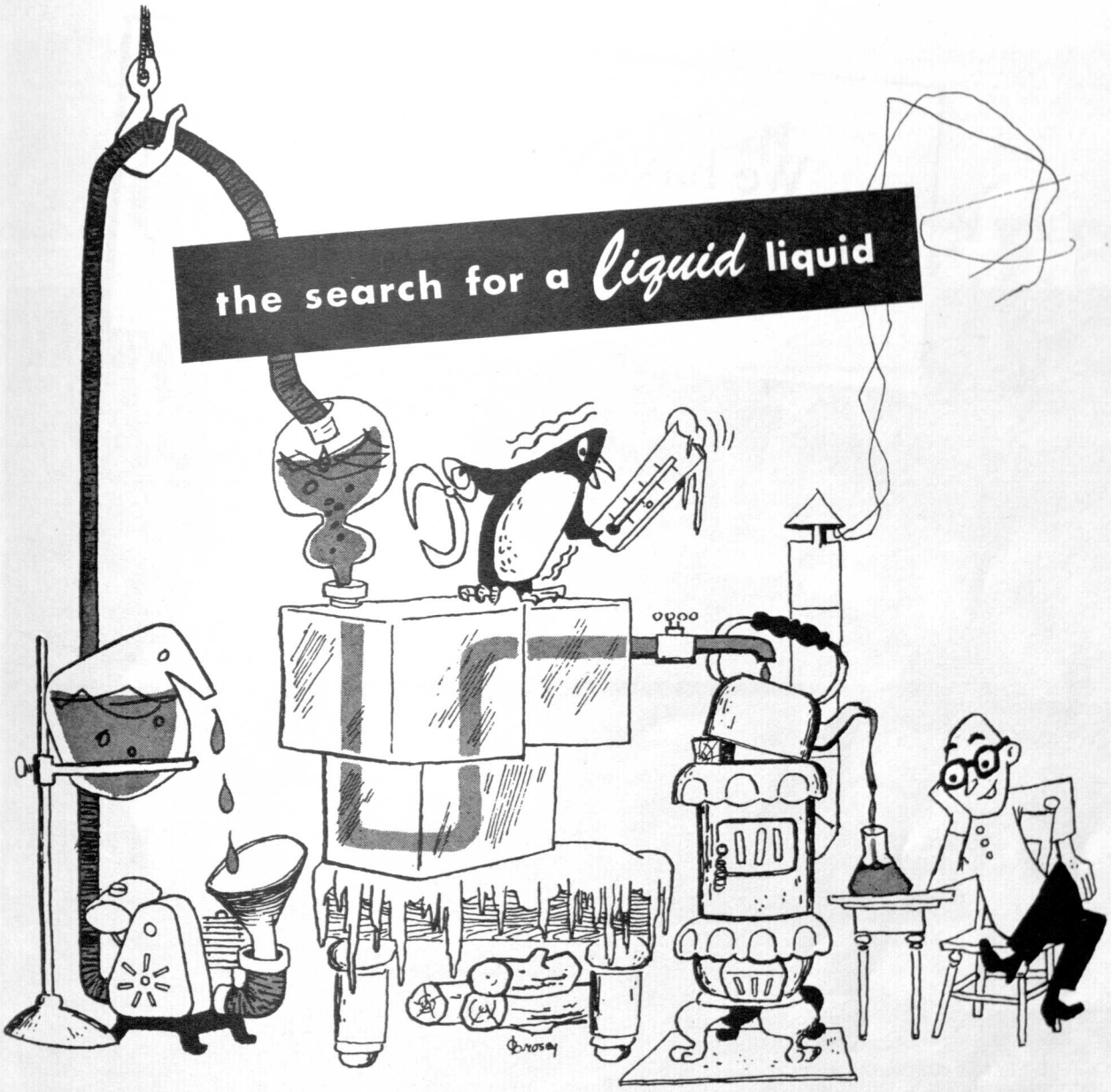
CRUSHING STRENGTH — The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

BEAM STRENGTH — When cast iron pipe is subjected to beam stress caused by soil settlement, or disturbance of soil by other utilities, or resting on an obstruction, tests prove that standard 6-inch cast iron pipe in 10-foot span sustains a load of 15,000 lbs.

Without bursting strength—or, for that matter—without all of the strength factors listed opposite—no pipe laid 100 years ago in *city streets* would be in service today. But, in spite of the evolution of traffic from horse-drawn vehicles to heavy trucks and buses—and today's vast complexity of subway and underground utility services—cast iron gas and water mains, laid over a century ago, are serving in the streets of more than 30 cities in the United States and Canada. Such service records prove that cast iron pipe combines all the strength factors of long life with ample margins of safety. No pipe that is provably deficient in any of these strength factors should ever be laid in city streets. Cast Iron Pipe Research Association, Thos. F. Wolfe, Engineer, 122 So. Michigan Ave., Chicago 3.

CAST IRON

CAST IRON PIPE SERVES FOR CENTURIES



When is a liquid *not* a liquid?

It often seems that research moves in strange ways to solve problems. Take the case of the *liquid* liquids . . . products of the Dow laboratories. Called Dowanols, these chemicals offer industry a valuable tool, liquids that *remain* liquid over a temperature range of 390 degrees. In addition, they have many other physical characteristics that make them extremely helpful to the processing industries. Their solvent power, for instance, is remarkable . . . for Dowanols are miscible in all proportions with fluids from water and olive oil to benzene. This wide solvent range leads to their use in many applications where stabilizing action is required: cutting oils, printing inks, rust removers, dry cleaning soaps, textile finishing compounds and many others.

Dowanols are but one product resulting from a program of continuing research carried on by Dow in the interests of producing more "Chemicals Indispensable to Industry and Agriculture."

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DOW
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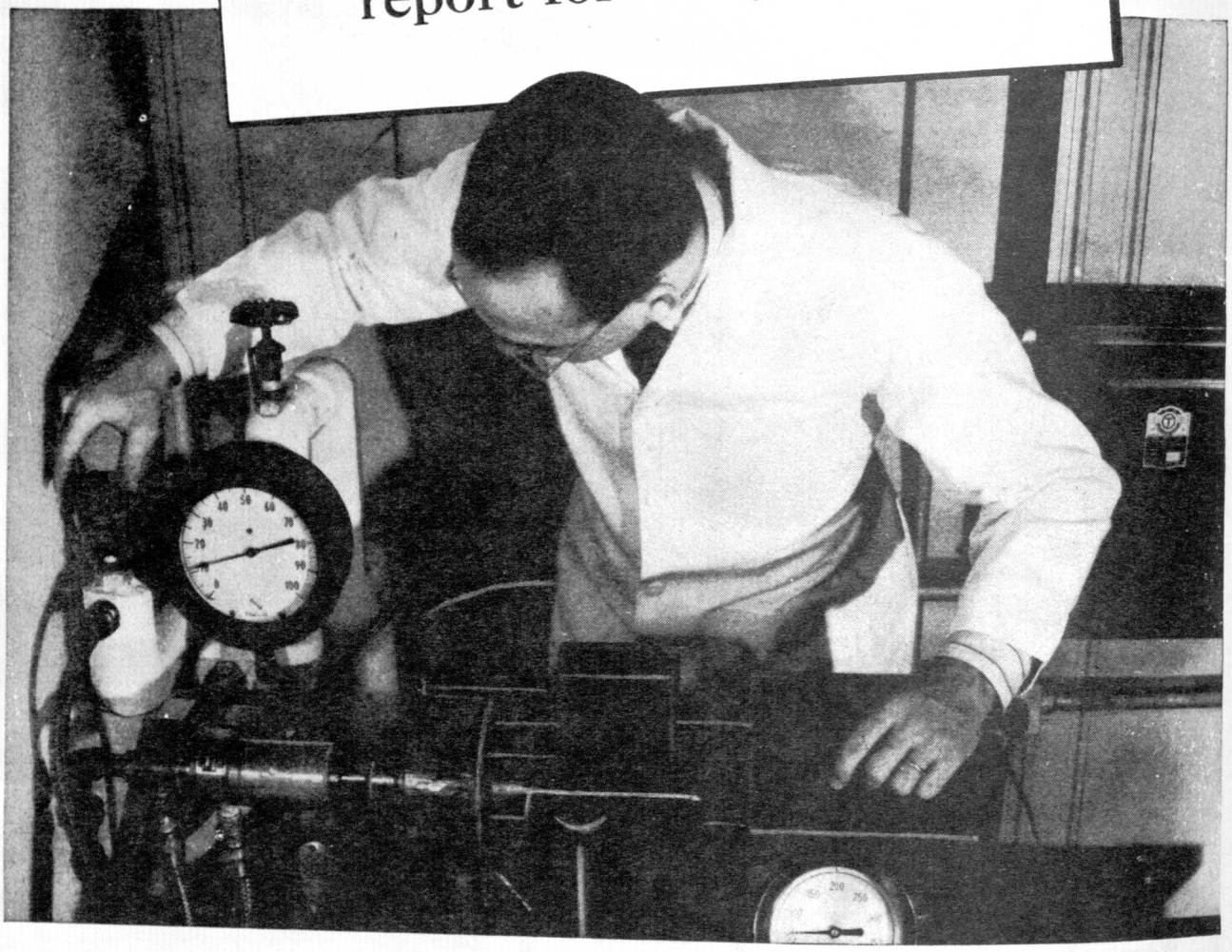
We have good news to report for the journals



SOME JOURNALS are technical publications. Some journals are the parts of rotating shafts that turn in bearings.

For both kinds of journals, there's good news in Standard Oil's performance testing program. One result is a new testing device for mill and locomotive driving-journal grease that enables us to tell more accurately than ever before what our greases will do under actual conditions of use. That, in turn, enables us to proceed more directly with the job of making our greases still better.

Standard Oil took the lead in performance testing, and is a leader today. During the war our tests furnished information that enabled the Army to procure certain products with greatly increased reliability of performance. Some of our tests have become a part of government specifications. Many users of our products are benefiting, both from better products and from more accurate information.

As time goes on, we are doing more and more performance testing. In some cases, we have to develop not only the tests but also the testing equipment. But to Standard Oil researchers and engineers, any effort is worth while if it will help make better, more useful petroleum products.

Standard Oil Company

(INDIANA)

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COVER: R. E. Olds
This issue is dedicated to the late Ransom E. Olds

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PLASTICS

A GLANCE AT THIS INCREASING POPULAR INDUSTRY

BY DOUGLAS HAMILTON
SOPHMORE CH.E.

What are plastics? Despite the ever increasing occurrence of plastics in our daily life, the average person would find it difficult to answer this question. The finished product furnishes no clues as it seldom, if ever, resembles the original materials, while the many different shapes and forms in which we use plastics further confuses the issue. However, if the more complicated details of chemistry are left out, plastics can be quite clearly understood.

Plastics are essentially synthetic organic substances. By synthetic we mean that they do not occur anywhere in nature, but are products of the chemist's creative genius. As they are made from coal, air, water, petroleum, and vegetable by-products, they come under the classification of organic compounds. The name "Plastics" has been adapted because of the ease with which these materials can be moulded into any desired shape.

Shellac and bitumen are natural plastics. They have been known and used for many centuries, but they really don't belong in the same class with our more modern synthetic plastics. They undergo no chemical change in their formation and haven't the versatility of the true plastics.

All synthetic plastics are made by the process of polymerization. When the proper chemicals are combined under heat and pressure, the molecules of these chemicals join together to form long complex chainlike molecules with new properties and characteristics. It is these very long molecules that give plastics their strength and flexibility. For simplicity, a plastic can be defined as a polymerized substance.

At the present time there are about thirty basic plastics. Each of these can be varied by changing the reaction conditions and constituents so that hundreds of different plastic products can be obtained. However, many types can be divided into two main groups which are; thermosetting and thermoplastic.

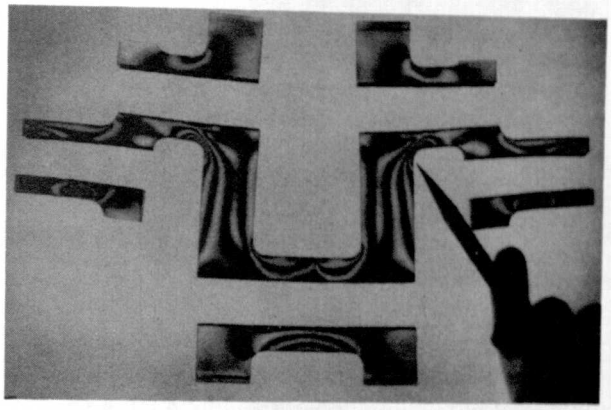
Thermosetting plastics undergo a permanent chemical change when treated by heat and pressure. The finished product cannot be melted, dissolved or broken down by heat or chemicals. This permanent change makes exact control of the manufacturing process essential. Complicated equipment is often necessary, but the finished product has many important applications. A good example of a thermosetting plastic is the telephone we use every day.

Thermoplastic plastics do not undergo a chemical change when subjected to heat and pressure. Heat merely softens a thermoplastic material; as soon as it cools it is hard again. This property helps reduce loss of material during manufacturing. Any imperfectly formed molding may be ground up, melted, and molded again. Thermoplastic plastics are usually used where a product does not have to withstand high temperature. The common plastic pocket comb is usually made of thermoplastic plastics.

The substitution of plastics for the more traditional materials (metal, stone, wood, and cloth) has taken place mostly in the last fifty years. John Wesley Hayatt accidentally discovered celluloid (cellulose-nitrate) in 1869. He made false-teeth and celluloid collars, but the market for celluloid did not really develop until the advent of the motorcar, when celluloid was used for windows and as the first filler for safety glass.

Dr. Leo H. Backeland developed the well known plastic bakelite in the year 1909. With the development of celluloid and bakelite the march of plastics had begun.

The plastics industry, which today is strong and vigorous, has every indication of goind on to even greater heights of achievement. The development of new plastic compounds and the discovery of new ways of using old plastics is continually growing.



