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Volume 62 - Issue 7 - April, 1951

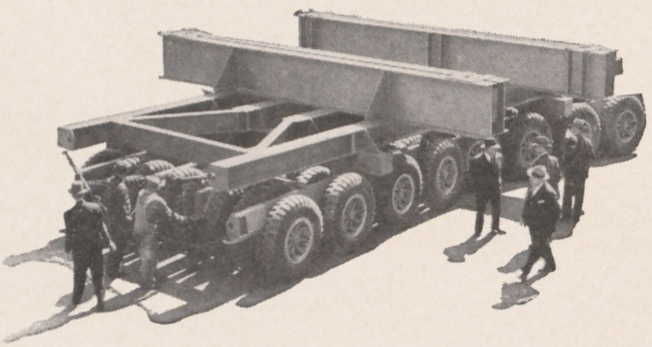
Rose Technic Staff
Rose-Hulman Institute of Technology

Rose Technic

MEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED

APRIL, 1951

Another page for **YOUR BEARING NOTEBOOK**



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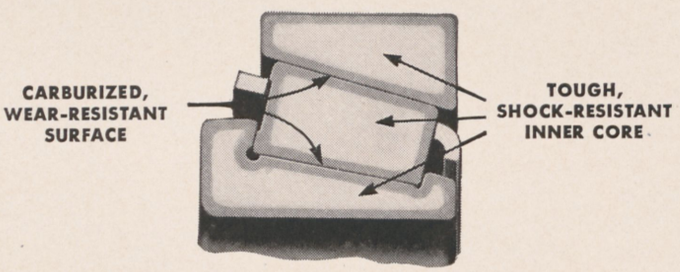

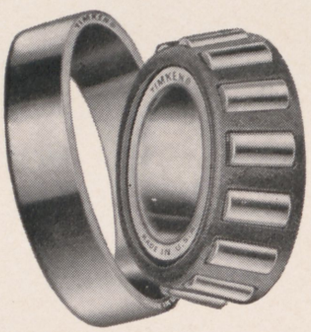

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BEARING TAKES RADIAL ⬭ AND THRUST →⬭← LOADS OR ANY COMBINATION ✳

Rose Technic

VOLUME LXII, NO. 7 APRIL, 1951

In This Issue

Cover

A Refinery at Night, courtesy of THE LINK.

Frontispiece

The insulation of a stator of a generator being examined by means of an optical device. Courtesy of WESTINGHOUSE.

PHOTO CREDITS. Page 11. RADIO CORPORATION OF AMERICA.

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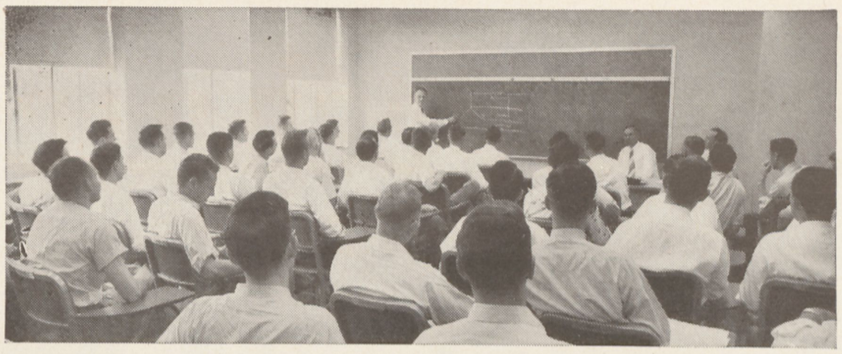
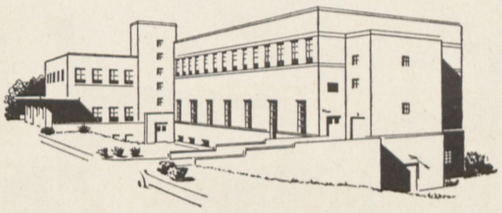


Classroom work is combined with conferences and actual work assignments to help develop potential abilities.

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

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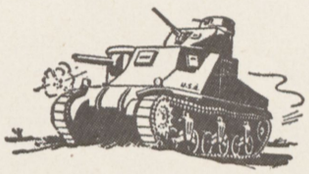
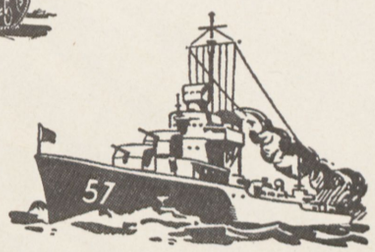
Terre Haute, Indiana



FASTER

FASTER

FASTER!



AUTOMATIC GUN-LAYING

Some things man just can't do fast enough — manually Time was when gun-pointing information was transmitted to dials and guns were pointed manually in accordance with the data.

Arma was in the thick of the apparatus development which brought gun fire control to this point. And, it was Arma who undertook to aim the guns automatically.

All that was *before* jet planes were a reality—*before* supersonic planes introduced such terms as "Mach 4" into military language Adapting and improving the speed of apparatus for the automatic control of anti-aircraft batteries is one of the important assignments of accelerated engineering at Arma. It is typical of many ways Arma engineers are aiding in making America safe against those who wish to destroy it.

If you think you might like to start your engineering career at Arma, write for the booklet titled "Engineering at Arma." Please address your request to the Engineering Division, 254 36th Street, Brooklyn 32, N.Y.

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"... accomplish the mission"

The first duty of a soldier is to accomplish his mission. Our national leaders now face the task of determining the exact mission of each individual in the defense of "the American way of life."

As engineering students, we naturally feel that we may best serve our country by continuing our education. That technically-trained individuals are essential to normal peacetime pursuits and indispensable in the execution of modern warfare is irrefutable. In view of the trend in decreased engineering enrollment—with estimated deficits, forecast for the next four year, of from 30 per cent to 60 per cent of the minimum required 30,000 graduates—it is apparent that further depletion of the supply of engineers would be hazardous to the civilian economy and to military security.

The most practical solution is the adoption of a draft-deferment plan which will allow qualified students to continue their studies and will induce competent high school graduates to enter engineering schools.

The slide-rule shover may have difficulty in considering the sculptor or musician essential in time of war (or, perhaps, even in peacetime). Nevertheless they too contribute to the way of life that we are defending. A deferment plan which would apply only to persons receiving technical training would, therefore, create an unbalanced culture. Such a plan would not be congruous with our national aims.

The student deferment policy formulated by General Hershey and his advisers and announced by President Truman earlier this month most nearly fulfills the need presented.

Condemnation of this proposal by some, on the grounds that it is undemocratic should be carefully examined. While the plan accentuates certain injustices—such as the financial barrier to college entrance—it does meet the need for trained personnel. This criticism, possibly having been made without full realization of the damage it could cause, serves to awaken all students to the responsibility placed upon them. Adoption of a modified Hershey plan would define the student's mission as the completion of his education. Accomplishment of this mission requires buckling down to the job at hand, which includes the elimination of any remnants of the "College Joe-ism" of the 1920's.

The first duty of a soldier is to accomplish his mission.

R.C.B.

R.A.K.

Octane Boosting

By Clyde F. Willian, jr., ch.e.

BLENDING OPERATIONS

Much has been written recently about the cracking processes which refine crude petroleum, but there has been only slight mention of the all-important blending processes that transform this refined petroleum into finished gasolines. Before these blending processes can be described adequately, it is necessary that the reader understand the terms "octane rating" and "hydrocarbon saturation.' The octane rating or number of a motor fuel is a measure of its resistance to knocking. As you may know, fuels with high octane numbers (low knock) are the more eficient in engines, while fuels with low octane numbers (high knock) are less desirable.

The octane number of an unrated fuel is determined in the following way: Iso-octane (which has been assigned an octane number of 100) is added to a quantity of n-heptane (which has been assigned an octane of 0) until a test mixture is obtained which has the same knock properties in a standard engine as the unrated fuel. The octane number of the unrated fuel is then evaluated from the proportions of n-heptane and iso-octane in the test mixture.

A hydrocarbon is a compound containing only carbon and hydrogen. A saturated hydrocarbon is one whose general formula is CnH_2n+_2; the hydrocarbon is saturated because the ratio of hydrogen to carbon in the molecule cannot be increased. Unsaturated hydrocarbons with the genera formula CnH_2n (such as ethylene) or CnH_2n-_2 (such as acetylene) can be saturated by the addition of hydrogen until the general formula becomes CnH_2n+_2.

We can now define blending as the rearranging, combining, and saturating of low octane hydrocarbons to form new hydrocarbons of higher octane rating. The blending processes are hydrogenation, isomerization, alkylation, and polymerization.

HYDROGENATION

Hydrogenation is the saturation of an alkene to form an alkane. In the manufature of aviation gasoline octene is hydrogenated to form an octane. The catalyst for this process is prepared by reducing nickel nitrate on some inert carrier. Care must be taken so that all of the nickel nitrate is reduced or nitrogen dioxide will be formed during the reaction; nitrogen dioxide stops the reaction. The process is carried on at four atmospheres pressure and at 400°F. About 1000 gallons of product are obtained per pound of nickel before the catalyst is regenerated.

The product from the hydrogenators has an octane rating ranging from 95 to 103. Several new processes for hydrogenation are being developed, but the operating details have not been released.

POLYMERIZATION

Polymerization is the combining of two unsaturated hydrocarbon molecules to form a single large unsaturated molecule. In the manufacture of aviation gasoline two butenes are combined to form an octene.