THREE DIMENSIONAL TRANSPARENT PLASTIC MODELS OF TOOLS AND MACHINE PARTS ARE USED FOR ANALYZING STRESS. WHEN VIEWED THROUGH SPECIAL POLARIZED LIGHT, THE STRESS PATTERN TELLS THE LOCATION, DIRECTION, AND MAGNITUDE OF THE STRESSES.

For simplicity the plastics industry can be roughly divided into four distinct groups. There are the plastics makers, the molders, the laminators, and the fabricators.

Because of the large investments required for equipment, space, and laboratory research, the main plastics makers are large chemical firms. They make the plastics compounds and supply the other branches of the industry.

The molders buy their raw materials from the plastics makers in powder form. While it is referred to as powder it is really in the form of granules, flakes, and pellets. The finished product is made with the use of special molding and extruding machines.

By pressing together sheets of cloth, paper, wood or glass fiber, coated with a liquid plastic, the laminators make such things as gears, pulleys, electrical parts, and items of furniture.

The fabricators use wood and metal working methods to assemble sheets, rods, pipes, and special shapes into a variety of items from small toys to large and complex articles. This branch of the industry has been steadily growing in importance.

All of these fine new plastic compounds would be of little use without a satisfactory means of molding them quickly and economically into finished

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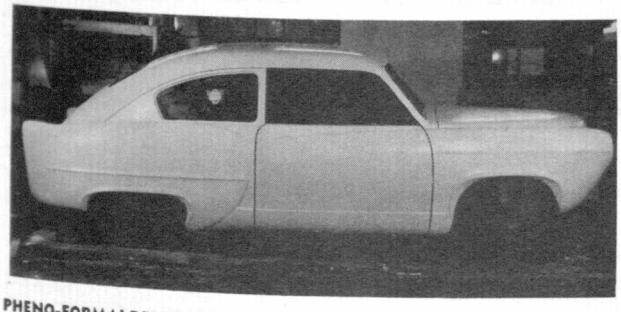
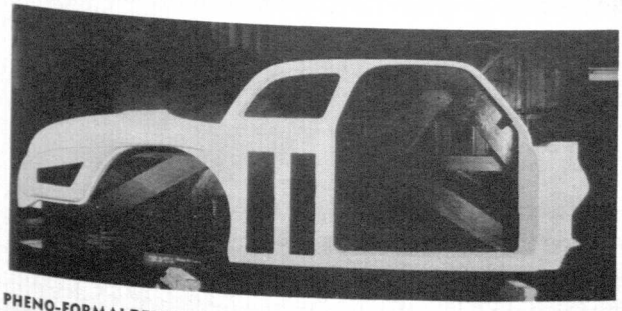
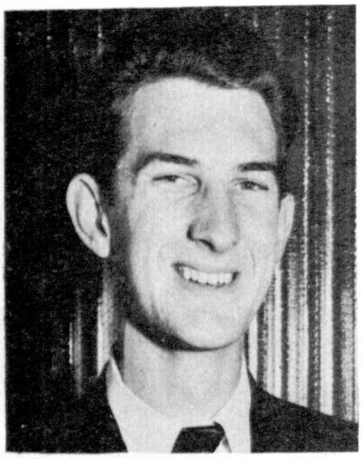


PHENO-FORMALDEHYDE PLASTIC IS USED HERE TO MAKE A FULL SCALE DIE MODEL OF THE HENRY J. THIS MODEL IS USED FOR MAKING DIES, ASSEMBLY FIXTURES, AND INSPECTION FIXTURES.



PHENO-FORMALDEHYDE PLASTIC FIXTURE MASTER FOR BUILDING AND MAINTAINING ASSEMBLY FIXTURES IN AUTOMOBILE PLANTS.



DEVELOPMENT AND PRODUCTION OF A METAL KINESCOPE

BY ELTON H. MOORE
JUNIOR E.E.

Perhaps the most interesting feature of post-war television has been the development of large-screen picture tubes or "metal cone kinescopes." The first of these tubes, a 16-inch directly-viewed kinescope, was announced to television receiver manufacturers in January 1948. Since that date most development has been confined to minor improvements on this basic tube.

In the development of this tube, the 16AP4, it was recognized that to make a large-size picture available to a sizable portion of the television public, the kinescope to do the job must be designed for mass production and low cost. The design had to be suitable for high-speed production by automatic machinery, have electrical requirements within the range of inexpensive high-voltage and deflection power supplies and have minimum-volume and weight for a given picture size. In addition to these production requirements, the kinescope must have a face of good optical quality and little curvature to provide high-quality pictures on an essentially flat viewing screen.

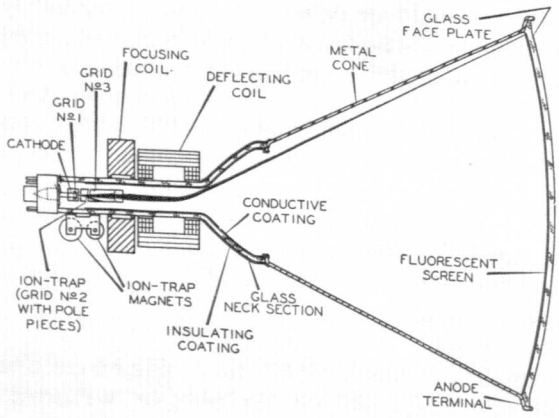


FIG. 1

A cathode-ray tube for television consists of three fundamental parts: an electron gun, a fluorescent viewing screen, and an elongated envelope which contains the electron gun and fluorescent screen and through which the electrons are directed. As the picture size requirement increases so does the size of the tube envelope, and with that increase, the advantages of the metal construction become increasingly evident.

Metal was selected for the envelope because of its lower cost, plentiful supply, ease of control of the dimensions, durability, and the adaptability of the tube assembly to mass production. The art of heating and forming, and annealing and cooling heavy masses of glass is highly specialized. However, the same processes are relatively simple when metal is the working substance.

Necessary in tubes of this type are external magnetic, electron-beam-deflecting and focusing coils, and ion-trap magnets. A minimum of magnetic shielding is desired between these external magnetic fields and the electron beam. Therefore, glass is used as the neck material in these tubes.

As illustrated, in Figure 1, the metal tube consists of a truncated metal cone, to the large end of which is fused a relatively thin, nearly flat face plate, and to the smaller end a glass flared

neck section containing the electron gun. The flared section provides electrical insulation between the deflecting coils which operate at ground potential and the exposed metal cone surface which operates at high potential.

The major properties required of the metal selected for the envelope were:

1. The coefficient of expansion of the metal must match that of the glass.
2. The metal oxide formed in heating the metal must be soluble in glass.
3. The metal oxide must have excellent adherence to the base metal.
4. The metal shall not be readily over-oxidized to form a thick porous oxide.

Those iron alloys which included chromium in their composition were found to have the above properties to the greatest degree. Therefore, the chromium-bearing alloys were considered with respect to the additional requirements imposed by the use for which the metal was intended. The requirements were that it have a high tensile strength, both at room temperature and at tube baking temperatures, that it have good corrosion resistance, and that it be vacuum tight.

After much experimentation, the metal found most suitable was a modification of a commercially available high-chromium alloy SAE Type 446.

Formerly, face plates were made by pressing molten glass in an iron mold. These plates are rough, scatter light, and contain visible foreign particles. The 16AP4 contains high-quality window glass as its face-plate. The presence of atmospheric pressure which totals about a ton and a half on the 16-inch tube, necessitates either a curved or an excessively thick wall.

This tube, however, was designed to have high strength in the metal rim so that the face plate may be relatively thin and nearly flat. The face plate of the 16AP4 is only 3/16 inch thick and has a radius of curvature of about 27 inches.

As may be concluded from the list of desired qualities of the metal, the sealing of glass to metal depends upon the ability of glass in the molten state to partially dissolve strongly adherent metallic oxides, thus forming a mechanically strong bond between the glass and metal. The process used for sealing the glass face plate and the metal cone consists of placing the face plate and cone on the dealing machine, rotating the assembly, and heating it uniformly until it is close to the annealing point of the glass. At this time, the sealing heat is applied to the sealing area so that the glass in contact with metal is melted and the seal formed. Air pressure is used inside the cone during this operation to hold the face plate in position and to work and form the seal. Smooth contour of the seal is important because it eliminates points of high stress concentration in the seal area.

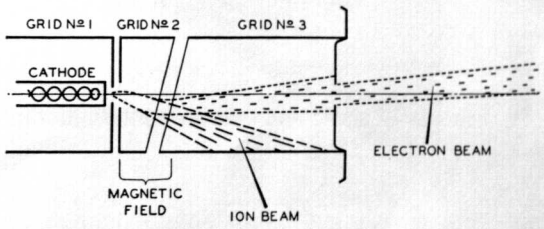


FIG. 2

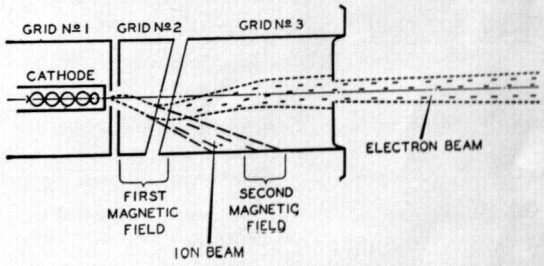


FIG. 3

After the sealing operation, the bulb is transferred to an oven maintained near the annealing temperature of the glass and allowed to temperature-equalize. Formerly, with all-glass tubes, it was necessary to cool the tube very slowly to avoid excessive strains. This is not necessary in the 16AP4. However, so the bulb may be removed from the oven and allowed to cool in air at room temperature. This operation is possible because cooling and shrinking of the metal places the glass in both tangential and radial compression to limit the formation of tensile stress. The neck assembly is sealed on by conventional sealing methods and flame annealed prior to the face-plate sealing operation.

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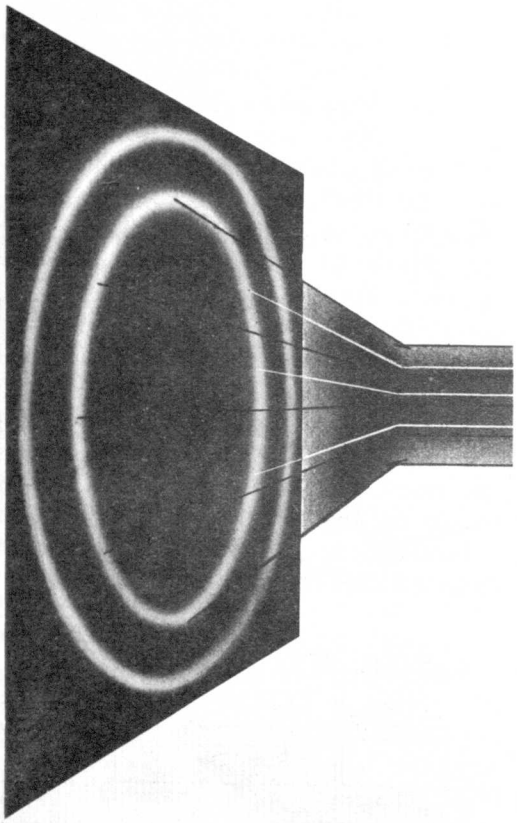
X-RAY DIFFRACTION



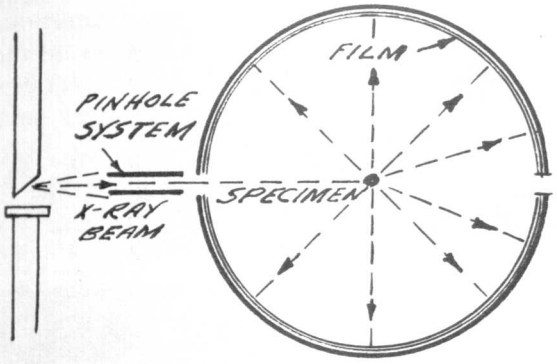
BY EMIL RAULIN
SENIOR M.E.

Atomic structures which were previously unknown may today be determined by the relatively new science of X-ray diffraction. Some of the more general applications of X-ray diffraction are to identify, compare, and analyze raw materials in the manufacturing of paints, pigments, plastics, pharmaceutical chemicals, metals, paper, and rubber. The applications are so numerous and diversified that it will take a few more years before this new science will be used to its fullest extent.

The Metallurgical Engineering Department of Michigan State College has recently acquired a new X-ray diffraction apparatus. The apparatus is manufactured by the North American Phillips Company and will be used to help the metallurgists get a greater knowledge of the fundamental structures with which they work. Some of the metallurgical applications which are possible with this apparatus are: to study the atomic structures, to determine the effects of hardening and annealing, to study the effects of various forming processes such as rolling, stamping, spinning and drawing, and to study the effects of alloying agents in metals.

X-ray diffraction is made possible by the fact that almost every substance is composed of small crystals having different and definite structures. These structures, in most cases, determine the properties and characteristics of the substance. Thus, when a fine beam of "X" radiation strikes a particular substance, the rays will be diffracted. The pattern obtained from the diffracted rays will be characteristic of this material. The separations and the intensity of the pattern depend on the size of the crystals and their structure. Hence, once a picture is obtained of a material in its pure state any additional material or foreign matter will immediately give a different pattern. This phenomenon is the basis for X-ray diffraction.

The advantages of the X-ray diffraction is that it makes it possible to see into the fine structure of matter. This is impossible to do with microscopes or other instruments. The reason this is possible with X-rays is that the wave length of the X-ray is much shorter than that of light. By knowing something about the internal structure it is possible to give reasons for certain behaviors.

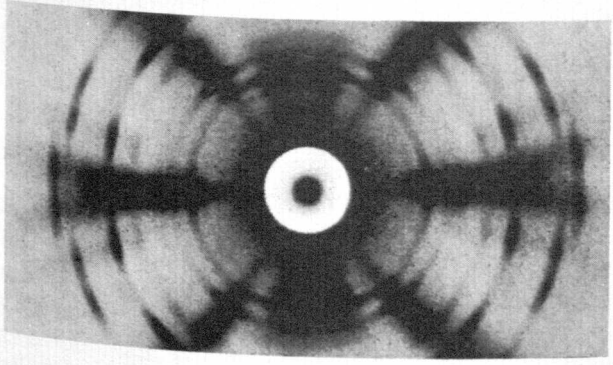


SCHEMATIC DIAGRAM OF A POWDER CAMERA.