The polymerization process can be carried on with hot (160°-190 F.) or cold (70°-90F.) sulfuric acid. From 50-200 gallons of product are obtained per one pound of catalyst used. The reaction is exothermic; hence close temperature control must be maintained. Usually 85-90 per cent conversion of the C_4 hydrocarbon is obtained.

The product from the polymerization process cannot be used directly as a gasoine, but must be hydrogenated. The polymerization reactors are usually built in conjunction with hydrogenators.

ALKYLATION

Alkylation consists of combining a saturated hydrocarbon with an unsaturated hydrocarbon; in commercial operation isobutane is combined with butene to form an octane.

The alkylates are one of the most important components of 100 octane aviation gasoline. Alkylation is carried out under two processes: (1) the sulfuric acid process, and (2) the hydrofluoric acid process.

In the sulfuric acid process one gallon of butene is reacted with 1.2 gallons of isobutane to yield 1.7 gallons of alkylate. In the actual alkylation the ratio of butene to isobutane is about one to four to prevent polymerization of the butene. The two hydrocarbons are usually mixed together and cooled to 30° to 50°F. before entering the reaction chamber. After the mixture is in the reaction chamber the acid catalyst is admitted. After the reaction has taken place, the acid is removed in a settler tank and the hydrocarbon mixture is neutralized by washing with caustic. The unreacted isobutane is removed by a debutanizer and is used as a recycle. The isobutane is recovered as the overhead from the debutanizer and the alkylate is the bottoms product.

There are several disadvantages to the sulfuric acid process. The reaction has to be carried out at a low temperature, below 50°F, which means that refrigeration is required. The amount of acid required for the reaction is high, about one pound of

Continued on page 20

Frozen Stress

By Myron Hawk, sr., c.e.

Money—this is the controlling factor in peacetime production and a major factor in wartime. Operations must be carried out the economical way. Therefore, the design of structures must be done as inexpensively as possible.

There are several methods of accurate stress analysis. Outstanding among these is the mathematical theory of elasfiticity. Unfortunately, calculation difficulties greatly increase as the member or the loading on the member becomes irregular.

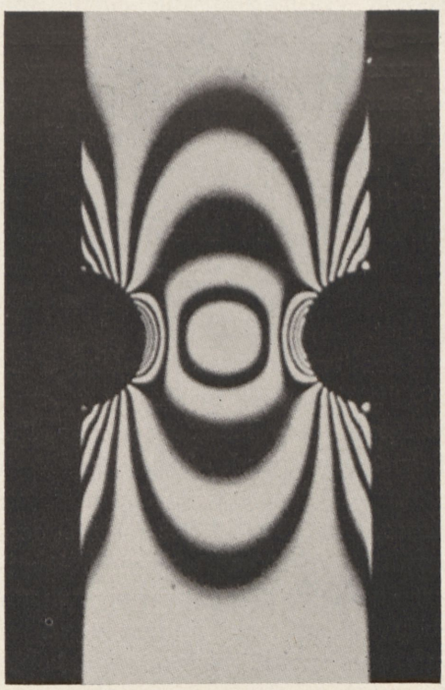
Great stress concentrations are present at points of concentrated loads, reactions, nicks, holes, groves, keyways, and even at tool marks or stamped notches made by the inspector. These provide a starting place for the formation of cracks, which, through repeated loading, wreck the structure. This spot is the "weakest link" of an otherwise strong "chain". Any spot must necessarily fail when it is stressed beyond its limit, no matter how harmless the applied load may have been to the other parts of the same structure.

The method of mathematical deduction is insufficient where stress concentrations are present. The designer must resort in these cases to experimental methods for solution of his problem. The optical method of stress analysis known as protoelasticity may be here utilized as a cheap, convenient means.

This science first appeared in the engineering world at the turn of the century and was developed mainly through the life-long persistence of Professors E. G. Coker and L. G. Filon, both of the University of London. There were, of course, many others who pursued this study. The science of photoelasticity, although comparatively new, has developed far beyond the formative stage. This method is now a very powerful tool of qualitative and quantitative stress analysis, and, for two dimensional stresses, exceeds all others in reliability, scope, and practicability.

The operation of obtaining an image of the stressed member that will show the stresses clearly is very complicated and technical. The main consideration is that the image of the model obtained shows the actual stress in the prototype. The method used necessitates the use of a model through which a polarized light beam is passed and then

Typical Specimen



diffracted to produce an image on a screen or photo plate.

The material used for the model must necessarily conform with many requirements; of these, the following properties are desirable:

Transparency:
Light must pass through.

Machinability:
The cost of working the material must be low.
(this requirement excludes glass)

High optical sensitivity:
The stress lines must be clearly defined.

Proper hardness:
The material must be workable and not brittle, yet sufficiently strong to withstand clamping during machining.

No undue optical or mechanical creep:
The exact pattern must not vary with the time element, but only with the loading.

No initial stresses:
The stresses shown must be due to loading only.

Isotropic:
The physical properties must be the same in all directions.

Linear stress strain relationship:
The model must act as its own prototype.

Rigidity:
The shape must remain essentially the same and there should be only very small deflections. This requires a high modulus of elasticity.

Constant properties with moderate changes of temperature and machining

Moderate cost

There are several materials which possess some of these properties, but the closest approach to all the requirements is found in an American Bakelite product known commercially as BT-61-893.

The model may be made larger or smaller than the prototype, depending upon the size of the prototype and the particular area to be studied. This model is supported and loaded in exactly the same manner as its industrial facsimile, heated slowly until beginning to soften, cooled cooled slowly, and the loads removed. The model then contains the frozen stress pattern and is ready to be

Continued on page 22

Research and

By Fritz Wheeler, soph., e.e., Jack Vrydagh, soph., m.e.,

Food For Thought

If man should fail in his present quest for self-extinction via the hydrogen bomb, there are still a number of natural agencies which thousands or even billions of years from now might wipe out all life on the earth, according to Dr. I. M. Levitt, director of the Fels Planetarium at The Franklin Institute. The destructive potentialities of these agencies—comets, asteroids, the sun, and even the gentle moon—are the topic of the new Planetarium show entitled "How Will the World End?" which opened at the Institute on Tuesday, April 3, and which will continue through the end of May.

The hydrogen bomb has been called an open-ended weapon, Dr. Levitt said, in that it can be built up without limit to gigantic proportions. A super hydrogen bomb can be made so that it can wipe out a large section of the country or even an entire country.

In explaining this statement, Dr. Levitt stated that, "If one were to assume that a hydrogen bomb weighing a thousand tons could be built and if it were ignited in Philadelphia, it would kill all people and level every building in an area bounded on the south by Baltimore, on the west by Harrisburg, on the east by the Atlantic Ocean, and on the north by New York. In addition to this blast effect, everybody in the United States east of Chicago and north of Georgia, if out in the open, would be fatally burned by the heat flash.

Dr. Levitt pointed out that this hypothetical bomb could be rigged with 7500 tons of cobalt. The radioactivity produced by the radio-cobalt would be equivalent to about 5,000,000,000 pounds of radium and would be another factor in making the area uninhabitable.

However, he continued, while it is possible that a super hydrogen bomb could end all life on earth, it is at the moment unlikely.

On the other hand, Dr. Levitt reassured, while there are several ways that Nature might take matters into her own hands, these possibilities are in the very remote future.

If a missile such as a swarm of meteorites or the head of a comet should crash into the earth, the energy released by the impact dwarfs to insignificance the energy released in an atomic bomb explosion. The head of a comet striking the earth might conceivably wipe out the population on one side of the earth. But if, instead of a comet, an asteroid should crash into the earth, it might end all life on this planet.

Occasionally a star will become 10,000 times as bright as it was formerly, thus becoming a nova, Dr. Levitt continued. Occassionally a star will become a million or more times as bright and become a supernova. Some supernovae emit as much energy in 36 hours as our sun will give off in a million years. If our sun should become a nova, a frightful wave of energy would engulf the sun side of the earth, and even if the earth were not vaporized, all life would immediately cease. However, he added, astronomers are not worried that such a catastrophe will ever occur, as our sun seems to be a well behaved star and not given to outbursts of this type.

A recurrence of the ice ages might also terminate life on earth, Dr. Levitt explained. There is no worry about the sun's burning out, because its mass is so great that, even if it continues to radiate at its present rate for the next 150 billion years, it will lose only about one percent of its mass. However, an interesting result of the theory that the sun is growing hotter is that there will be an increase in the number of storms because of increased radiation, and the earth will be deluged with water.

Because of the increased evaporation and precipitation, the sky will be completely overcast for long periods. This in turn will reflect the radiation of the sun back into space, and little radiation will fall to the earth. The precipitation will fall and in some cases freeze. Gradually, without the warm rays of the sun, the snow will lie thicker and thicker on the ground, until it freezes into glacial ice, and we have a recurrence of the ice ages.

An ice age might also result if the solar system passed through a part of space containing a great deal of cosmic dust, which would filter the sun's energy.

The moon might also end all life on the earth. Billions of years from now the moon will approach the earth, giving rise to unprecedented volcanic activity. As the moon closes its distance, tidal waves will sweep across the continents. And when it finally comes within 6000 miles of the earth, the tidal action of both bodies will cause the moon to break up into a thin ring of tiny particles which will encircle the earth in the former path of the moon. This violent upheaval will be followed by complete peace and tranquility on the earth, but there will be no survivors to witness it.

These natural catastrophes are too far in the future to give cause to worry, Dr. Levitt assured. Our chief concern, he said, should be to pro-

Development

and John Rinker, soph., ch.e.

mote peace and harmony among mankind, so that man does not bring about his own end.