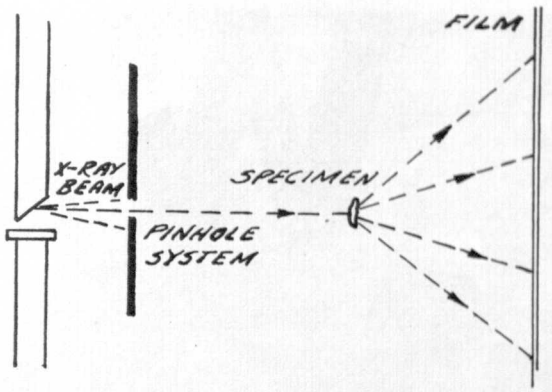
Where two materials have the same chemical analysis but different physical properties, the difference in properties may often be explained by observing the X-ray diffraction patterns.

A brief description of the operation of the X-ray apparatus is as follows: A sample of the specimen to be tested is placed into a specially designed camera. A strip of radiographic film is placed around or in back of the sample, depending on the type of camera used. X-rays in the form of a fine beam are then directed at the sample and the diffracted rays are recorded on the film. The film is then developed and the pattern is obtained.

The X-ray diffraction apparatus is capable of taking four pictures at one time. This is to save time, as a specimen must usually remain in the camera for two to three hours. There are various types of cameras developed that may be used for diffraction work. The most common cameras are the powder and the lave types. The powder camera is used for obtaining determinations of lattice constants whereas the special back reflecting powder camera is used when high precision is required. The



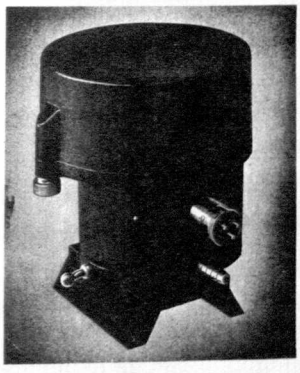
FROM A PHOTOGRAPH LIKE THIS, WHEN LINE SPACINGS AND INTENSITIES ARE PROPERLY INTERPRETED, PROPERTIES OF A SUBSTANCE MAY BE CLASSIFIED.



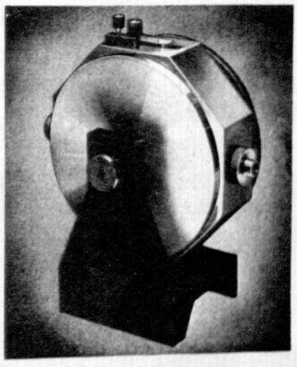
SCHEMATIC DIAGRAM OF A LAVE CAMERA.

lave camera is used chiefly for determining effects of cold working and heat treating.

Since most substances give a different diffraction pattern a file somewhat like that used with fingerprints may be set up. This file may then be used for control purposes, serving as a



PRECISION, BACK-REFLECTION-FOCUSING CAMERA.



POWDER CAMERA.

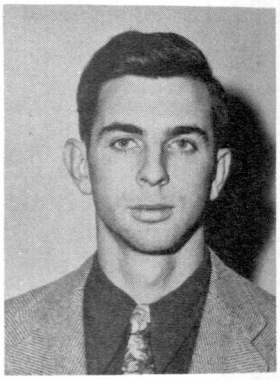
standard against which subsequent material may be checked for uniformity. In some cases the unknown may be identified from its pattern by means of a card index file published by the American Society for Testing Materials.

X-ray diffraction is rapidly finding many uses in industry. Several industries employ the apparatus as a control test for the quality of sheet steel such as that used in automobile bodies and fenders. Diffraction patterns may also be used to reveal the orientation of granules resulting from various forming operations and thereby indicating which forming process is best for a particular material.

With the aid of X-ray diffraction quick and efficient analysis may be made. No progressive industry should overlook the possibilities of this equipment in their laboratories.

W8SH

..... CQ, CQ, HELLO CQ, THIS IS W8SH AT MICHIGAN STATE COLLEGE CALLING. CQ, CQ .....



BY HARMON D. STRIETER
SENIOR E. E.

Almost any day of the week, you can hear these strange signals emitted from the lofty tower of the Electrical Engineering building. The home station of Michigan State's Amateur Radio Club is located in this tower.

In the past few years, MSC has become noted throughout the country for many phases of its academic life. The football team, track team, Basic College, Engineering facilities, and many others are becoming well known. In amateur radio, W8SH has become well known for its work in handling messages, rag-chewing, and in up-holding the best standards of amateur radio.

The MSC Amateur Radio Club was founded in the infancy of radio and is one of the oldest clubs on campus. It has grown with the advent of new techniques and equipment of radio communication.

What is amateur radio and what is its history?

Amateur radio is a scientific hobby, a means of gaining personal skill in the art of electronics and an opportunity to communicate with fellow citizens by private shortwave radio. As defined in international law, amateur radio performs a service of "self training, intercommunication and technical investigations carried on by ... duly authorized persons interested in radio technique solely with a personal aim and without percuniary interest."

The history of amateur radio is the history of radio development itself. When Marconi first proved that messages could be sent by wireless, private citizens began experimenting with home-made affairs that emitted signals. As knowledge developed about wireless, more people became interested in radio communication until by 1912 government regulations were passed specifying frequencies, laws, and licenses. Amateur radio enthusiasts were assigned frequencies above 1500 kilocycles. At the time this was an unheard of frequency since dependable radio communication was thought only to be possible at frequencies lower than this. With the development of better amateur equipment occasional 1000 mile two-way contacts were made. At the outbreak of World War I there were approximately 6000 amateurs in the United States. Four-thousand of these served in the war as radio operators and formed the nucleus of radio operator during this period.

After the war, and with the re-opening of the amateur radio bands, thousands began as amateurs and operated with spark transmitters. With the coming of the vacuum tube, amateurs immediately adapted them to both receivers and transmitters for use on their allotted frequencies. The distance of the communication range increased until in 1923, the first two-way transatlantic

communication was made. Frequencies increased, ranges increased, and dependable wireless communication became commonplace.

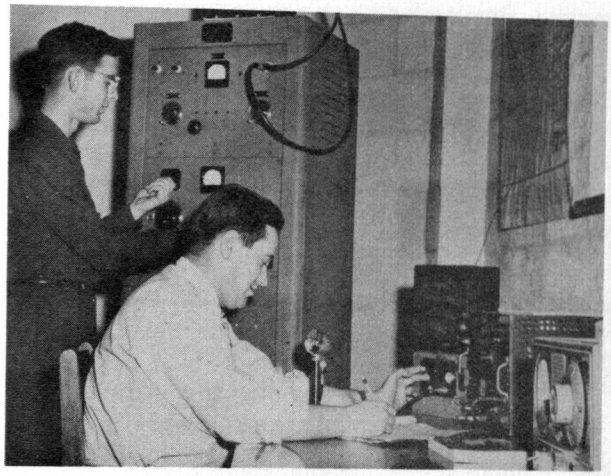
Amateur radio has served the public well in its period of existence. Experience received by the amateur in his hobby has served the country well both in time of peace and in war. Trained operators are readily available for any emergency and the record has shown the valuable service rendered in times of floods, earthquakes, typhoons, and fires. Often the only communication available into a stricken area is by ham radio.

Ham radio is credited also with many new technical developments of radio engineering. Experimenting with high frequency wave propagation, single side band suppressed carriers, and many other new developments may be traced to some amateur.

It may be of interest to know just where the word "Ham" originated. It comes from the cockney English pronunciation of amateur. They pronounced "Hamateur" and this was then shortened to simply "Ham."

The Federal Communication Commission has the authority to classify and license radio stations and to prescribe regulations for their operation. With this in mind, and hoping to help those who are not licensed by the FCC, but who have an interest in amateur radio, the MSC Amateur Radio Club conducts code and theory classes at convenient times throughout the week. It is necessary to be able to pass a 13 word per minute C.W. (code) test and a basic transmitter theory examination to be licensed as an amateur.

TAKING CODE IN THE "RADIO SHACK."



TUNING UP A 350 WATT TRANSMITTER WHILE OPERATING 75-METER PHONE.

At the present time, the club membership consists of 24 members, 10 with licenses, and the others working on obtaining their licenses through the facilities of the club.

As in the past, W8SH has handled traffic, originating with students on this campus to all parts of the world. The traffic handled so far during this school year has been quite heavy. Messages received during the day are sent out as quickly as possible to various relay points throughout the country. The club has direct outlets to the international phone net, eastern sea-board net, and various local nets that are designed solely for handling traffic. Occasionally it is even possible to contact the person direct and then two-way communication is established which is much the same as a long-distance telephone call.

W8SH calls in daily on the 75 meter HAN. The HAN stands for "Hot Air Net" and that is its sole purpose. Though the club does handle many messages, the members still find time to do a lot of rag-chewing on the various amateur bands. (The author does - Ed.)

A new service has been added this term for the benefit of the students. Located on the first floor of the E.E. building is a message box where messages may be dropped for delivery via ham radio. The messages are picked up daily and relayed at the earliest opportunity.

During fall term, several long-wire antennas were put up. One is the envy of every ham contacted. This antenna is stretched between the old WKAR antenna on top of the Woodshop building to the

(Continued to page 28)

NEW Developments

RUBBER ROADS

With an increase in the amount of wear that our highways receive each year, highway engineers are looking for a long-lasting resurfacing material. One of the solutions that has been tried is the mixing of natural rubber with bitumen. This mixture then has a high melting point and the penetration and flow are lowered.

Several experiments with this rubber asphalt mixture have been made in the Netherlands and Java. The rubber was added in varying percentages according to the type of the aggregate and asphalt used.

The results of the tests to date indicate that natural rubber added to asphaltic paving material, increases the life of the pavement, requires less maintenance, increases the elasticity of the pavement, reduces its susceptibility to temperature variations, the pavement becomes less brittle at low temperatures, and materially increases the coefficient of friction of the surface area. The destructive effect of traffic shock and vibration is materially reduced where natural rubber is present in the asphaltic paving material. The full extent of these benefits have yet to be determined by future tests.

At present there are several tests being made as to the brittleness of asphalt paving, where natural rubber has been added to the materials, at below freezing temperatures. Early results indicate that there is a reduction in brittleness which would bring about a corresponding extension in the life of the pavement.

In regard to temperature, there is a study under way on surface films of ice on straight asphaltic paving vs. asphalt-rubber paving. Preliminary tests indicate that asphalt-rubber paving has a tendency to resist the formation of an ice film. It has been noted in early tests that a film of ice occurs at a slightly lower temperature where rubber has been added to the asphalt paving material.

Five strips of asphalt-rubber paving were laid in North America last year both in the city and on heavily traveled trunk lines. In addition to the facts already known about asphalt-rubber, tests on these strips indicate that the distance required to stop, both on wet and dry pavement, is decreased.

Among the potential applications of rubber asphalt are paving of airports, sidewalks, tennis courts, playgrounds, and industrial flooring. It also has existing or potential applications in sealing compounds, asphalt roofing and joint fillers.

TALKING OVER A LIGHT BEAM

Equipment for talking over an invisible beam of light between ships at sea and from airplanes to the ground with complete security from the enemy's detection has recently been developed.

The great advantage of the lightbeam system is its security from detection as it is not broadcast in all directions as are radio waves. Coding messages is no longer necessary. Only when some opaque object comes between the transmitter and the receiver can the lightbeam be interrupted. Unlike radio, the beams do not depend on separate channels, so communications will not become jammed.

The working of the system is very simple. The light intensity from the transmitter is varied in accordance with the frequency of the voice. The beam falls on a light-sensitive receiver at a distance, the signals are amplified and the fluctuations and are then converted back into voice signals. The message can then be routed through the intercom to any location.

The use of a wide angle beam makes the new system useful for ship to ship, and plane to plane communication. The aircraft model is designed for formation flying and to speed communication with ground and paratroops. (Continued to page 26)

History of the Sliderule

BY PHIL SANFORD
FRESHMAN M.E.

The now-common "Slipstick" had its basic origin back in 1614, when John Napier, Baron of Merchiston in Scotland, publicly announced his invention of logarithms.

The earliest "slide rule" was constructed in 1620 by Edmund Gunter, an astronomy professor at Gresham College in London. To arrive at the length of the scale, Gunter used the principle of logarithms. However, the scale was not a sliding rule because it was laid off by the use of a pair of dividers.

Reverend William Oughtred is the actual inventor of the slide rule. He took the principle used by Gunter, and simplified it by placing one scale on top of another, rather than end to end as Gunter had done. In addition to the straight slide rule, Oughtred devised a circular rule, which made use of one large and one small disc fastened together so as to allow their rotation.

Following Oughtred's invention, another improvement of the slide rule came in 1657. In that year, Seth Partridge, a surveyor and teacher of mathematics, made a duplex slide rule that had two strips of wood connected together, with another strip running freely between them. This was much like the modern slide rule.

In 1683 an English mechanic named Thomas Everard made the first commercial slide rule and was the first to use the name, "sliding rule." His slide rule featured "gauge points," using standard measurements and unit conversion factors market on the scale.

The "inverted scale" first appeared on the sliding rule in 1697. This was brought out by William Hunt. The scale was based on a means of finding length of a rectangle of unit area when either dimension is known.

By 1716, Jean Baptiste Clairaut of France, had re-invented the circular slide rule. This rule was not generally used until about the middle of this century, when George Adams, a manufacturer of mechanical instruments for King George III, brought out a more complete and convenient form of it.

Although up until this time the development of the slide rule had gradually become better, not until about 1775 was its use widely accepted. In fact, John Ward, in a paper on practical mathematics and gauging, wrote, "The use of those lines of numbers, so much applauded and but too much practiced, which at best do but help to guess at the truth, and may be called an idle, ignorant way of doing business, if compared to that of the pen." Later Ward explained that he meant "pocket" rules only one foot long. However, he did find some advantage to the one he used. This rule was six feet long.

Sir Isaac Newton made an important contribution to the development of the slide rule. In work on the theory of algebraic equations, Newton used a runner to produce greater accuracy in his computations. The runner first became a regular part of the rule in 1775.