The planetarium chamber has undergone many changes in preparation for this unusual demonstration. Brilliant lighting effects, realistic sounds, and vivid handpainted background give the visitor the feeling of being an actual observer of the various earth-breaking phenomena. "How Will the World End?" will be the plantetaarium feature for the month of May as well as April.

Budd Diesel Rail Car

A self-propelled stainless-steel railway passenger car has been developed by The Budd Company for main line and branch line operation. The car is powered by diesel engines, uses hydraulic torque-converter transmissions and is air-conditioned. Its high power-weight ratio which provides excellent acceleration and high speed performance combined with lightweight, high strength design and comfortable interior will make it profitable for operation and attractive for passengers.

The two 275 hp engines that power this new car are two-stroke cycle, six-cylinder diesel engines, each driving one axle of each truck. Each engine and transmission unit is mounted in an aluminum box that has been covered with synthetic rubber to absorb engine noise.

The torque-converter transmission was selected not only for its great efficiency, but for its considerable saving in weight. It was built by the Allison Division of General Motors and is essentially a combination converter and fluid coupling. The converter has a lock-up clutch for direct drive so that the torque-converter is used during acceleration periods only. The reversing is accomplished by means of two sets of constant-mesh helical gears, one or the other of which is engaged to an extension of the engine shaft by a hydraulically actuated clutch to suit the direction of car movement desired.

The engine-cooling radiators are installed on the roof of the car and are connected by piping to insulated water tanks under the car. The exhaust pipe and water connections from each engine are housed in ducts which form a partial bulkhead near the middle of the car. The water from the engine passes first through a storage tank under the car. This would normally be the water circuit during winter weather. When additional cooling is required, thermostats open pipes which bypass the storage tank and lead through the radiators. When the water temperature rises above 160F, the cooling fan motors on the roof are automatically started by thermostatically controled electric circuits. Tests indicate that the heat transfer capacity of the cooling system is adequate for the highest ambient temperatures.

Heat exchanges for the torque-converter fluid and lubricating oil form an integral part of the power plant. The pump which circulates the engine-cooling water delivers it from the storage tank or radiators first to the torque-converter heat exchanger, then to the lubricating oil heat exchanger and then to the engine water jacket.

Power is transmitted through a ring gear mounted on the drive axle of each truck. The trucks are of special lightweight construction with

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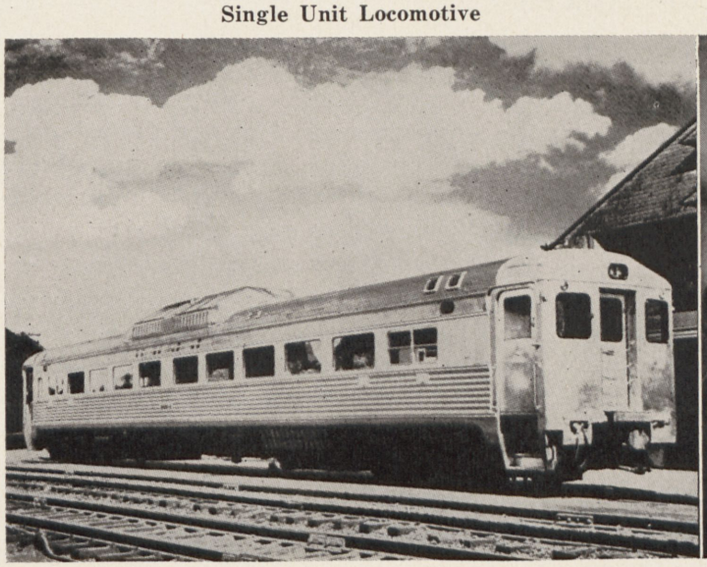
Single Unit Locomotive



Portable T. V. Camera

Campus

By James Myers, jr. e.e., Duane Pyle, jr. c.e.

Rose Wins!

Yes, those rumors you have been hearing are absolutely true. The Poly cinder stompers won their first meet in over five years by tromping Taylor University 57½ to 46½.

Taylor took the first event of the evening when Honaker broke the tape in the 60-yard dash a step ahead of two Rose men, Howie Clark and Bob Kawano. Taylor then proceeded to cop a first and second in the mile to forge ahead to a 13-5 lead.

Co-captain "Rapid Robert" Failing then evened matters by winning the 440-yard dash in 56.1. He was followed over the finish line by "Skip" Zopf to raise the score to 14-13 Taylor. The results of the shot widened the gap for Taylor to 19-17.

The one-two combination of co-captain Bob Bohrman and Gene Hailstone in the 60-yard high hurdles put Rose ahead 25-20. Plants and Reigals of Taylor jogged around the track 24 times to finish one-two in the two-mile run and shove their team back into the lead 28-26.

Harry Badger then took the high jump at an even six feet for a quick five points. Vern Bertram and Gene Hailstone finished one-two in the low hurdles to boost the Fighting Engineers to a 39½ to 32½ lead. At this point in the meet Taylor ran off with the 880-yard dash, but Harry Badger and Gene Hailstone retaliated in the pole vault to keep the margin at a close 7 points 48½ to 41½.

Rose then iced the meet with a second and third in the broad jump. The score then stood at 52½ to 46½ with only the mile relay left to run. The Engineer mile relay team of Kawano, Bohrman, Clark, and Failing ran away from the opposition to make the final score 57½ to 46½.

Greyhounds Outrun Engineers

The Greyhounds of Indiana Central all but swept the distance events to win a 72½-40½ verdict over the Fighting Engineers.

Central started the meet by sweeping the mile for a clean nine points. Meyerrose of Central then took the 60-yard dash and the shotput for ten more points. This put Central in the lead 23 to 4.

Co-captain Failing brought the Central bandwagon to a grinding halt in the next event, the 440-yard dash, by outrunning Meyerrose in a fast 55:3.

Harry Badger paced the Polymen with 11 points. Five for a 11′ 6″ pole vault, five for a 6′ 3″ high jump and one for a third in the broad jump. His 6′ 3″ leap was better than his best jump last year.

Gene Hailstone was the second high scorer for the Brownmen; he picked up three for a second in the 60-yard high hurdles, three in the pole vault and one in the low hurdles for a total of seven points.

The mile relay team of Kawano, Bohrman, Clark, and Failing churned around the oval in 3:56.2 to contribute five more points to the cause.

Library News

The library is particularly proud of the acquisition of Thomas' Register of American Manufacturers. Ours is the forty-first (1951) edition of this fine old directory. Thomas' Register has the following arrangement:

1. Index or finding list. This is an alphabetic list of the products under which manufacturers are grouped with references to column numbers.

2. List of manufacturers classified according to business. Under products, firms are arranged geopraphically and alphabetically. Letter ratings give approximate financial resources of firms.

3. Manufacturers arranged alphabetically by name, giving home office, brances, affiliations, succeeding concerns, cable addresses.

4. Leading trade names, brands, etc.

5. Appendix: Banks, boards of trade, leading trade papers.

It can be seen from the contents listed above that this can be made a very useful tool in many fields of study. Many students will be interested in Thomas's some day as a list of prospective employers. It would be wise for all students to step into the library and familiarize themselves with this extremely important reference work.

The ASEE Committee on Engineering School Libraries has the following observations to make about libraries in our type of school:

"1. Time and efficiency, which are so important to the success of any engineering endeavor, too often are sacrificed where even a small amount of literature-searching skill on the part of the investigators would have saved both.

"2. The ability to find information quickly can be an asset of high economic value. Acquired through ordinary powers of analysis, such ability will be found to be of measurable value from the first year of college through an engineer's entire career.

"3. The potentialities of library techniques and resources are seriously overlooked by the studying, the teaching, and the practicing engineer alike.

"4. It is the librarian's responsibility to advertise these potentialities, and to give the engineer an oppor-

Survey

Carl Bals, jr., ch.e., and Allen Forsaith, jr. m.e.

tunity to take advantage of them."

We hope to see all of you in the library early and often.

Program Change

Due to the questions in the minds of many students concerning the accerelated program as suggested by the administration recently, we would like to publish the following announcement which explains the school's policy on the question:

At its meeting on Thursday, March 29, the Faculty considered proposals to accelerate the educational program at Rose Polytechnic Institute. A faculty committee, of which Professor C. C. Knipmeyer was chairman, presented the results of its study of the problem and the Faculty adopted the committee's recommendations that Rose Polytechnic Institute *do not* undertake an accelerated program at the end of the present semester.

"This recommendation was based on the following conclusions.

1. That, inasmuch as Rose has been conducting its program on a year-round basis for approximately nine years, it is essential to the proper conduct of its educational program that it does not remain in session from June until September of this year.

2. Statements by the Armed Services and Selective Service officials indicate that the present national emergency has not reached conditions that would make acceleration essential as an educational contribution to the national defense.

3. The poll of students and a survey of prospective freshmen indicate that the enrollment in a summer term would be too small to support such a program financially.

4. While there have been no official statements to that effect, it is believed, from information received from several sources, that all high school graduates and college students who are now or will become eligible for deferment or postponement of induction for educational purposes will remain eligible during the June to September period.

5. The size of the Institute is such that if an accelerated program were adopted it would have to be compulsory for all students. Such a plan would interfere seriously with the program of many students needing summer work for financial aid in going to college and with the scheduled camp for advanced ROTC students.