That same year, James Watt used the slide rule to great advantage in his work on the steam engine. This popularized the use of the slide rule among English engineers.

William Nicholson brought out improvements in the slide rule, particularly in the spiral and circular types. In "Nicholson's Journal" he announced the folded scale, as it was devised by Sylvanus Bevan. In devising the folded scale, the normal scale was "folded" at the middle so that the ends were together and was then parted at the folding point making these separated sections the ends of the new scale.

(Continued to page 24)

The Societies.....

ETA KAPPA NU

The Gamma Zeta chapter of Eta Kappa Nu has recently been installed at MSC. The organization was formed during Spring Term 1950. After receiving the necessary approval from the executive council and from the 52 college chapters this chapter had the installation which was highlighted by a formal initiation and followed by a banquet. National officers attending the installation were Frank Sanford, President; Dr. Ovid Eshbach, Vice President; and Alton Zerby, Executive Secretary.

To become eligible to join this electrical engineering honorary the student must be a junior or senior electrical engineer, must be of unimpeachable character and have undoubted ability as evidenced by his scholarship. The scholastic requirement for a junior is to be in the upper quarter of his EE class and for seniors the upper third of the EE class.

AMERICAN FOUNDRYMEN'S SOCIETY

During the fall term, the Michigan Foundrymen held their annual regional conference at MSC. One of the main attractions was the gray iron casting exhibit on the second floor of the Union Building.

CASTING EXHIBIT PRESENTED BY AFS.

This display is the property of G. W. Cannon, Sr., a pioneer foundryman from Muskegon, Michigan. He brought the collection to this country from Germany, Sweden, and Switzerland. The display was arranged by the student chapter of the American Foundrymen's Society.

The majority of the castings were made by a foundry company in Wetzlar, Germany. The major highlight of the display was the complete table service of cups, saucers, plates, and cutlery, all cast in sand. The extremely fine artistic detail is difficult to reproduce by the sand casting method, especially when thin sections are involved.

One of the most interesting castings in the display was the figurine of St. Barbara who is the patron saint of German Iron Workers and Miners. To cast this figure, 38 cores and 2 half-molds were necessary. Mr. Cannon said that he saw a statue of St. Barbara in just about every iron foundry that he visited in Germany.

Another attraction was the set of five pierced panels depicting the "Erle King," a poem written by Johann Wolfgang Goethe, an early German poet. The poem tells the story of a father and child attempting to escape death by fleeing on horseback, but in the end death closes the gap.

A large vase which was made in Sweden was rust-proofed by dipping the casting in a boiling mixture of linseed oil and iron oxide.

To the layman these castings are merely objects of art, but to a person with a knowledge of foundry, they are also objects which represent a very high degree of craftsmanship.

PI TAU SIGMA

Pi Tau Sigma is a National Mechanical Engineering Honorary Fraternity. The aims of Pi Tau Sigma are: to promote student scholarship, to further relationships between students, faculty and the professional men; and to be of service to the school and the Department of Mechanical Engineering by taking an active

part in engineering activities and services.

The Michigan State College Tau Epsilon chapter was organized in the spring of 1950, by a group of senior mechanical engineering students. The chapter was officially installed in April, 1950, at which time 52 student members and 4 honorary members were initiated into the chapter. The honorary members included Professors F. B. Harris and J. M. Campbell, Dean of Engineering L. G. Miller, and Head of Mechanical Engineering Department L. C. Price.

During the fall term, 24 student members and 2 honorary members were formally initiated into Pi Tau Sigma. The new honorary members are Professor Womochel of the Mechanical Engineering Department and Claud Erickson, well known Lansing engineer.

A banquet in honor of the new members, was held at the 1861 House in Lansing. The guests, totalling close to one hundred, enjoyed the talk given by the main speaker, "Bill" Otto, of the Lansing Chamber of Commerce, and talks given by the honorary members.

Eligibility for membership in Pi Tau Sigma is based upon scholarship as well as those personal characteristics that are requisites of all good engineers. Mechanical Engineers, you are invited to become eligible for membership in Pi Tau Sigma.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

The guest speaker during fall term was Mr. A. C. Pasini, national vice president in charge of Region 5. His talk was "Our Society". Mr Pasini outlined the objectives of the senior mechanical engineering society and urged all students graduating this year to become affiliated with a senior group. This will save engineers money because those who do not belong to the student chapter will be required to pay $10 more to join.

Other activities for the term were a picnic and dance at Grand Ledge and a March of Time movie, "Public Relations."

A speaker from the television industry will be presented during winter term. He is to bring a portable television broadcasting and receiving setup for a demonstration.

ENGINEERING COUNCIL

The officers for this year are:
Roland Carlson, President
Darwin Grote, Vice-President
Bill Throop, Treasurer
Frank Dillon, Secretary

The Engineering Exposition, which is sponsored by the Engineering Council, and with aid from the various societies will be held on May 11, and 12 this year.

TAU BETA PI

President Jim Jursik made the annual Tau Beta Pi slide rule award to Elvin Tuttle, freshman engineer of last year with the highest point average.

William Guntrum's winning thesis "Electronics in Industry" was selected by the chapter to be sent to the National Headquarters for competition with other chapters of Tau Beta Pi.

TAU BETA PI INITIATES.

Suggested projects for the organization were promotion of information about Tau Beta Pi to freshman, publication of a news letter twice a year and installation of a monument for Tau Beta Pi on campus.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

The last meeting of the fall term, the AIEE heard a very informative talk, "Electrical Measuring Instruments" given by Mr. T. S. Cawthorne of Cawthorne Instrument Co., Detroit.

Tentative plans for the winter term include an inspection trip through Oldsmobile, a talk by Mr. Skamser on Placement Office procedure and job interviews. Mr. Beatty of Consumers Power is scheduled to talk on "What the Interviewer Looks for in a Young Engineer."

R.E. OLDS AUTOMOTIVE PIONEER

BY CHARLES E. PAUL, SENIOR E.E. AND WILLIAM M. THROOP, SENIOR S.E.

During the ninteenth century automotive pioneers were busy perfecting the "horseless carriage" which was destined to become one of the greatest inventions of that era. One of the many men working on this project was the late Ransom Eli Olds. Here are some of his experiences while he was working on improvements of the automobile.

By 1880, when young Olds had reached fifteen, he had already become quite a dreamer. As a boy, young Ranny, as he was called, was always investigating things that were mechanical. Almost from the time he could walk he had spent his spare time rummaging in the dark corners of his father's small shop in Geneva, Ohio. In the shop he found tiny pieces of scrap metal that were more precious to him than diamonds. He would take this metal and twist or hammer it into workable parts which he could use.

One day while he was taking care of the family horse he began dreaming how wonderful it would be if a person could design an engine that could be hooked to a carriage, thereby eliminating the horse. Olds thought that if steam could be used to propel boats and trains why could it not just as easily drive a carriage

Sometime later the Old's family moved to Lansing, Michigan, and Ransom became a partner in his father's business. It was here that Olds conceived ideas for his first steam carriage.

As a source of power for his new carriage. Olds invented a steam boiler that obtained its heat from gasoline. He tested it by attaching the boiler to a small skiff taking trips up and down the Grand River in Lansing. Although the invention worked remarkably well, Lansingites were saying, "If that wild Olds' kid keeps fooling with steam he will blow himself to Hades."

Shortly thereafter Olds started work on a steam automobile. At first he was laughed at by the men in his father's shop. They predicted that the contraption he was building would never work. However, in the face of this skepticism, he diligently worked on his idea.

One spring evening in 1886, Olds completed his first steam automobile. Rather than take the chance of his friends making fun of him for being a failure he waited until early the next morning before testing it. At 3 A.M. Olds awoke and went to the machine shop where he kept his carriage. As he cautiously wheeled the "horseless carriage," out of the shop and made a few last minute adjustments while the engine was building up steam, the momentous question kept haunting him ..... "Would it work?". Up to this point the test had gone according to plan. He had come this far without awakening his family or his neighbors and was wise enough to

schedule the test at an hour when the streets were quiet.

The streets of the immediate vicinity were very quiet until R. E. began to work the clutch on the "horseless carriage". Suddenly the streets reverbrated with inhuman sounds of metal parts grinding together. In a cloud of smoke the carriage jumped and jerked and then went rumbling down the quiet village street. After traveling two blocks, awakening countless sleepers, and causing a milk horse to run away, the engine came to an abrupt stop.

Olds was immediately surrounded by irrate citizens who made fun of him and wanted to know why he was performing the test at this peculiar hour. While he was sitting upon his carriage waiting for the engine to again build up steam R. E. was accosted with insults. Nevertheless, once again he put the carriage into gear. The carriage shook and out of a cloud of steam Olds began his trek back to the machine shop. He created a horseless carriage that would run perhaps only a few blocks, with its defects, but it had operated under its own power.

That morning at breakfast Olds was teased by his brothers about the defects of his invention. Later that day, after the workmen in his father's shop had gone home, he took the canvas off his carriage and began dismantling it. His father, who remained in the shop, watched with interest. Finally he said, "Somehow, R. E., I didn't think you'd given up this wild idea of yours, but I see you're tearing the thing down".

R. E. realized that his father had misinterpreted his gesture. Finally he said, "Yes, I'm tearing it down, but only because I've thought of some obvious improvements. Before long I'll be putting it back together again, and when I do it will be a much better vehicle".

After numerous rebuildings Olds realized that he had made a serious error in calculating the power necessary to drive the carriage. In order to get the necessary power he would have to build a larger boiler. Another weakness was the gear arrangement. The crude gears had been responsible for the noise that had awakened every family for blocks on his initial venture. With these improvements in mind R. E. set upon the task of achieving them.

By 1890, the second steam automobile began taking shape. This auto had a larger boiler and more refinements than the first steam carriage. At the appointed time he rolled this second "horseless carriage" into the street. As the crowd gathered R. E. began making the necessary adjustments. After issuing a warning for the spectators to stand back the young inventor opened the throttle and the vehicle began moving forward.

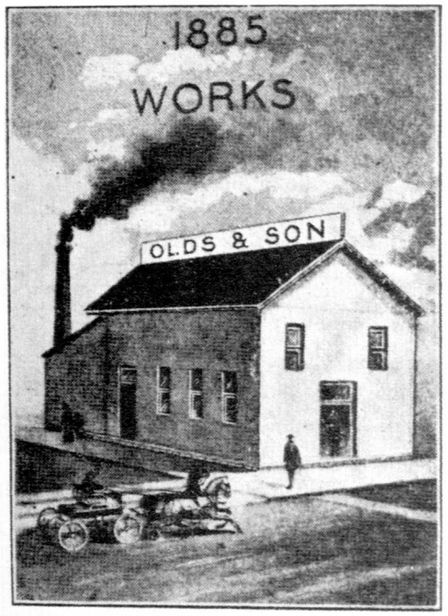
This attempt was different than his first. The carriage did not lurch forward as before and the grinding of gears was not as noticeable. After traveling a few blocks and gaging his trip according to the amount of steam he had built up, Olds started back to the shop. Arriving at the shop with little steam to spare and knowing he could travel little farther, he decided to quit for the day.

Olds was immediately approached by a reporter from the local newspaper who said that he would publicize the invention. This was big news as there was no successful inventor of a "horseless carriage" before this time. The publicity was international and a patent medicine company in London, England bought this second carriage for use in Bombay, India.

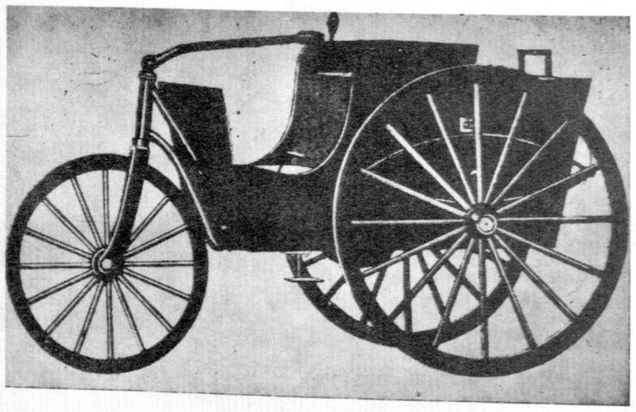
By 1893, the Olds Gasoline Engine Works was producing gasoline engines in quantity. After Otto developed the four cycle engine with illuminating gas as a fuel, Olds started a search to use liquid gas in the internal combustion engine. Finally he devised a mixing valve or carburetor which split the liquid gasoline into fine particles in

(Continued to page 22)

Automobile Scenes of the Early 1900's

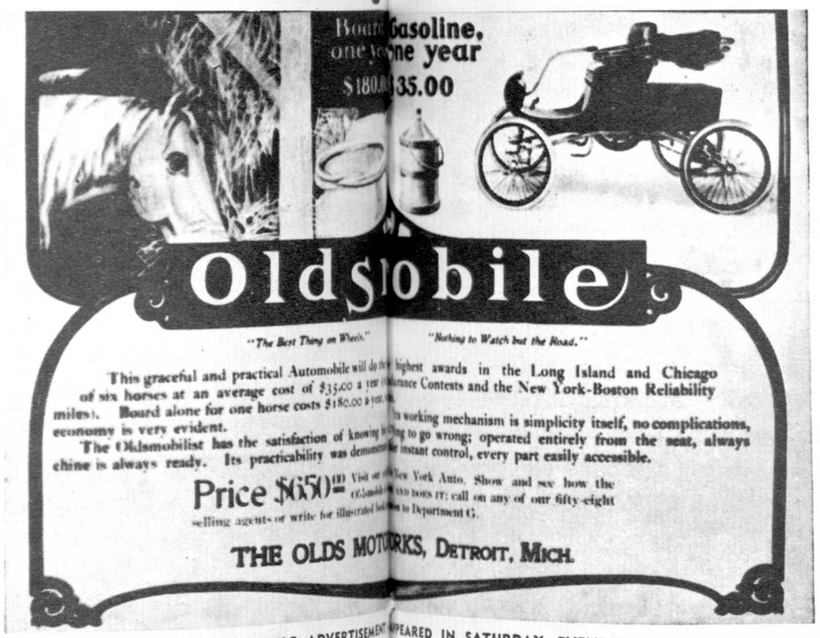


WORKSHOP WHERE THE FIRST OLDS ENGINE WAS BUILT.