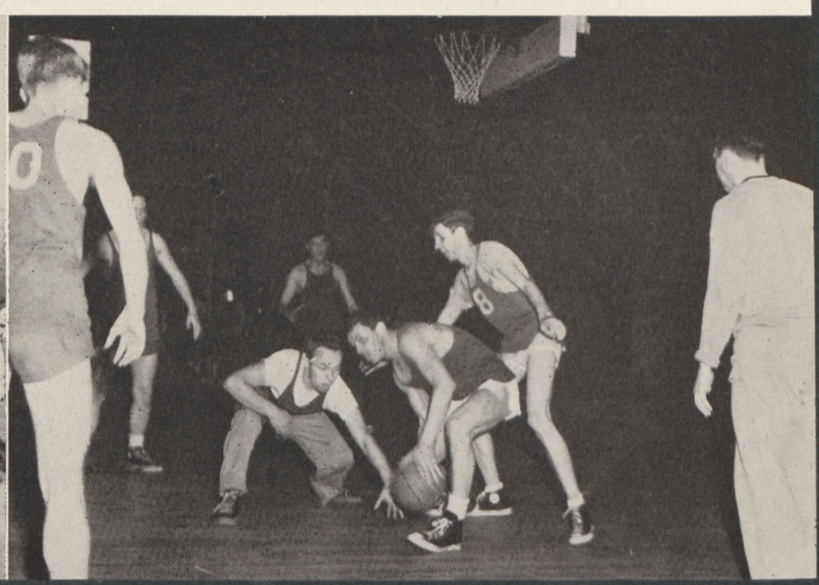
In making this decision, Rose Polytechnic Institute has arranged its schedule beginning September 10, 1951, in such a manner that, if conditions change to make acceleration necessary and desirable, it can shift its program at any time during the academic year.

Although many colleges in the country have arranged regular summer sessions so that students may begin their freshman year in June, the presidents of Brown, Columbia, Harvard, Princeton, Yale, Tufts and Massachusetts Institute of Technology have issued a join statement announcing that these institutions consider that the unfavorable educational effects on students and faculty of an acceleration of the educational program were such that they outweighed any advantages that may accrue to the national defense at the present time. Rose, with other major institutions, is ready to adopt any program of study that will in the opinion of its Board of Managers and Faculty aid materially the national defense. Neither the Executive Committee of the Board of Managers nor the faculty feel that the condition of affairs at present warrants drastic changes in the Institute's orderly educational program.

F. L. Wilkinson, Jr.
President

Tug 'o War on St. Pat's Day

The Freshmen Win!



Alumni News

By Chris Sharpenberg, jr., m.e.

'07 Mr. Charles C. Scharpenberg, C.E., has recently been honored by the Bakersfield Post of American Legion as "Man of the Year" for Bakersfield, California. This award is made annually to the citizen who has contributed outstanding services to his community and nation.

Mr. Scharpenberg was born in Girard, Illinois, in 1884, and was raised on a farm there. After receiving his Bachelor of Science from Rose, he continued studies and obtained a Master of Science in 1909 and the Civil Engineering Degree in 1937.

While at Rose, he was one of the founders of the Theta Xi Chapter on the Campus. Since graduating, he has remained in close contact with the alumni association and has been a strong supporter of Rose.

Upon graduating from Rose, Mr. Scharpenberg joined the Ohio Oil Company staff in southern Illinois. Then in 1911, he moved to Taft, California, with the Standard Oil Company of California. He moved to Bakersfield and established his home there, although his job forced him to do much traveling. In his later years with Standard Oil, he was chief engineer, which necessitated him having his office in San Francisco. In 1938, he retired from active service with the company.

During World War II, he was active in defense strategy for the oil industry. Also, he was a member of the local Selective Service Board.

Although he is supposed to be retired, Mr. Scharpenberg is still hard at work in many projects which promote the growth of industry. For his outstanding work in standardization of oil drilling equipment, the American Petroleum Institute honored him in 1949. He is associated with the McKittrick Mud Company, processors of rotary drilling mud for the oil industry. Having been interested in geology, he was identified with a gold mine, where he spent considerable time studying the formations found in tunnels and shafts.

The hobby in which he is perhaps most interested is a ranch located southwest of Bakersfield. Although his son Fred carries on most of the management, Mr. Scharpenberg enjoys spending time doing odd jobs, and even building sheds and grainaries for the ranch.

Being very active in community affairs, he is a member of both ASCE and ASME; a director of the YMCA; a member of Petroleum Pioneers, Incorporated; a Kern County Housing Authority member; a very active Mason, devoting many evenings each week to that work; and a trustee of the First Baptist Church.

In 1912 he married Lola Holloway of Terre Haute. His son, Fred, and a daughter, Mrs. Lois Ann Hayden, are both residing in Long Beach, California.

'08 After forty years of service with the C&EI Railroad, Mr. John E. Bernhardt, C.E., has entered the service of the William J. Howard Engineering and Contracting Concern as Chief Engineer. Mr. Bernhardt believes that this seemingly radical change is in reality not much venture, because Mr. Howard has been a close friend for many years.

The Howard Company was the general contractor on the Veterans' Memorial Bridge over the Mississippi River at St. Louis. The structure was dedicated last January. Also, the company is constructing two bridges over the Missouri River, one on either side of Omaha.

'32 Frank P. Butler, C.E., is with the American Consulate General in Istanbul, Turkey. His family is with him in Istanbul; Paul, his son, attends a community school on the renowned Robert College grounds.

Feb. '43 Antonio Bogran, M.E., is now a special assistant to the owner and manager of the Horne Lumber Industries in San Pedro Sula, Honduras, C.A. In this capacity his work ranges from building roads to settling labor disputes.

Dec. '47 Edwin Tao, M.E., went to Hongkong, China, for the Otis Elevator Co. Shortly thereafter, he joined the American Engineering Corporation, doing service and installation work on air-conditioning jobs. He claims that this company has installed more than 95 per cent of the air-conditioning units for Hongkong theaters. Mr. Tao has helped install two 150-ton air-conditioning plants in two new theatres. However, the largest unit is being installed in the Bank of China building, making all seventeen floors completely air-conditioned. This plant will consist of 450 tons of refrigeration and two low pressure boilers for heating. For ducts, they are using fabricated aluminum sheets, insualted with two inches of cork and one-half inch of plastering.

Jan. 49 William J. Tennessen, E.E., passed away recently at a Madison, Wisconsin, hospital at the age of 27. Mr. Tennessen was an assistant plant engineer for the Commonwealth Telephone Company at Madison. A veteran of World War II, he is survived by the widow, Jane; two children, his mother, a brother, and a sister, all of Fond du Lac, Wisconsin.

Wanted: *More Green Thumbs*

IN A WORLD faced with constant food shortages in so many countries, more "green thumbs" are needed!

Here in America, modern agricultural methods have increased farm production 60% in the past generation—even though today there are 20% fewer workers on the farms. This increased yield means plenty of food for every one here—and more besides. And the same methods, applied in other countries, would help answer world food needs.

Better seed, fertilizer, and new scientific methods play their part. Equally important are the various chemicals that now fight off blight, disease, and destructive insects. Starting before planting and continuing until the food is ready for our tables, hundreds of new materials increase and protect our food supply.

Even after harvest, man-made agents speed the ripening process. Others guard our food against rodents and insects.

The people of Union Carbide help make possible the high productivity of America's food producers by supplying chemicals for fungicides and insecticides, gases for ripening and preserving, and the stainless steel so important in the preparation and distribution of food. If you have a materials problem, in this field or other fields, it is quite likely they can help you also.

FREE: *Learn more about the interesting things you use every day. Write for the illustrated booklet "Products and Processes" which tells how science and industry use Union Carbide's Alloys, Chemicals, Carbons, Gases, and Plastics in creating things for you. Write for free booklet B.*

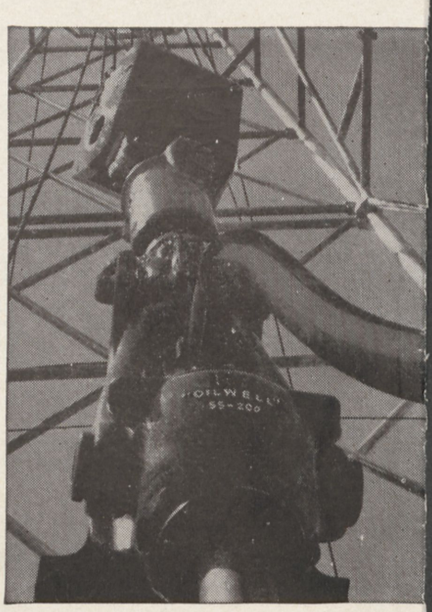
UNION CARBIDE
AND CARBON CORPORATION
30 EAST 42ND STREET UCC **NEW YORK 17, N. Y.**

Trade-marked Products of Alloys, Carbons, Chemicals, Gases, and Plastics include

SYNTHETIC ORGANIC CHEMICALS • ACHESON Electrodes • ELECTROMET Alloys and Metals • HAYNES STELLITE Alloys
PREST-O-LITE Acetylene • LINDE Oxygen • PYROFAX Gas • NATIONAL Carbons
EVEREADY Flashlights and Batteries • PRESTONE and TREK Anti-Freezes • BAKELITE, VINYON, and VINYLITE Plastics

Only STEEL can do so many jobs

NINE TIMES THE DISTANCE TO THE MOON. Each year, it is estimated that America uses approximately 30 billion tin cans (in terms of an average-sized can) to protect food, oil, paint and hundreds of other products. Stack those 30 billion cans one on top of the other, and they'd stretch more than nine times the distance to the moon. A goodly percentage of these tin cans is made of U·S·S Tin Plate . . . steel with a very thin coating of tin.