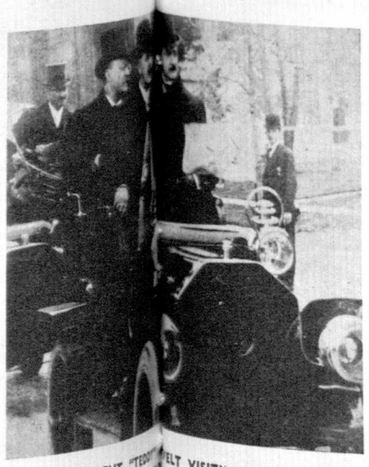


FIRST OLDS GASOLINE STEAM CAR - - - BUILT IN 1886.

OLDS MOTOR WORKS, DETROIT - FIRST FACTORY FOR BUILDING MOTOR VEHICLES.



FIRST AUTOMOBILE ADVERTISEMENT PEARED IN SATURDAY EVENING POST.



PRESIDENT "TEDDY" ELT VISITING M. S. C.
R. E. AUFFEUR.

SECOND AUTOMOBILE BUILT BY R. E. OLDS. IT WAS LATER SOLD TO A MEDICINE COMPANY IN INDIA.

A MASS PRODUCTION ASSEMBLY LINE AS IT APPEARED IN 1901.

THE OLDS MOTOR WORKS, DETROIT - DESTROYED BY FIRE IN 1901.

R. E. OLDS

(Continued from page 19)

combination with air. This mixture provided far more power than the illuminating gas. Olds started investigating the possibility of putting the gasoline engine on wheels.

R. E. knew that the finished gasoline powered vehicle would need a body similar to that of the "horseless carriage". Finally the automobile began taking its final shape. Hard rubber tires were provided instead of steel rims. Two seats were installed and the vehicle was equipped with gears to move in both forward and reverse directions.

After Olds had run into considerable financial difficulties in Lansing he was promised support in Detroit. A site for a new plant was purchased, a three story building erected, and the Olds Motor Works was moved to Detroit.

A new car was designed which weighed scarcely 700 pounds. The engine was of the single cylinder, four cycle type. A metal chain transmitted the power from the engine to the axle. It had two forward speeds and one reverse. The front of this car curved upward and this new model soon became known as the Curved-dash Oldsmobile Runabout.

It was while in Detroit that Olds started building cars on the principle of mass production. However, shortly after this mass production was started the entire plant was razed by fire. One of the workers managed to save one of the Curved-dash models as well as the drawings and specifications. Olds was immediately offered the State Fair Grounds at Lansing as a site for another plant. This would be given to the Olds Motor Works at no cost and since many buildings were available it was a great incentive to return to Lansing. After the change back to Lansing, production was resumed almost immediately.

At the age of forty R. E. found himself a minority stockholder in the company he had founded. He had been assuming the duties of general manager, but now his policies were being questioned. The shift of policy was not due to a superior knowledge of engineering, but because of the amount of stock held by outside men. Mr. Olds told the board that they were free to choose a new general manager. This removed him from the automobile business which he had worked so hard in creating.

In 1904, Olds was approached by a group of citizens from Lansing that proposed the establishment of a second automobile plant in Lansing. After a time another company was formed which was to be known as the REO Motor Car Company, taking its name from Mr. Olds' initials. Soon an 800 foot, two story building was erected and REO cars were being produced in it.

During his entire career, he never forgot a friend. Once, in 1887, when the newly organized Olds Gasoline Engine Works was experiencing a financial crisis, R. E. was able to obtain a small loan from Professor R. E. Kedzie, a chemist at Michigan State College. R. E. repaid the loan in full, but he never forgot.

Thirty years later, Dr. Frank S. Kedzie, a son of Professor Kedzie, was president of the same institution. A disastrous fire destroyed the engineering building, leaving Dr. Kedzie confronted with a difficult situation.

The college was faced with the loss of many students, for there were no funds to replace the facilities destroyed by the fire. R. E. Olds came to the rescue almost immediately.

On June 1, 1917, the Olds Hall of Engineering was formerly dedicated. The cost was $121,422.00 -- more than 121 times the amount R. E. had once borrowed from Dr. Kedzie's father.

Through the efforts of men like Ransom Eli Olds the automotive industry has, from a humble beginning, grown to one that equally ranks with the largest industries.

HISTORY of the SLIDERULE

(Continued from page 15)

While most of this development was in England, France did contribute some to the development of the slide rule until the time of the Napoleonic Wars. In 1815, Peter M. Fuget, a French physician, invented the log-log scale. Such a scale was not practical then, but came into use after several "inventions" by the French and English. In 1821, Lenoir popularized the log-log scale by inventing a machine to divide it. His machine greatly increased the accuracy of the scale, which previously had been divided by hand.

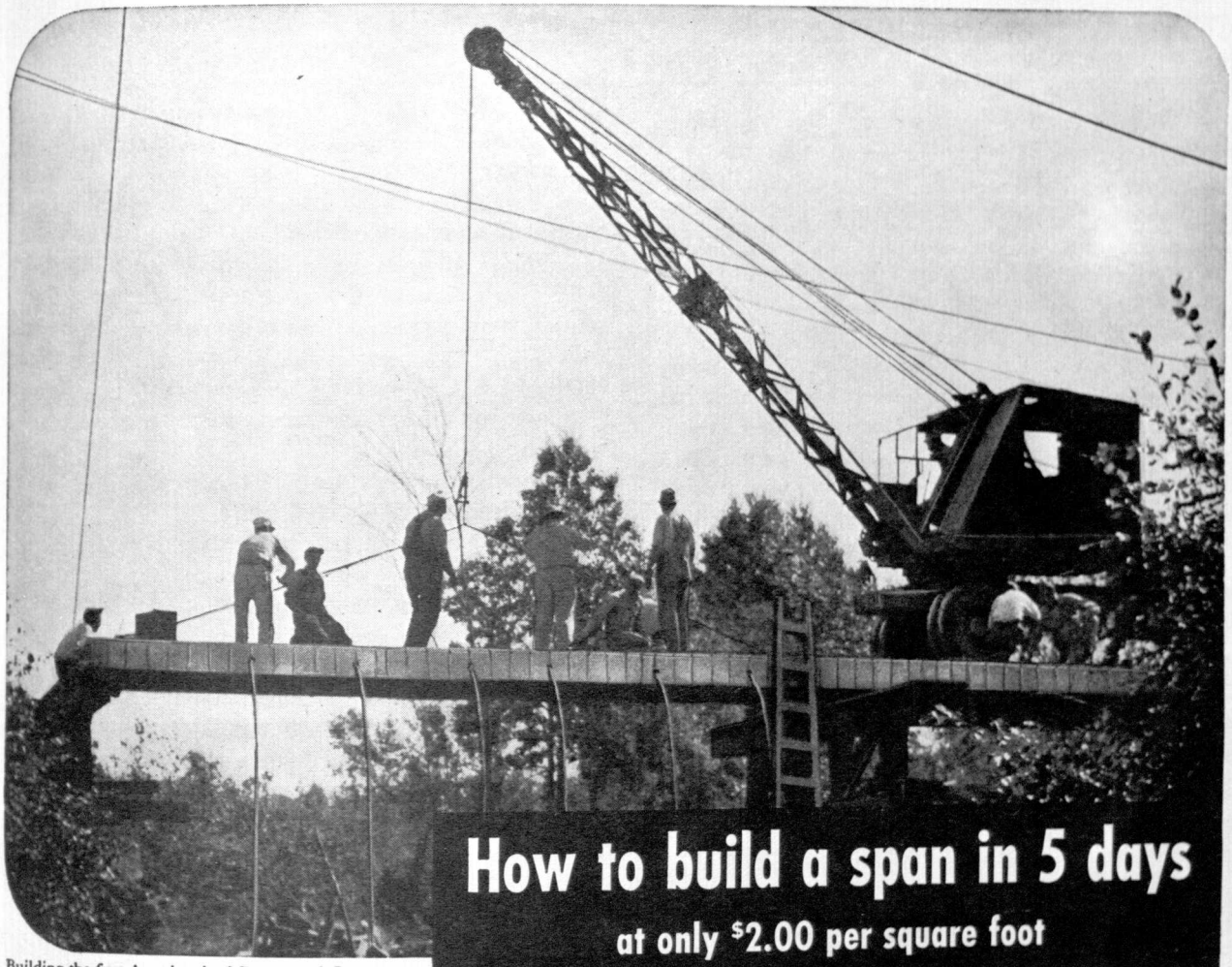
Amedee Mannheim introduced the Mannheim Slide Rule in 1851. Although he designed his rule in 1850, he publicly announced it the following year in a publication called Modified Calculating Rule Instructions. At the time, the 20-year old Mannheim was a French artillery officer at Metz, a fortress of Alsace-Lorraine. The French artillery adopted Mannheim's rule for their use, and named a firm to manufacture them.

It took an Italian to popularize the Mannheim rule. In 1859, a book written by the Italian Sella highly recommended the Mannheim rule, and soon it came into general use in Europe. However, England did not begin to use it until twenty years later and in the United States ten years after that.

The United States began to recognize the Mannheim rule about 1881, which coincided with the invention of the first cylindrical slide rule by Edwin Thacher. But the use of the slide rule did not become really popular until 1890. About this time William Cox began work on the slide rule. Taking the Mannheim rule as a standard, Cox started a long campaign of propaganda and "education" in the New York publication, Engineering News. He wrote articles describing the Mannheim rule and told of its value and importance to engineers and technical workers. In addition, he obtained several patents to variations of the Mannheim rule, and in 1891 wrote a manual of instructions for use of the slide rule. Also, Cox patented his duplex slide rule. Based on the principle used by Seth Partridge back in 1683, and using a variation of the Mannheim rule, Cox's rule was the immediate forerunner of the popular polyphase duplex rule.

All of Cox's rules were manufactured by Keuffel and Esser, and several times they published and revised his slide rule manual. In 1908, K & E brought out the log-log duplex slide rule, and more recently the log-log duplex decitrig variation, to complete the list of slide rules of standard form now in use.

Until engineering students are able to purchase one of the new electronic computing machines of the pocket variety, they will have to continue to use this invention of three centuries ago.

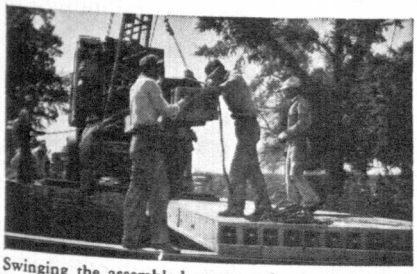


How to build a span in 5 days

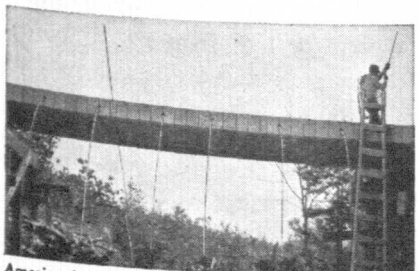
at only $2.00 per square foot

Building the first Americanized Prestressed-Concrete Bridge. Crane which exceeds designed load capacity of the bridge operates safely on the unfinished span before its concrete slab has been laid or lateral prestressing applied.

The bridge, located in Madison County, Tennessee, was designed by Bryan and Dozier, of Nashville . . . built by Madison County Highway Dept. under supervision of Edwin C. Rogers, County Engineer. Concrete blocks by Nashville Breeko Block & Tile Co.



Swinging the assembled concrete beams into place to form the deck cover for the bridge. Beams are only 11⅞" deep.



Americanized Prestressed Concrete employs special galvanized cold drawn steel wire and specially designed fittings. It is these recent Roebling developments which make possible this type of construction.

IN OCTOBER the first Prestressed-Concrete Bridge in the United States was put in service. Its roadway, designed for a 15-ton load, was of an entirely new design which permitted amazing speed of construction and cost only $2.00 per square foot. With the experience gained, it is estimated that similar spans to be built will be erected in five days—ready for traffic in 14 days—and at an even lower cost.

The span is made up of beams formed of machine-made concrete blocks laid horizontally with mortar joints. Two Roebling Prestressed-Concrete Galvanized Strands running through longitudinal holes in the blocks were placed under tension, converting each beam into a self-contained monolithic concrete unit. After the beams were erected in place, the span was covered with a continuous, mesh-reinforced concrete slab and laterally prestressed when the concrete had cured to strength.

Americanized Prestressed-Concrete, employing special cold drawn steel wire and specially designed fittings, is an exclusive Roebling development. It makes available a new construction material with an exceptional strength-weight ratio . . . a material economical in itself and a real time-saver! Its potentials quickly recognized, it has already been adopted in several structures, including use for floors and roof of a large commercial building now under construction.

The Roebling engineering staff is ready to help your engineers work out problems connected with new applications for Prestressed-Concrete.

FOR NEW DEVELOPMENTS AND EXTRA VALUE IN WIRE AND WIRE PRODUCTS . . .

Today it's Roebling!

JOHN A. ROEBLING'S SONS COMPANY, TRENTON 2, NEW JERSEY

Atlanta, 934 Avon Ave. ★ ***Boston,*** 51 Sleeper St. ★ ***Chicago,*** 5525 W. Roosevelt Rd. ★ ***Cincinnati,*** 3253 Fredonia Ave. ★ ***Cleveland,*** 701 St. Clair Ave., N.E. ★ ***Denver,*** 4801 Jackson St. ★ ***Houston,*** 6216 Navigation Blvd. ★ ***Los Angeles,*** 216 S. Alameda St. ★ ***New York,*** 19 Rector St. ★ ***Philadelphia,*** 12 S. 12th St. ★ ***San Francisco,*** 1740 Seventeenth St. ★ ***Seattle,*** 900 First Ave., S.

NEW DEVELOPMENTS

(Continued from page 14)

For ship to ship contact the receivers are mounted on the deck for clearance in all directions. Gyroscopically controlled mounts may be used to keep the instruments steady and aimed at the other instrument even in the heavy use.