MAN FROM MARS? No, it's an "Oilwell" Swivel and Rotary Hose . . . a common sight in the oil fields where they drill for the precious "black gold." Steel for oil well drilling equipment like this is essential to building America's security. And U. S. Steel produces a great deal of it.

THESE PIPES CARRY COMFORT. You won't see them when the house is finished. They'll be buried in the plaster. But this National Steel Pipe for radiant heating will keep the rooms warm and uniformly comfortable, in the coldest weather.

so well...

THE MRS. McGREGOR'S FAMILY NAIL BOX—a wide assortment of small size nails—is handy to have around the house for any kind of repair job from fixing Junior's fire engine to mending Dad's stepladder. Wire nails of all types are today making an important contribution toward helping to build a better America.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

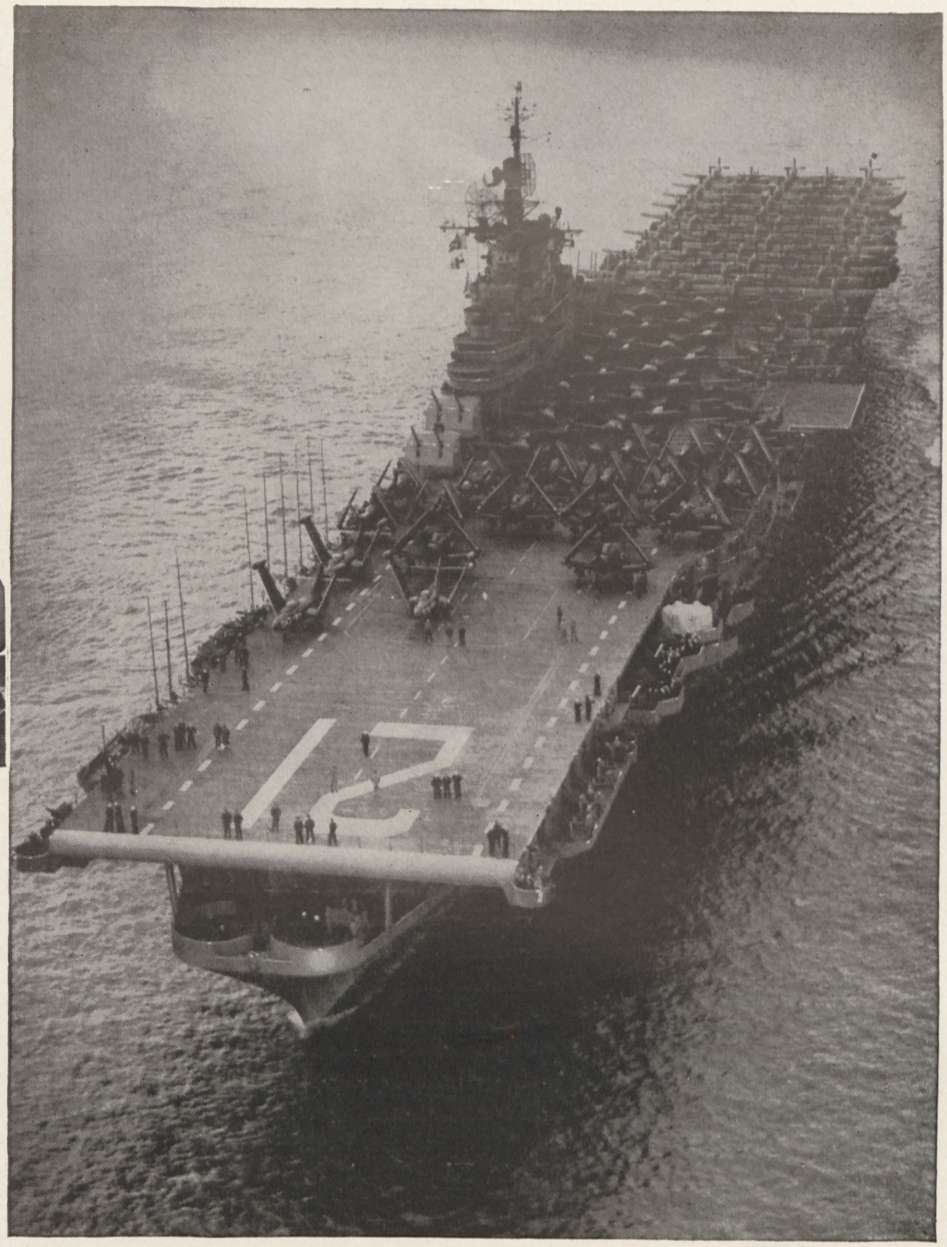
FACTS YOU SHOULD KNOW ABOUT STEEL

***Every day,* American steel mills produce enough steel to make all of the following:**

1000 freight cars	2 cargo ships
2000 trucks	2 tankers
2,000 autos	500 tanks
2000 houses	500 airplanes
0,000 refrigerators	1000 anti-aircraft guns
0,000 stoves	1000 howitzers
1 aircraft carrier	2000 aerial bombs
2 heavy cruisers	500,000 3" shells

and have 23,000 tons of steel left over!

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★



SEA-GOING ROOST FOR WAR BIRDS. An aircraft carrier like this is an incredibly complex structure, made mostly of steel. The ship's plates, wiring, machinery, even the planes themselves, call for steel and more steel. Only steel can do so many jobs so well. And fortunately, United States Steel and the 200 other steel companies in America, can produce huge quantities of this vital metal . . . about 13 million tons more per year than the rest of the world combined.

Listen to . . . The Theatre Guild on the Air, presented every Sunday evening by United States Steel. National Broadcasting Company, coast-to-coast network. Consult your newspaper for time and station.

MANUFACTURED FROM USS TRADE MARK STEEL UNITED STATES STEEL

. . . and this label is your guide to quality steel

UNITED STATES STEEL

Helping to Build a Better America

STEEL CORPORATION • GERRARD STEEL STRAPPING COMPANY • GUNNISON HOMES, INC. • NATIONAL TUBE COMPANY • OIL WELL SUPPLY COMPANY
UNITED STATES STEEL PRODUCTS COMPANY • UNITED STATES STEEL SUPPLY COMPANY • UNIVERSAL ATLAS CEMENT COMPANY • VIRGINIA BRIDGE COMPANY

Fraternity Notes

Sigma Nu

On the first warm Saturday of spring, the men from Beta Upsilon rounded up dates and refreshments, and with Dutch Leonard and his "gee-tar" leading the procession, headed for Turkey Run State Park to enjoy the weather.

The basement barroom, newly completed with a bright red bar, served, along with other attractions, to draw a lively crowd of stags to the Sigma Nu open house stag on Saturday, March 31.

Twelve men from Beta Upsilon drove to Greencastle on the first Saturday of April to enter the all-state Sigma Nu basketball tournament sponsored by the Beta Beta chapter at De Pauw. An excellent dinner was served that evening with the local chapter acting as host.

Beta Upsilon extends a hand of welcome to Carson Bennett, school librarian and a Sigma Nu alumnus, who has agreed to act as co-advisor for the chapter in cooperation with Ben Wilson of Indianapolis, present chapter advisor.

Theta Xi

Kappa wishes to welcome Bill Jones who was recently pledged, and to congratulate Bob Young and Jack Niemi who were initiated into the fold of Theta Xi on April 7. On this date five men from the chapter at the University of Kentucky were also initiated as a service of Kappa's parenthood to that chapter.

The social committee was particularly busy this month with such activities as a pledge dance, a weiner roast, and a stag party. The pledge dance was of the "Bowery Ball" style with couples in appropriate constumes. The chapter wishes to extend its thanks to Mr. and Mrs. Bill Hollis and Mr. and Mrs. John Newlin who acted as chaperones. Bill Somelongname and his four-piece concert orchestra furnished the "Innovations in Modern Music" for the evening. The guests were presented with miniature beer mugs as favors; the mezzanine lounge served as a candlelight coke-bar.

In the "Theta Xi Invitational Basketball Tourney," held at the Rose fieldhouse before a capacity crowd, the pledges upset the actives 47-44. Harry Zorman was high-point man with 20 "slopped in" points; the pledges now hold a 2-1 margin for the season.

Lambda Chi Alpha

Ralph Schmidt, Roy A. Moody, and Al Forsaith were formally initiated into the bond of Lambda Chi Alpha on Sunday night, March 11, 1951.

Lambda Chi Alpha celebrated St. Pat's Day with a dinner party before the dance and an open house after the dance. Approximately fifty-eight activities, pledges, and guests attended the dinner. After

On March 30, a combination Founders' day dinner and pledge banquet was held at the house. Prof. O. L. Stock and Dr. C. E. Kircher were the main speakers. At this time four new pledges were welcomed into the chapter. They were Loren Masley, Ernie Hilman, Henry Hosek, and Bill Lamb.

Our congratulations to Tom Reifenberg who pinned Miss Marg Korb, and to Tom Norman who pinned Miss Delores Voges.