A portable unit has been developed for field use. This transceiver may be carried and operated easily by one man, and the wide angle beam makes it useful in contacting both tanks and planes.

The new system uses a gas discharge light whose intensity can be varied electrically to carry the voice communication. One source use in the transmitter is the caesium vapor arc-lamp operating in an atmosphere of argon gas. The resonance light from the lamp is similar to that emitted by yellow sodium vapor-lamps used for street lighting, except that the caesium vapor arc-light is just beyond the visible range in the near infra-red region.

TURBO-HEARTH

Details of a new steel making process were presented recently to the American Institute of Mining and Metallurgical Engineers.

This process, called the "turbo-hearth," is to be capable of making open hearth-quality steel in 12 minutes without using external fuel.

The hearth chamber in which the steel was experimentally produced, is shaped like a large coffee-maker, built of heavy steel and lined with basic brick which can stand temperatures as high as 3000 degrees F. It is suspended on trunnions so that its spout can be raised during the heating period and lowered for charging and to pour of the finished steel into ladles or ingot molds.

Like the Bessemer converter, "turbo-hearth" steel is made without the use of external fuel. The heat is provided from chemical energy obtained from the burning of the impurities in liquid iron with a blast of air. The air in the "turbo-hearth" is applied from the sides at the surface of the charge.

The experimental steel produced was cast into ingots, rolled into plates, and subjected to tests for tensile strength, bending, strain aging and impact. In all these tests the new steel behaved like open hearth steel of the same composition.

The "turbo-hearth" development is regarded as especially important because it provides a steelmaking method that is fast yet flexible. A hearth of 30-ton capacity is capable of making much more steel in a day than a 225-ton standard open hearth furnace. Hearths may be used as the demand for steel warrants it. Most significant is the fact that oxygen may be added to the standard air blast and still further speed up the process.

NON-FERROMAGNETIC SYNCHROTRON

A new atom smasher expected to produce X-rays of 300,000,000 volts, was announced as being successful in its first phases of operation.

This new machine is known as a "non-ferromagnetic synchrotron," and was built for the Office of Naval Research. Although it has been operated only to the million-volt range it is expected to be running in the higher ranges very soon.

The new atom smasher is designed to eliminate the large iron-core electromagnets that are commonly used in devices. In the place of these large electromagnets have been put specially designed coils of wire. These coils carry the heavy load, and are contained in a steel, evacuated tank. The vacuum produced in this tank is equal to one billionth of an atmosphere or better.

Physicists believe that synchrotrons of this type may be used in the acceleration of electrons up to a billion volts.

LUBRICATED SKI'S

American ski champions may set new records through the use of skis made of micarta, the same plastic used in Army helmet liners during the war.

Micarta has a high gloss and smoothness and is best lubricated by water. It is this water lubricating property that makes micarta a good surface for skis. By actual test the micarta bottomed skis have proved to be faster than the best skis made entirely of hickory.

Micarta is made of layers of cloth saturated with a synthetic resin and pressed under heat. The plastic being lubricated by water, and the ski being in constant contact with the snow keep the ski lubricated at all times. This means not only more speed, but also no necessity for waxing, except in very wet snow conditions. The micarta-bottomed skis, need not be sanded, regrooved, refinished or relacquered over years of normal service.

New television microphone, developed at RCA Laboratories, virtually vanishes when in active use.

Vanishing Microphone lets the stars shine

Now you see it, now you don't! RCA's new "vanishing microphone" is plainly visible when standing alone—but let a television performer stand before it and it seems to disappear.

Called the "Starmaker," this RCA microphone is little larger than a big fountain pen . . . and principles of design based on modern camouflage techniques blend it with an artist's clothing. There's no clumsy "mike" to distract your attention from the artist's performance—and it's also a superbly sensitive instrument.

Through research carried out at RCA Laboratories, the "Starmaker" microphone picks up sound from all directions—hears and transmits every sound the human ear can detect. It's not only small and almost invisible, but it's also one of the most efficient microphones ever devised.

* * *

See the latest wonders of radio, television, and electronics at RCA Exhibition Hall, 36 West 49th Street, New York. Admission is free. Radio Corporation of America, RCA Building, Radio City, New York 20, N. Y.

Continue your education with pay—at RCA

Graduate Electrical Engineers: RCA Victor—one of the world's foremost manufacturers of radio and electronic products—offers you opportunity to gain valuable, well-rounded training and experience at a good salary with opportunities for advancement. Here are only five of the many projects which offer unusual promise:

- Development and design of radio receivers (including broadcast, short wave and FM circuits, television, and phonograph combinations).
- Advanced development and design of AM and FM broadcast transmitters, R-F induction heating, mobile communications equipment, relay systems.
- Design of component parts such as coils, loudspeakers, capacitors.
- Development and design of new recording and producing methods.
- Design of receiving, power, cathode ray, gas and photo tubes.

Write today to National Recruiting Division, RCA Victor, Camden, New Jersey.
Also many opportunities for Mechanical and Chemical Engineers and Physicists.

RADIO CORPORATION of AMERICA
World Leader in Radio—First in Television

W 8 S H

(Continued from page 13)

television tower on the E.E. building. The antenna itself is 400 feet long, and averages 150 feet high. A new ten meter beam antenna also has been mounted which is 120 feet high. Upon the completion of the ten meter transmitter, we hope to be able to handle our foreign traffic direct.

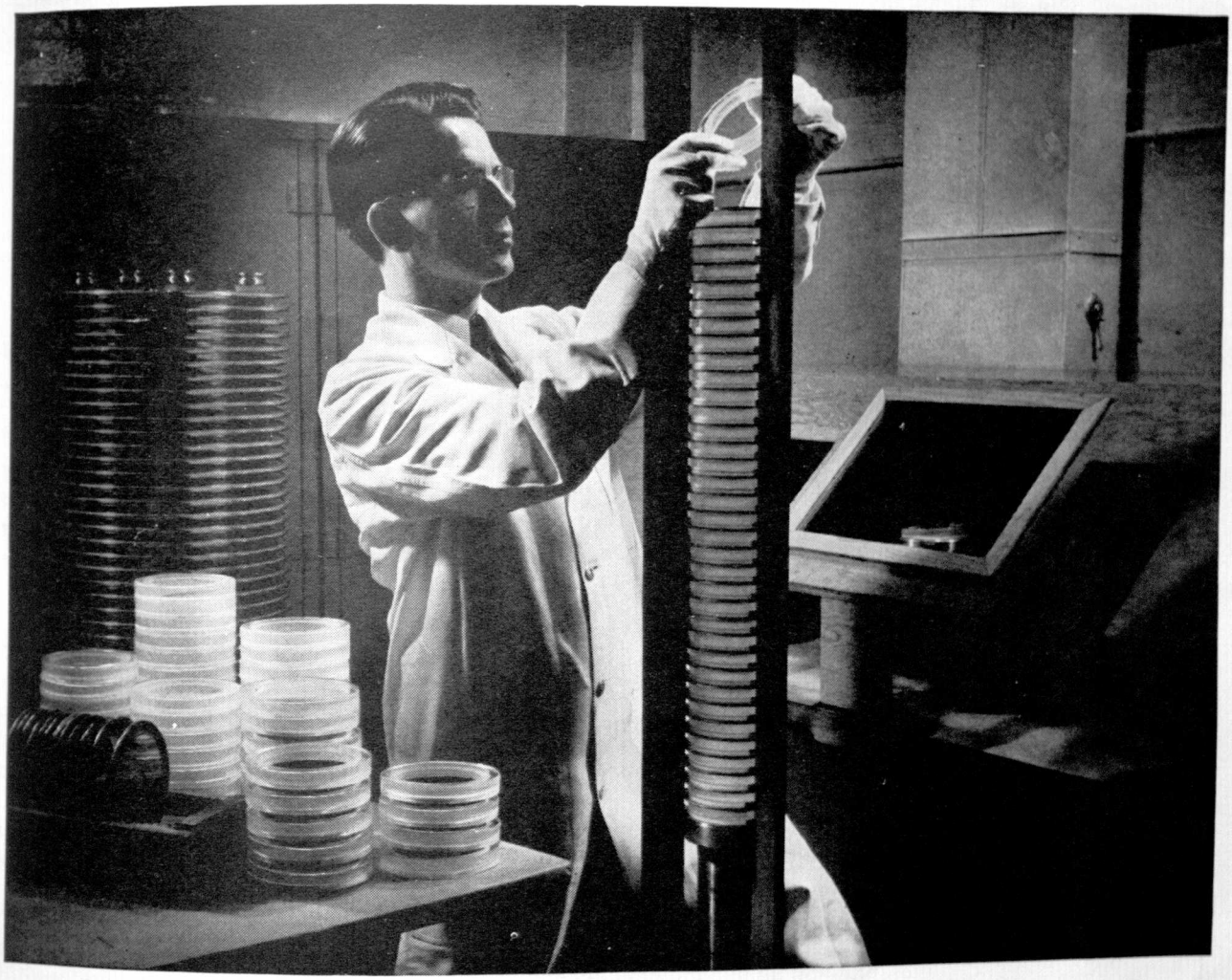
The club's location is very advantageous in case of any emergency, and is prepared to go on the air to handle any emergency traffic within an hour. The emergency equipment includes a portable motor generator which supplies the power to run the transmitters, receivers, and other equipment in case of any power failure. The faculty of the Electrical Engineering Department have been very cooperative in carrying out this emergency program.

During times of disaster--floods, ice storms, typhoons, etc., when telephone and telegraph lines are down the amateurs provide very valuable radio communications to direct repairs and keep transportation coordinated. The amateurs provide communication for the Red Cross, civic officials, police and fire departments, telephone and telegraph companies, broadcast stations, railroads, and for private citizens. This will now be possible with the new emergency program set up by station W8SH.

Ham radio is not all work and many of the fellows get great pleasure from contacting some ham and talking with him for lengthy periods. From this experience comes valuable training for times of emergencies.

With new developments continuously being made in radio communication, the amateur radio operator must keep abreast with these developments. We believe that through the club members having a coordinated program, W8SH will continue to be well known in amateur radio circles and will continue to uphold the best standards of amateur radio.

The MSC Amateur Radio Club cordially invites any person interested in amateur radio to visit the radio shack located in the tower of the Electrical Engineering Building.



A gun barrel made of glass . . .

This scientist is putting together the barrel of an "electron gun." When completed, it will be capable of developing cancer-killing rays at twice the power of those given off by all the medical radium in the world.

The barrel of the gun, part of a new super-voltage X-ray machine used in cancer research and treatment, is a tube formed by stacking precision-made rings of one of Corning's special electrical glasses.

Two million volts drive electrons through the tube, much as a bullet is driven through a gun barrel. As these electrons are suddenly stopped by a water-cooled block of gold at the end of the barrel, two-million-volt X-rays are generated. This X-ray beam is powerful enough to reach diseased areas four inches inside the body and it can be directed with great accuracy on the spot the doctor wants to bombard.

High Voltage Engineering Corporation, manufacturers of this generator, at first had difficulty finding a high-voltage electrical insulating material for the gun barrel, a material that would stand electron bombardment hour after hour without breaking down. The answer to their problem was a glass selected from the many developed by Corning to meet exacting electrical specifications.

Providing glass for medical research is not new to Corning. Since the early days of X-rays, glass by Corning has played a vital part in the development of X-ray apparatus —transmitting glasses for tubes and absorbing glasses for shields. And Pyrex brand laboratory and pharmaceutical glassware has served medical science since World War I.

Throughout industry, *Corning means research in glass*—research that has contributed in countless ways to better products and processes, and through them, to better living for us all.

That's why we suggest—when you're out of college and concerned with improving products or processes—that you consider glass, a material of practically limitless uses. And should you want to know more about Corning electrical glasses, or the hundreds of other glasses Corning makes, we hope you'll write us before your planning reaches the blueprint stage. Corning Glass Works, Corning, New York.

CORNING
means research in glass

PLASTICS

(Continued from page 7)

products. The development of proper molding machines has been a difficult task but great progress has been made. Where a few years ago a 200 ton molding machine was considered large, 500 ton machines are now commonplace. There are four major molding methods in use today: compression, transfer, injection, and extrusion.

As the name implies, compression molding is done by compressing the plastic compound between the two steam heated halves of the mold. After a short lapse of time to allow for curing, the mold opens automatically and the finished piece is ejected. This method is largely used with thermosetting plastics.

Transfer molding is a newer process which is quicker than compression molding. Here the plastic compound is melted in a container above the mold, which is similar to the compression mold. The melted plastic flows down into the mold where it goes through the curing process before being ejected. This method also is used for thermosetting plastics.

The injection method uses thermoplastic plastics to achieve a higher production rate than any other molding technique. The plastic powder is fed into a heated cylinder where it melts. A plunger then forces the melted plastic out into a multiple mold which is kept cold to hurry the hardening. No time is necessary for curing in this process.

Extrusion molding is used to make plastic rods, sheets, tubes, filaments, conduits, and similar shapes. The melted plastic compound is forced through a die and as it comes out of the machine it is picked up by a conveyer belt. After the plastic has cooled by water or by air ducts, it is cut into the desired lengths.

While plastics can never succeed in replacing iron, wood, or glass completely, there are some things which they can do much better than with other materials. Their present success has proven their value and worth in this era. With such merits and potentialities, only an illustrious future can be foreseen for plastics.

Drill Night

From a point high on the campus, a radar beam searches the sky. Lights burn in classrooms. Khaki replaces tweed and covert for the night as college men assigned to Reserve units study the machines and methods of defense.

Preparedness is the order of the day.

And the Bell System stands prepared. In five busy years, we have added more than 12,500,000 telephones. Many improvements have been made in the quality and speed of service. Our force of highly skilled, experienced men and women has been greatly enlarged—and now numbers more than 600,000.

A nation in a hurry goes by telephone. This country has the best telephone service in the world.

BELL TELEPHONE SYSTEM

KINESCOPE

(Continued from page 9)

The phosphor used in the screen of this tube is a mixture of blue-emitting zinc sulphide and yellow-emitting zinc cadmium sulphide. This combination, when properly manufactured, blended, and applied to the kinescope face plate, is a very efficient emitter of white light.

A graphite conductive coating is applied to the inside of the glass neck section from the flared end down to just beyond the middle of the tubular section. This coating, shown in the figure, connects with the metal cone and is the conductor which maintains the inside of the glass neck section at the same potential as the metal cone. The screen and the conductive coating are baked to insure their adherence to the glass surfaces.

The electron gun is sealed into the bulb assembly and the tube is then exhausted by a straight-line exhaust machine initially developed for the 10-inch kinescope. The base is cemented to the tube neck. The cathode is aged to stabilize emission and the tube is then tested.

Externally, the tube receives three different coats of paint: The first is a conducting paint applied to the metal rim used as the anode connector; the second is applied to the main cone as a decorative finish; the third is an insulating paint applied to the flared part of the glass neck section. This coating prevents electrical leakage between the anode and the deflecting coils under conditions of high humidity.

A common problem of early television tubes was that of the ion-spot. The ion spot is a dark discoloration which may appear on the screen of a cathode ray tube using magnetic deflection. After operating for a period of time, the spot is the result of deterioration or fatigue of the screen phosphor in the area bombarded by the relatively heavy negative ions in the beam. Ever since this problem has been recognized, attempts have been made to prevent these ions from reaching the screen.

Such attempts have usually been concerned with removal of negative ions from the beam. The principle used has

(Continued to page 34)

Build Confidence ON BROAD EXPERIENCE

by ARCH COOPER
Manager, Empire Region
ALLIS-CHALMERS MANUFACTURING COMPANY
(Graduate Training Course—1909)

YOU NEED the confidence that comes from wide experience, whether you intend to be a salesman, designer, researcher, or production man. Confidence based on knowledge is one of the greatest assets an engineer can have. Here is what I mean.

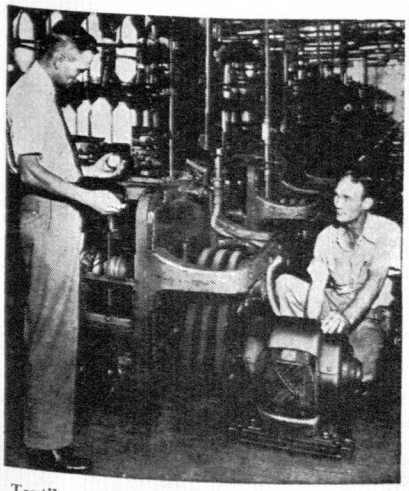

ARCH COOPER

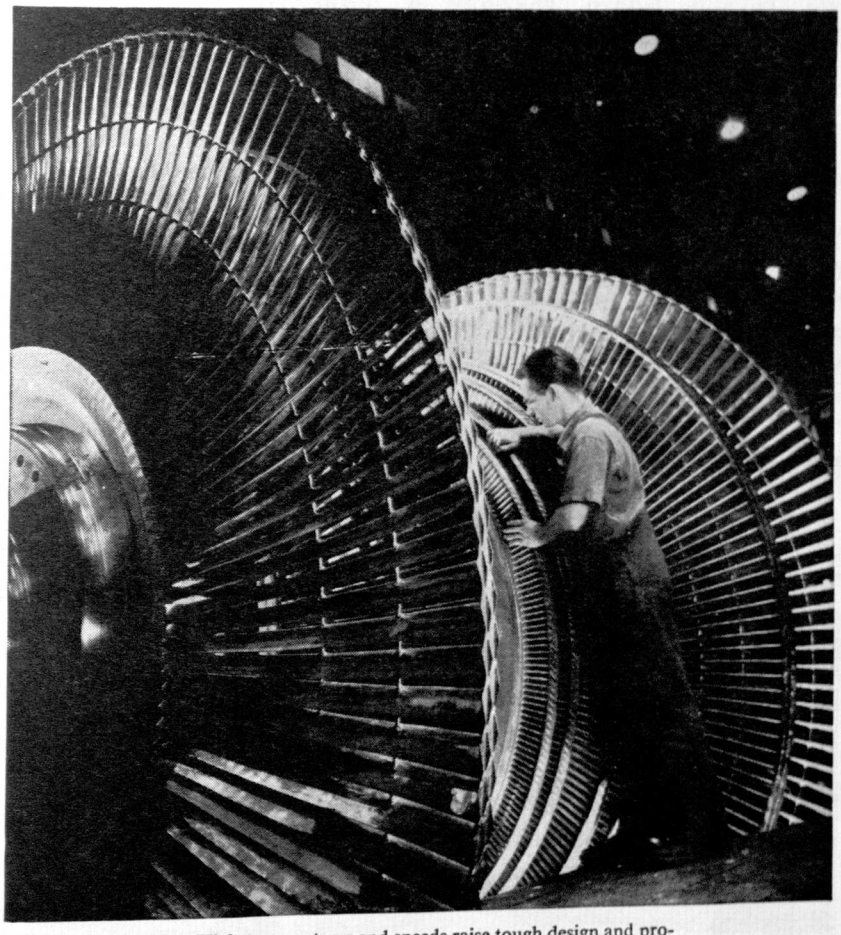
You may visit a mine with the idea of talking about crushing equipment, but find that their engineers have an electrical problem. Or you may visit a utility to talk about electrical equipment and find that they're all excited about a pump break-down.

Offer All-Around Help

Can you help them? Or are you just another peddler who is taking their time when they have problems on their minds. In my work I call on electric utilities, cement plants, machinery builders, textile mills, paper mills, shoe factories and many other types of plants. In each of them, I try to help the engineers and mechanics I call on.

It's a good credo for salesmen, but it takes broad experience to carry it out. It's the kind of experience you must deliberately set about acquiring as early as possible. I had heard of Allis-Chalmers equipment, seen A-C's giant Corliss engines in Australia's biggest power plant and decided to study design at Allis-Chalmers. It looked like the best place in the world to get a broad engineering background.


Textile mills are getting adjustable speed at lower cost by using new automatic Vari-Pitch sheaves on spinning frames as shown.


High temperatures and speeds raise tough design and production problems on giant steam turbine spindles like these.

I joined the Allis-Chalmers Graduate Training Course after graduation from Sydney Technical College in 1908 . . . worked on steam turbines, wound coils of all types, performed tests for the electrical department. After that there were field trips to erect electrical equipment. It was soon apparent that I wasn't a designer at heart, and my sales career started.

Broad Opportunity

Forty-one years later, Allis-Chalmers still offers the same opportunity for broad experience. A-C still builds equipment for electric power, mining and ore reduction, cement making, public works, pulp and wood processing, and flour milling.

And the Allis-Chalmers Graduate Training Course is still flexible. Students help plan their own courses. They can switch to design, manufacturing, research, application, sales, or advertising—divide their time between shops and offices—and can earn advanced degrees in engineering at the same time.

Men at Allis-Chalmers get a close-up of the basic industries. No matter what path they take in the industrial world, experience gained with this broad organization lays a foundation for the confidence that comes with all-around knowledge.

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin

KINESCOPE

(Continued from page 32)

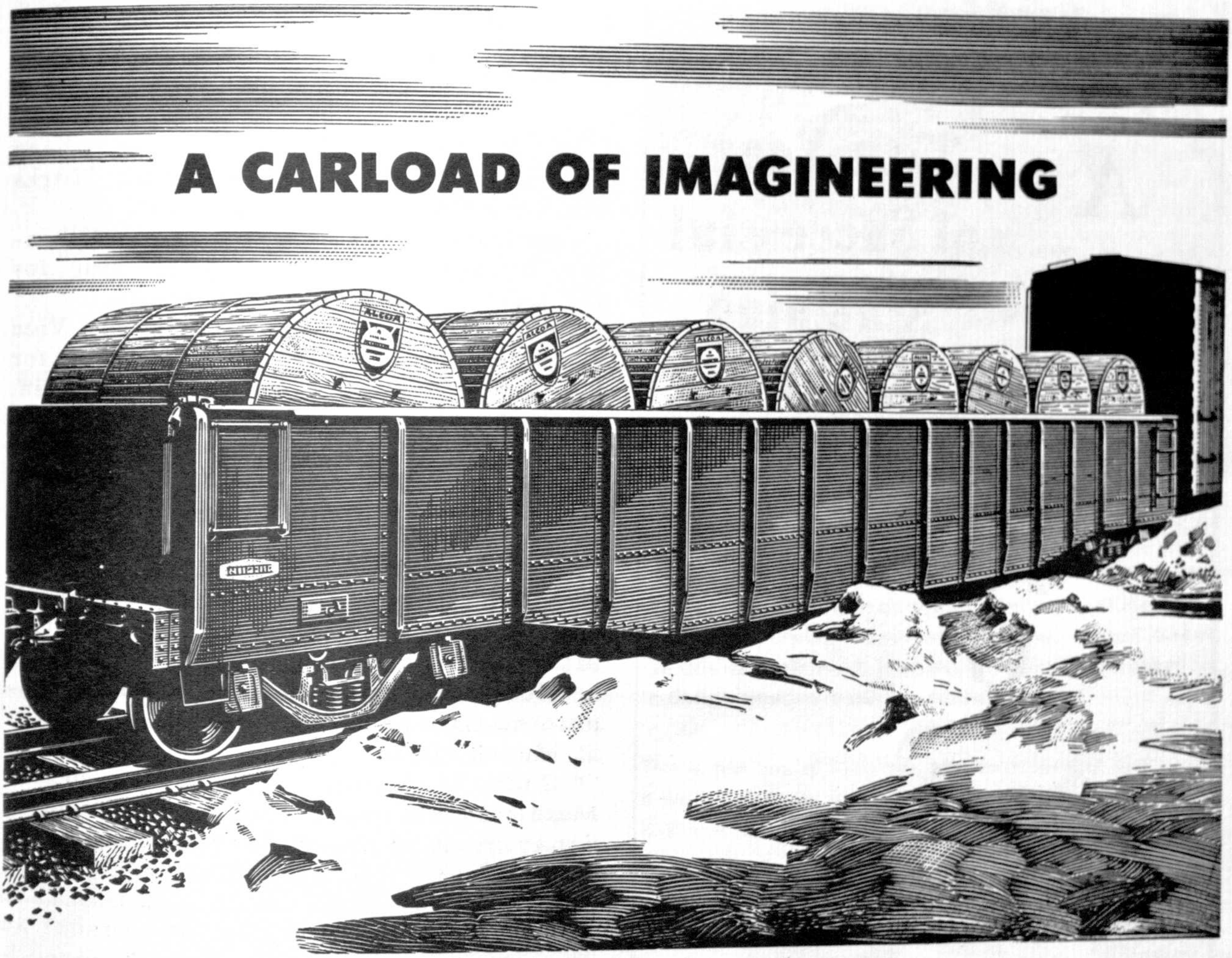
been the one of separating streams of particles of different mass by passing the mixed beam through a magnetic field. The device used to separate and discard the ions is called an ion trap.

Most ion traps proposed in the past have used combinations of non-symmetrical gun structures, bent necks, and extra electro-static deflecting electrodes which required additional connections for the application of voltages. Such complicated designs, of course, added to the cost of the tube. The development program undertaken resulted in the tilted-lens ion trap. The principal feature of this method is the electron gun which has a tilted electron lens formed by cutting the adjacent ends of grid No. 2 and grid No. 3 at a slight angle to the plane normal to the gun axis. The tilted lens deflects the mixed beam of electrons and ions away from the axis of the electron gun. In order to return the electron stream toward the axis of the gun a magnetic field of proper direction and strength is positioned in the vicinity of the bend. The problem then was that the electron beam could not be brought back on the axis but only across it as in Figure 2. This caused spot distortion and required additional centering current.

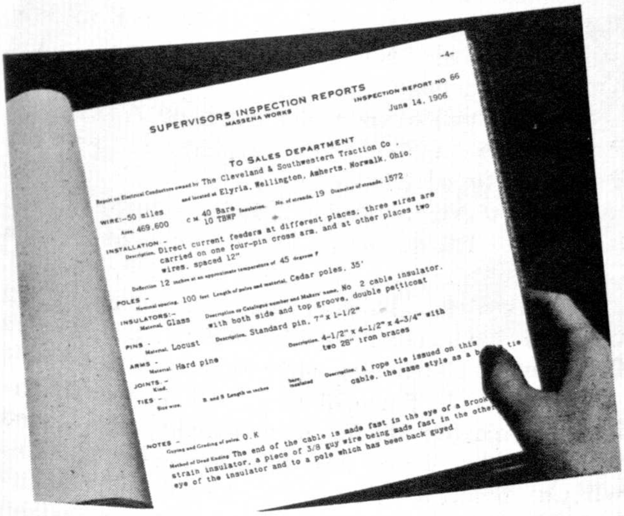
The solution for this was to use a second magnetic field on the ion-trap magnet. The first magnetic field was located as before but its strength was adjusted to cause the beam to cross the axis within the gun. The second field was of opposite polarity and of lower strength. It was located at the point where the beam crossed the axis and served to align the beam to coincide with the gun axis. Figure 3 shows the approximate path of the beam when the double magnetic field is used. This ion trap is a positive method of eliminating ion spots and is independent of gas pressures over a very wide range.

This gives you the problems faced and the solutions and production procedures worked out in one of the phases of the expanding television industry. Other problems have appeared and will continue to be present. We hope they will be solved equally as well.

A CARLOAD OF IMAGINEERING



That gondola of 954,000 circ. mil. Alcoa ACSR (Aluminum Cable Steel Reinforced) is only one of forty-five similar carloads for one 230-kv transmission line.



-4-
SUPERVISORS INSPECTION REPORTS
MASSENA WORKS
INSPECTION REPORT NO 66
June 14, 1906
TO SALES DEPARTMENT
The Cleveland & Southwestern Traction Co.
Elyria, Wellington, Amherts, Norwalk, Ohio.
WIRE:-50 miles
469,600
40 Bare
10 TBWP
19
1572
INSTALLATION -
Direct current feeders at different places, three wires are carried on one four-pin cross arm, and at other places two wires, spaced 12"
12
45
POLES -
100
Cedar poles, 35'
INSULATORS:-
Glass
No 2 cable insulator, with both side and top groove, double petticoat
PINS -
Locust
Standard pin, 7" x 1-1/2"
ARMS -
Hard pine
4-1/2" x 4-1/2" x 4-3/4" with two 28" iron braces
JOINTS -
TIES -
A rope tie issued on this
cable, the same style as a
NOTES -
O.K
The end of the cable is made fast in the eye of a Brook
strain insulator, a piece of 3/8 guy wire being made fast in the other
eye of the insulator and to a pole which has been back guyed

Even before the first ACSR line was strung, Alcoa supervisors were on the job. The report above is dated June 14, 1906, covering the erection of all-aluminum conductors. Thus, the Alcoa "Book-of-Knowledge" has grown rich with on-the-job experience.