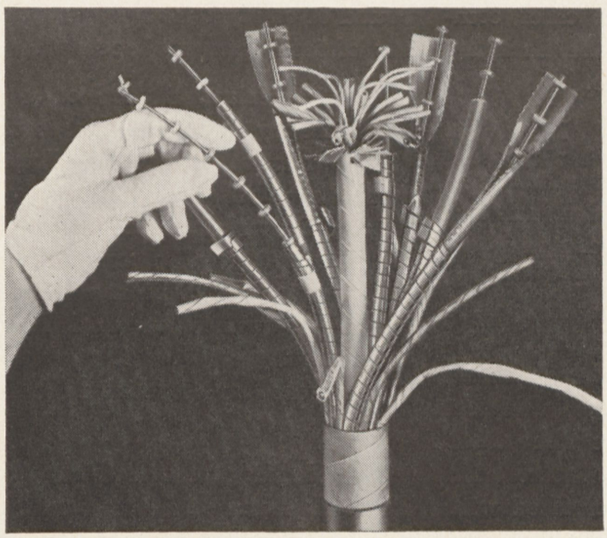
Alpha Tau Omega

A stag party at the chapter house on April 6 was the social beginning for the month. The following weekend a hayride-weiner roast provided the entertainment. Gamma Gamma's house party after the Junior Prom proved a great success.

Congratulations to Jim Myers, who recently pinned Miss Jo Anne Hook; Larry Leonard, who pinned Miss Elaine Thompson; and Riley McKeen, who pinned Miss Betty Farmer.

Newsworthy Notes for Engineers

Between the gloved fingers, you see the plastic discs which separate and insulate inner wire from outer tube of coaxial unit.



Plastic "life-savers" For Coaxial Cable

(ACTUAL SIZE) 

In every mile of new eight-unit Bell Telephone coaxial cable there are over half a million little plastic insulating discs. They look simple enough—like small plastic "life-savers"—but there's a lot of engineering behind them.

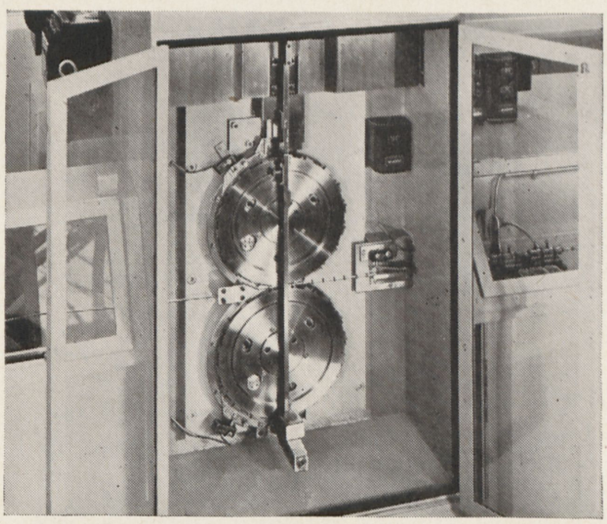
In early coaxials, the insulators were made of hard rubber. But scientists at Bell Telephone Laboratories found that polyethylene—because of its extremely low power factor and lower dielectric constant—reduced shunt losses to about one-twelfth of those with rubber discs.

Use of polyethylene plastic, however, required the development by Western Electric—manufacturing unit of the Bell System—of unusual handling techniques and special machinery.

Punching the discs, with a neat hole in the center, from sheets of the tough plastic is routine. To position them on the coaxial conductor accurately and speedily is not so simple. Equipment was designed and built which receives the discs from a hopper, forces each against a knife edge to slit it, and slips them on to the wire at regular intervals of one inch. At the same time another part of the machine forms copper tape into a tube around the wire and discs, gives a high voltage test, and wraps the tube with two spiral layers of steel tape to produce a completed coaxial unit.

Before the discs go into the machine, they are subjected to an "ozone atmosphere" and to the radiation from radium salts to remove static electricity which would cause them to stick together and refuse to enter the feeding tracks.

All of this – the development of new production methods and machines, the infinite care in manufacture – requires engineers of many kinds—electrical, mechanical, chemical, metallurgical, industrial. Working closely together, they help to convert scientific developments in communications into economically manufactured products for the Bell System.



Plastic insulators, fed into this mechanism, are slit — and pressed on to the coaxial conductor exactly one inch apart.

Western Electric

A UNIT OF THE BELL SYSTEM SINCE 1882

Concluded From Page 8

concentrated acid for each gallon of alkylate. Also the acid cannot be regenerated causing a large initial cost and posing a major disposal problem.

The hydrofluoric acid process was developed so that the disadvantages of the sulfuric acid process could be avoided. The only drawback to this process was the destructive property of hydrofluoric acid. It was found that by dehydrating the acid the destructiveness could be kept to a minimum. The hydrofluoric acid process has two major advantages over the sulfuric acid process: 1) the reaction can be carried out at room temperature eliminating refrigeration, and 2) the catalyst can be regenerated with ease.

The desired product from the alkylation process is iso-octane which has an octane rating of 100, but this can never be realized to the extent of 100 per cent. The alkylate usually has an octane rating of 92 to 94.

ISOMERIZATION

Isomerization is the rearrangement of a straight chain hydrogen into a complex molecule. The chief commercial application is the changing of butane into isobutane.

$$\begin{array}{cc} AlCl_3 & CH_3 \\ C\text{-}C\text{-}C\text{-}C & C\text{-}C\text{-}C \end{array}$$

The catalyst for this reaction is aluminum chloride and hydrocholric acid. The hydrocarbon charge is divided into two streams: 1) The first passes through a saturator where it is saturated with aluminum chloride; 2) the second stream is mixed with anhydrous hydrogen chloride. The isomerization occurs when these two streams are mixed. The reaction is carried out in a tower filled with quartz chips. The effluent from the reactor is passed through an aluminum chloride recovery column, and then through a hydorgen chloride recovery column. The reaction is carried out at 125°-250°F. and 150-500 psi. Conversion of 50 per cent pes pass is achieved in the commercial operations. Usually one pound of catalyst is used per 50 gallons of isobutane produced.

The isomerization product is not used directly for a fuel, but is used in the alkylation process. Experiments are being carried on with large hydrocarbon molecules so that the product may be used directly for gasoline. N-hexane has been isomerized to neohexane which has an octane rating of 88 to 91.4; however, this process has not been utilized to the extent of the butane.

The blending processes have contributed much to the American peoples' standard of living by permitting the development of the high-compression engines which power today's automobiles and aircraft.

"That's right.... *church closed*"

"No, this didn't happen in a communist country.

"Happened right here in town. We'd just gotten home from a motor trip and, of course, hadn't heard what happened.

"Been going to that church about fifteen years, so what a shock it was when Officer Povey stopped us at the door. *'That's right,'* he told us, *'I said church closed!'*

"*Then* he explained. There'd been a fire in the church the day before and he was shooing folks over to the Guild Hall for services. Mary and I looked at each other . . . then grinned. We'd *both* had the same crazy idea that the State had taken over the churches.

"That night Bill and Edna Johnson dropped in for TV. We told them what happened at the church. And about the crazy idea we had. But Bill asked, *was* it so crazy? Then he pointed out that it *had* happened in other countries. So we all got talking real serious.

"All week I've had it on my mind . . . *suppose we had no Freedom here?* Suppose the State took over religion, the press and professions like music, medicine and art? Suppose they took over industry and made me work where I didn't want to? Suppose the State took over our house? And suppose, on election day, we had our choice of *one* candidate?

"Maybe I don't run my life perfectly but I sure wouldn't want the State to run it for me! Y'know, every Thanksgiving we give thanks for the good things we have . . . all of which add up to Freedom. *So why shouldn't we all be just as thankful the* other *364 days, too?"*

REPUBLIC STEEL

Republic Building, Cleveland 1, Ohio

REPUBLIC STEEL

Republic BECAME strong in a strong and free America. Republic can REMAIN strong only in an America that remains strong and free . . . an America whose vast Agricultural Industry is unsurpassed. *And through Agriculture, Republic serves America.* Republic produces quality steels for *all* industries and much of it can be found in thousands of agricultural tools and equipment for field, pasture and farmstead. Thus, Republic works with the farmer to help keep America the best fed nation on earth.

* * *

For a full color reprint of this advertisement, write Republic Steel, Cleveland 1, Ohio

Concluded From Page 9

studied.

This prepared model is then placed in a polarized light beam which passes through the model and is then diffracted to produce an image on a screen or photographic plate. This image is made up of a definite pattern of light and dark bands or differently colored bands—depending on the type of light source.

The light source may be either a monochromatic beam or a white beam. The monochromatic beam is used more frequently of the two, but the white beam has definite appeal. Monochromatic light is light of one frequency (or color) only. The most commonly used source for monochromatic light is Mercury-Vapor which gives off both green and violet light. The violet light is filtered out leaving only the monochromatic green. This beam is circuarly polarized and passed through the model. When a beam is circularly polarized its light vectors are continuously changing direction, but the amplitude of vibration remains constant. Only monochromatic light can be actually circularly polarized, but white light may be used to produce satisfactory results.

Using monochromatic light, the resulting image is an outline of the model with alternating black and white lines or bands. The black bands are known as fringes; they represent the locus of points of constant maximum shear. These lines change size, shape, and position as the loading varies in magnitude. Permanent black dots, i.e., dots which are present for all values of, load represent points of isotropic stress.

If the source is white light, it produces a colored image. The colored bands are known as isochromatics and follow the same shape as monochromatic results for the same model and loading. The colors that appear are yellow, deep red, deep blue, and green, in that order. These colors are repeated in cycles.

By starting at a point of known stress and counting the stress lines between that point and the unknown point, then multiplying by a factor, the actual stress at any point may be found. The method of photoelasticity may also be used to study the third dimensional stresses by cutting a thin slice from the model and placing this in the polariscope.

☆ In 15 years of aviation pioneering a remarkable series of "Firsts" have been credited to Bell Aircraft Corporation. Bell engineers—with imagination and initiative—have been *writing* the aviation books. Every "First" has bulwarked Bell's position as a leader in the industry.

FIRST twin-engine escort fighter, multi-place, and mounting a 37 mm cannon in flexible gun turrets (Airacuda).

FIRST American fighter designed around its armament, firing cannon thru propellor hub, with tricycle landing gear (Airacobra).

FIRST commercial helicopter, with automatic stabilizing control.

FIRST supersonic airplane (X-1).

FIRST in many defense projects now restricted.

OTHER FIRSTS: Bell's pioneering spirit also developed—

FIRST satisfactory .50 caliber machine gun shock dampener which became standard for both Army and Navy.

FIRST modern all-wood military fighter (XF-77).

FIRST jet-propelled fighter in the U. S. (Airacomet).

FIRST commercial helicopter with 200 hp. engine and skid landing gear.

In the column at the right of this page we have listed many of the positions now available to qualified engineers, physicists, and applied mathematicians. Whether your interest lies with guided missiles, helicopters or supersonic aircraft, it is time to seriously consider YOUR future. Bell Aircraft's accomplishments in research, development and design provide the opportunity for permanent employment in all of our long-range programs.

We believe in the future of the aviation industry. Do you believe in YOUR future? Where will you be in your chosen career 10, 15, 20 years from now? Inquire NOW to find out how your abilities and training may mean a full and satisfying life for you with the leader in aircraft engineering. Salary, insurance and retirement benefits are most liberal. Secure application from your college placement office or write: Manager, ENGINEERING PERSONNEL.

BELL Aircraft CORPORATION

P. O. BOX 1, BUFFALO 5, NEW YORK

CAREER OPPORTUNITIES

Check Yourself:

- ☐ Electrical Designer
- ☐ Thermodynamicist
- ☐ Aerodynamicist
- ☐ Electronics Engineer
- ☐ Servomechanisms Engineer
- ☐ Electro-mechanical Engineer
- ☐ Telemetering Engineer
- ☐ Structural Analysis Engineer
- ☐ Instrumentation Engineer
- ☐ Rocket Motor Development Engineer
- ☐ Structural Designer
- ☐ Rocket Motor Test Engineer
- ☐ Missile Coordinator
- ☐ Flight Test Engineer
- ☐ Transmission Design Engineer
- ☐ Project Engineer
- ☐ Microwave Engineer
- ☐ Flutter Engineer
- ☐ Static Test Engineer
- ☐ Vibrations Engineer
- ☐ Weight Control Engineer
- ☐ Specifications Engineer
- ☐ Radar Engineer
- ☐ Structures Research Engineer
- ☐ Communications Engineer
- ☐ Dynamics Engineer
- ☐ Ultra-high Frequency Engineer
- ☐ Missile Test Engineer
- ☐ Electrical Systems Engineer
- ☐ Mechanical Systems Engineer

Continued From Page 11

welded frames and are equipped with Budd disc brakes. The brakes operate in conjunction with the Budd Rolocron anti-wheel slide device and give the greatest possible effective control over the train. Under service application they have stopped a fully loaded car from 85 miles per hour in 2330 feet, giving a deceleration of 2.8 miles per hours per second. Under emergency application, employing sand, they have stopped the car at 3.5 miles per hour per second. To increase rail adhesion, the car is equipped with both automatic and manual sanding devices.

An operator's station, located at the right-hand side of the vestibule at each end of the car, contains a master controller, the engineman's brake valve, a bell-operating valve whistle cord, an electric heater, a wind-shield wiper and defroster. Controls are similar to the equipment used on present cars with which enginemen are familiar.

The new car opens a new approach in the economics of railroading and in the character of railroad service. It is designed for passenger comfort and speed as well as for flexibility and reliability in operation. The new car enables railroads to provide more frequent service on an economical basis and is suited for practically every type of passenger run.

Portable Television Camera

A new portable television camera and transmitting station, designed to operate in the field as a one-man back-pack unit has been developed by RCA. Weighing only 53 pounds, the back-pack station is planned to function with its own battery-power supply. It has a range of approximately one mile. Because of its easy portability, numerous applications for the new equipment are foreseen by RCA research engineers. Among these are news coverage, with television-equipped reporters flashing pictures and commentary directly to editorial rooms, and remote industrial viewing and control.

The new transmitter operates in conjunction with a control station which may be located as far as a mile from the camera. Signals corresponding to the scene being televised are transmitted to the control point on an ultra-high frequency with a power of two watts. In addition to acting as a monitor for the televised picture, the control point performs two other functions. It sends out a stream of pulses which stabilize the camera and can be used also to issue vocal instructions to the cameraman.

Recent developments in the design of pencil-sized tubes and other subminiature component parts made possible the impressive reduction in bulk and weight of the equipment.

The back-pack is carried in knapsack fashion, suspended from the narrator's shoulders by flexible straps. Two small antennas extend from the top of the pack and are used respectively to transmit the picture signal to a base station and to receive voice and control signals from that same point.

The camera is an adaptation of the RCA industrial TV camera using the Vidicon tube. As an added feature, the camera includes a miniature kinescope picture tube which serves as a view-finder for the cameraman. Through it he is able to see an exact reproduction of the scene on which the camera lens is focused.

The equipment contains 42 tubes which, with their associated circuits, provide all synchronizing frequencies for a standard 525-line, 30-frame in-

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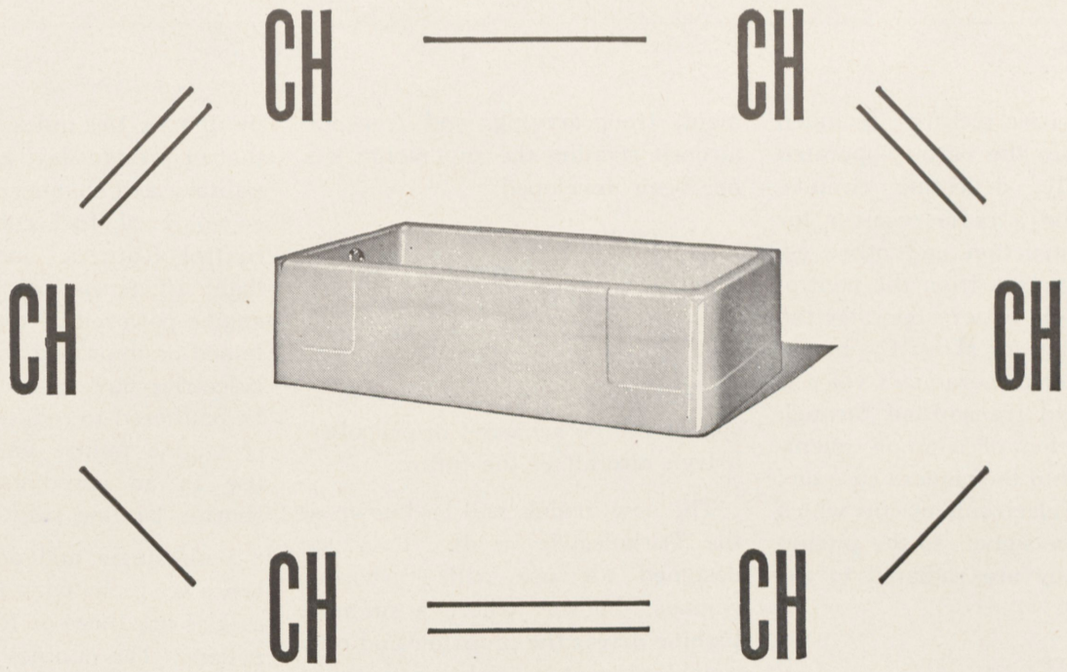

Ever use this ring around your bathtub?

PERHAPS you didn't know that if you sprinkle a little of a synthetic detergent in the tub before you draw your bath, you'll have lots of suds and *no* dirty ring around the tub.

Synthetic detergents—as well as aspirin, nylon, plastics, synthetic rubber and hundreds of other products—are made with benzene, C_6H_6, normally obtained from coal tar. There's now a demand for benzene such as has never been before. But production of benzene from coke ovens cannot be greatly expanded. So it's easy to see why, even before the cold war got hotter, it was good news that Standard Oil and other petroleum companies could manufacture benzene and other aromatics from petroleum.

During World War II, Standard Oil made "nitration grade" toluene for TNT manufacturers . . . as much annually as the previous production of all of the nation's coke ovens. Today, it appears that these facilities are more urgently needed to help supply the great demand for benzene. Plans also call for production of toluene and xylene of sufficient purity for much needed solvents and for aviation gasoline. Also possible are additional facilities to again make "nitration grade" toluene for TNT production when needed.

Thus Standard Oil's technically trained men have helped develop a vast new source of aromatics, a vast new reservoir of strength for American fighting forces. Increased supplies of aromatics also mean better living for American civilians. All of us, even the small boy who no longer has to scrub the ring from a bathtub, can thank them.

Standard Oil Company

910 South Michigan Avenue Chicago 80, Illinois

STANDARD

Continued From Page 24

terlaced television picture. Included in the unit are the battery-operated power supply, deflecting circuits, amplifiers, and a radio receiver for receiving instruction and other essential information from the control point. A single battery operates the portable station for about 1½ hours.

The narrator-cameraman's voice is picked up and transmitted through the combination of a small microphone built into the camera case and an ingenious electronic circuit which adds the voice signals to the picture signals as they are radiated to the control point.