The two million miles of Alcoa ACSR that carry electricity across the country today are a product of Imagineering. Back in the 90's, Alcoa started with a fact: Aluminum is a good conductor of electricity.

Imagineering involved building labs long enough to mount whole spans of cable which would be vibrated and mauled as the wind does. It meant developing new basic data.

The lifetimes of many people and a good many dollars invested in "Imagineering" Alcoa ACSR speeded the more recent promotion of Alcoa E.C. Aluminum for manufacturers of insulated wire and cable. When the day comes that you are specifying industrial wire and cable you'll discover how Alcoa Imagineering brings savings in both cost and weight when you "Figure it in Aluminum." ALUMINUM COMPANY OF AMERICA, 742K Gulf Bldg., Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM ®

Alumni News

C. A. Johnson, '27, has recently been appointed Supervisor of Public Works and City Engineer for Michigan.

Andrew T. Dempster, '32, is Director, Bureau of Sanitary Engineering, for the Detroit Department of Health.

Winfield C. Hinman, '35, is now Vice President in charge of Production for Franklin Products Company in Franklin, Michigan.

Forest E. Allen, '36, is mighty busy these days. After teaching in the M.E. department of Iowa State College for 9 years, he went to New York to work for International Nickel Co. He is now developing an educational program in cooperation with Colleges and Universities all over the country.

Norman W. Sageman, '37, was appointed City Engineer of Cadillac, Mich. in March, 1950.

John M. Keyes, '38, is the Senior Metallurgist supervising the technical department of the Wolverine Tube Division, Calumet & Hecla Co., in Decatur, Alabama.

R. E. Leffel, '38, is at present an Assistant Professor of Civil Engineering at University of Colorado in Boulder, Colorado. He had been a Colonel in the Army Engineers.

S. J. Ryckman, '38, is now Associate Professor of Sanitary Engineering at the University of Maine.

Milton Anderson, '39, is a Supervisor for the Magnesia Plant of Michigan Chemical Corp., St. Louis, Michigan.

Donald L. Baker, '40, is working on Guided Missiles at the Glen L. Martin Co., in Baltimore, Maryland.

Robert J. Buzenberg, '40, is performing administration, personnel, and sales work, for Viking Manufacturing Co., which makes farm machinery in Manhattan, Kansas. Bob holds the position of Vice President, and Assistant General Manager.

Duane M. Hart, '41, is a Staff Engineer for the Westinghouse Air Brake Co., at Wilmerding, Pennsylvania.

Fred T. Mitchell, Jr., '43, is working as an Electrical Engineer for Monsanto Chemical Co., in Monsanto, Tennessee.

Dale J. Meyers, '44, is now employed as a design engineer by Goodyear Tire & Rubber Co., in Akron, Ohio.

Gale D. Sharpe, '47, is doing product and process development of Vinyl Chloride resin base plastics for the Firestone Plastics Co., Pottstown, Pa.

Warren S. Hall, '48, is now in the Research Dept. of Phillips Petroleum Co., developing new low temperature synthetic rubber.

William and Karl Johnson, '47 and '49, brothers, are both draftsman for the Bureau of Reclamation of Grand Coulee Dam in Ephrata, Washington.

CAMPUS NEWS

Last month, four out of six scholarships awarded by the Society of Engineers' Wives during 1950 were presented to M.S.C. engineers. The other two scholarships were presented to students at the University of Michigan and Wayne University. The engineers at M.S.C. who received the grants are Richard L. Charnesky, M.E. '52, Dan M. Guy, M.E. '52, Harry A. Lipsitt, Met.E. '52, and Richard R. Zolnick, C.E. '52.

STANDING L. TO R. — D. M. GUY, H. A. LIPSITT, H. R. ZOLNICK, R. L. CHARNESKI. SEATED — DEAN MILLER.

The Society of Engineers' Wives offers to six junior and senior engineering students a gift scholarship of one hundred dollars annually. The scholarship requirement is that the student shall have maintained a 2.5 average throughout his freshman and sophomore years. The grants are also based upon campus citizenship and the necessity for help in continuing his college education.

We at M.S.C. can be proud of the honor bestowed upon these engineers by this organization, and congratulations are certainly in order. Hats off to these engineers.

SIDE TRACKED . . . .

She: "You're the kind of a fellow a girl can trust."
He: "Haven't I met you before? Your faith is familiar."

Dean: "Where are your parents?"
Coed: "I have none."
Dean: "Where are your guardians?"
Coed: "I have none."
Dean: "Well, then, where are your supporters?"
Coed: "Sir, you are forgetting yourself."
--U. of W. Columns

Stella: Does your new fellow like to go out to the clubs and gamble for money?
Della: No, indeed! He'd much rather take me home and play for fun.
--Urchin

Two stuttering blacksmiths had finished heating a piece of steel and one placed it on the anvil.
"H-h-h-h-h-h-hit it," one of them said to the other.
"Wh-h-h-h-h-here?" asked the other.
"Aw, h-h-h-h-hell, we'll have to heat it again now."
--Purdue Engineer

Not long ago, one of our citybred engineering graduates was making a trip through the country. As he passed a fertile field he spied an unusual sight - a farmer helping a calving. Now our engineer didn't have the slightest idea what was happening, and he stopped his car to watch the spectacle. He could tell that the farmer was having an awful time assisting the cow.
Presently he got out of the car, approached the farmer, and said, "Want some help?" And so, sweating and straining, he assisted the farmer at the difficult task. Then at last the calf was born.
Gratefully, the farmer accompanied the engineer to his automobile to see him off. But hesitating, as he wiped the sweat from his brow, the engineer looked up and said, "Say mister, just how fast was the calf going when it hit that cow?"
--Iowa Engineer

He: "Do you serve women at the bar?"
Bartender: "Nope! You'll have to bring your own!"

A bomb was invented and built which would destroy the entire world. The inventor couldn't resist trying it just once. After the smoke cleared away, the only thing remaining was a pair of monkeys. One turned to the other and said, "Shall we start the whole thing over again?"

Drunk: "Lookit zat sign."
Drunker: "Whazzit shay?"
Drunk: "Sez 'Ladies ready to wear clothes'."
Drunker: "Well, it'sh about time."
--Purdue Engineer

Love is one game that is never called off on account of darkness.

The engineer was shopping in a toy department. He squeezed one doll and it hollered "Mama". Then he squeezed another and it hollered "Floorwalker!"

The old colonel, 74 or more, married a beautiful girl of 19. A year later she gave birth to a strapping, eight pound boy, and the colonel was happy he called his whole regiment together. He stepped to the bandstand and announced: "I have called you together to tell you that my wife presented me with a son this morning. Gentlemen, I thank you!"

It's tough to find, for love or money,
Jokes that are clean and likewise funny.
--Purdue Engineer

Uncle: "What's a bachelor?"
Junior: "A bachelor is a man who didn't have a car when he was in college."
--U. of Cincinnatti Profile

Prof: "How can you explain the increase in population after the industrial revolution?"
C.E. "Everybody went to town."
--Iowa Engineer

Famous last words: "Aw, they don't flunk seniors!"

WHY I HATE MEN

I hate men because they take me into alleys, dance halls, and bedrooms -- they press me and feel me all over with their fingers. After they get me hot they hold me to their lips and drag the life out of me. When they get what they want they throw me aside and I'm only good for tramps.
Why should they take advantage of my white body? After all, I'm only a cigarette.
—South Carolina Engineer

Engr: "I seem to feel like we're engaged."
Coed: "Yes, and it's got to stop."
--Purdue Engineer

"Saw a horrible accident the other day. Girl backed into an airplane propeller."
"What happened?"
"Disaster!"
--South Carolina Engineer

Three salesmen were talking. The beer salesman said, "I hate to see a woman drink alone."
The food salesman said, "I hate to see a woman eat alone."
The mattress salesman remained quiet.
--Duk Engineer

The automobile motor began to pound, and finally stopped. The worried boy friend said to his companion: "I wonder what that knock could be?"
"Maybe," said the blond girlfriend, "it's opportunity."
--Michigan Technic

SIDE TRACKED . . . .

"What's worse than being a bachelor?"

"Being a bachelor's son."

--Duk Engineer

A newspaper reviewing a grade school play said, "The auditorium was filled with expectant mothers, eagerly awaiting the appearance of their offspring."

--Iowa Engineer

Sign in front of marrying parson's office.

"You get the bride; we'll do the rest."

Wondering bridegroom: "Well! that's hardly fair."

--Michigan Technic

Mirandy, surrounded by her brood of pickaninnies, was talking to the spinster settlement worker:

"Yas'm birth control am all right for you all but me, Ah's married an doan need it."

--Montana Engineer

A farmer was berating his hired hand for using a lantern to call on his best girl.

"What a waste!" he stormed. "When I was courtin' I never carried no lantern. I went in the dark."

"Yes, I know," said the hired hand, "and look what you got."

Motorist who always insists on his rights, just regaining consciousness. "I had the right of way, didn't I?"

Disgusted Passenger: "Yeah, but the other fellow had the truck."

Engineer to roommate: "Gad! Here it is only three in the morning, and I'm getting tired already."

--Penn State Engineer

A Swede walked into a saloon and asked for a shot of squirrel whiskey.

"I haven't any squirrel whiskey." said the bartender, "but I have some good Old Crow."

"But," replied the old Swede, "I don't want to fly, I yust want to yump around a little."

--Iowa Engineer

The scene is a train compartment in Romania. The characters: A German officer, a Romanian, an old lady, and an attractive girl.

The train enters a tunnel. The passengers hear first a kiss, then a vigorous slap.

The old lady thinks: "What a good girl she is, such good manners, such fine moral character?"

The girl thinks: "Isn't it odd that the German tried to kiss the old lady, and not me?"

The German thinks: "That Romanian is a smart fellow; he steals a kiss and I get slapped."

The Romanian thinks: "Am I a smart fellow? I kiss the back of my hand, hit a German officer, and get away with it."

--'Bama Beam

FRATERNITY HOUSE RULES

No liquor allowed in the rooms. Do not throw the bottles out the window.

--Michigan Technic

A man with a nose as red as a tail light was arrested for selling smuggled whiskey. The lawyer who defended him knew a few tricks of the trade. When he put his client on the witness stand he asked the jurors to look carefully at the man. After a dramatic pause the lawyer continued:

"Now ladies and gentlemen of the jury, you've looked carefully at the defendant. Can you sit there in the jury box and honestly believe that if he had a quart of whiskey he would sell it?"

"Not guilty!"

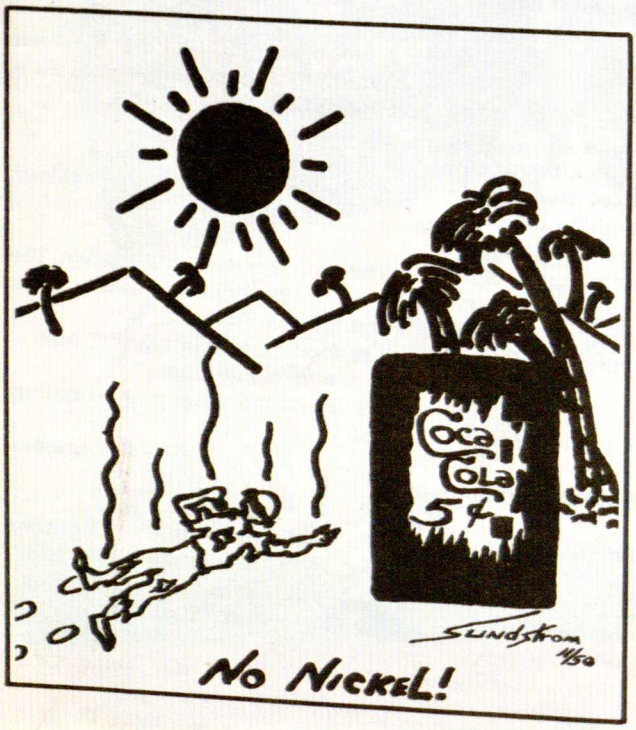
--Penn State Engineer

The drunk hailed a cab and fell into the back seat.

"Shay driver," he ordered, "drive me around the block a hundred timesh."

The driver, was startled, but he obliged just the same. Around and around the block they went. On the sixty-fifth trip, the drunk leaned over the driver.

"Hey, buddy," he said, "step on it, will you? I'm in a hurry."



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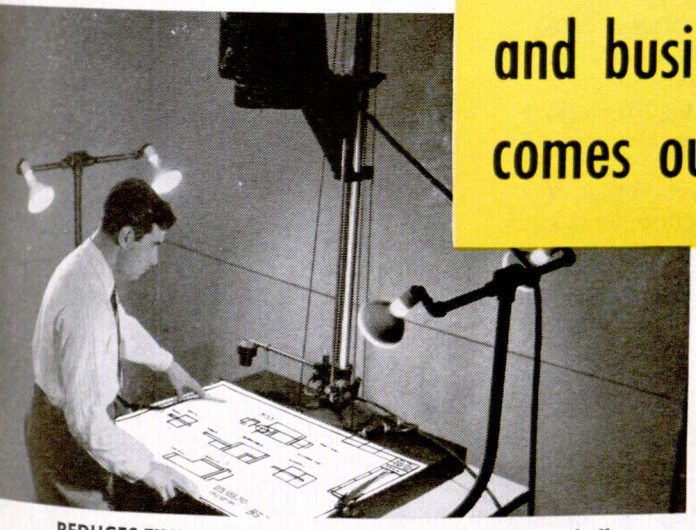

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