Turboelectrics

An advanced series of propellers which will pave the way to the eventual attainment of speeds up to 1,000 miles per hours with long-range, propeller-driven bombardment, troopcarrying, and transport aircraft rivaling the supersonic jets, has been developed.

At first the newly announced propellers will be used in aircraft capable of cruising 500 to 600 miles per hour. However, the engineers declare the research on which they are based indicates that twice these speeds can be achieved in propeller-driven aircraft of the future.

The new models will be known as the Turbolectric series. They are designed for use with turboprop engines, the sort where a spinning turbine drives the propeller and only a small percentage of the energy goes into the jet exhaust.

Used in combination with these superpower gas-turbine engines, the Turbolectrics will immediately increase the performance of aircraft by 100 to 150 miles per hour over that of present-day, propeller-driven military and commercial types. The economy of fuel consumption, the control features, and the over-all flight efficiencies of today's piston-engine-powered aircraft will be retained or improved. All of the Turbolectrics have propellers that may be feathered to reduce drag in event of engine failure and reversed for use as an aerodynamic brake to shorten landing runs.

Both single and double propeller types are included in the series. The singles are three-or four-bladed propellers. The double—props, one behind the other and rotating in opposite directions-have six or eight blades arranged in two rows of three or four each. Blades are approximately rectangular in shape with square tips.

The largest of the Turbolectrics will be able to harness turboprop engines of 20,000 horsepower—five to six times the 3,500 horsepower rating of the most powerful reciprocating engine now in production.

Radio-Frequency Micropotentiometer

Extremely simple devices which produce r-f voltages at a very low impedance and at a wide range of frequences have been conceived and developed. Known as "R-F Micropotentiometers," they provide accurate voltages from 1 to 10 microvolts without the use of attenuators at frequencies up to 300 megacyles and above. Thus, convenient standards of low voltages are made available and should greatly reduce equipment and shielding problems encountered in calibration of present-day commercial voltage generators, attenuators, voltmeters, and other radio-frequency equipment.

The micropotentiometers should prove especially useful in measure-

Continued on page 28

Music's immortals play again, sing again, in RCA Victor's "Treasury of Immortal Performances"

A treasury of **Music's Immortals**

Now artists whose names are musical legend live again for the modern listener. You can hear them, at their finest, in RCA Victor's "Treasury of Immortal Performances."

In recreating these performances on both 33 and 45 rpm, acoustical engineers drew on a vault of master records guarded for posterity by RCA Victor. But new electronic techniques, developed through RCA research, give the new records a quality far surpassing that of the originals.

Because RCA Victor could draw on so vast a storehouse of the past, there is something in the "Treasury of Immortal Performances" for listeners of every age and taste. Caruso sings light and serious music—as do Schumann-Heink, Mary Garden, and others . . . Paderewski is here . . . and, if your taste is for popular music, such greats as Berigan, Armstrong, Waller, in rare early records.

* * *

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

RESEARCH . . .

Continued From Page 26

ments of radio receiver sensitivity. Here the large disagreement between various standard voltage generators at high frequencies and low voltage levels has been due to three major causes. First, generator output impedance and receiver input impedance are not ordinarily known as functions of changing frequencies. Second, extreme care is necessary in using precision voltage dropping attentuators. Finally, the long-time calibration stability of vacuum-tube voltmeters is uncertain. For these reasons, manufacturers of voltage generators have not been able to guarantee the accuracy of their equipment at all frequencies. Development of the micropotentiometers now appears to have removed most of the obstacles to standardization of receiver sensitivity.

These micropotentiometers are the first low-impedance devices which provide r-f voltages in the microvolt range and which make these low voltages available without the use of attentuators. They thus provide useful tools for many problems arising where constant voltage and low voltage sources are required. The devices are inherently frequency-insensitive up to and above 300 Mc. Extremely low and essentially nonreactive output impedance facilitates their use for checks and references with standard voltage generators. They may be used for direct calibration of percentage-modulation indicators. By means of known voltage ratios, the micropotentiometers may be used to extend the range for checking attentuators up to 120 db. or higher. Simplicity of operation, trouble-free circuitry, flexibiilty, and absence of serious shielding problems make these instruments particularly adaptable to use by personnel of limited training.

In comparing the micropotentiometers with other sources, such as a

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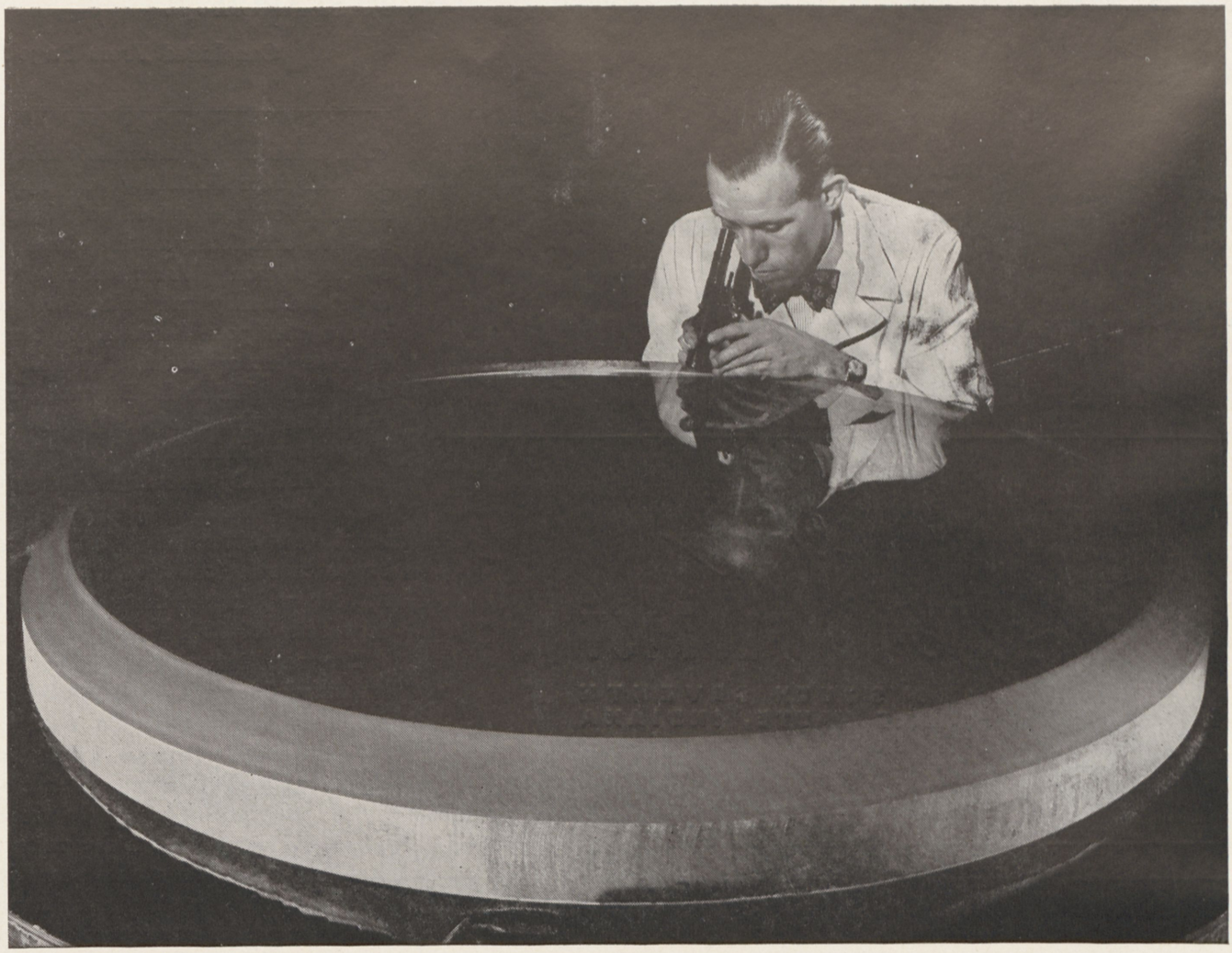


One-ton window for a supersonic wind tunnel

Just exactly how does a jet plane behave when it is roaring through the air at supersonic speed?

Scientists, peering through windows of Corning optical glass such as the one you see here, will soon have a more thorough answer to this question than ever before.

This piece of optical glass, weighing more than a ton, is one of two of the largest pieces of optical glass ever made. They will be used in the six by six-foot supersonic wind tunnel of the Ames Aeronautical Laboratory of The National Advisory Committee for Aeronautics at Moffett Field, California.

This tunnel generates wind velocities up to twice the speed of sound, equivalent to 1500 miles per hour at sea level.

The windows are six inches thick and 52 inches in diameter. They are so clear and free of imperfections that photographs of shock-wave and air-flow patterns can be made through them—to furnish scientific data of great value in the design of future airplanes and missiles for supersonic flight.

Until Corning research and glass-making skill found a way to mass-produce pure optical glass in large shapes, science had no suitable substance for wind-tunnel windows. Perfect optical glass with enough area to permit a full view—and thick enough to withstand the enormous wind-tunnel forces—was unheard-of.

Today, Corning can make lens blanks, directly from the molten glass, ranging in size from tiny camera lenses to these gigantic windows.

This Corning development is not only helping to make this country independent of foreign sources of optical glass; it also promises many new tools for science, paves the way for widespread improvement in products and processes.

Throughout industry, *Corning means research in glass*—research which has continually developed new kinds of glass and new uses for existing ones. As Corning has steadily pushed back the frontiers of glass knowledge, glass has become a material of limitless uses.

So we suggest—if you are thinking in terms of improved products or processes—that you keep glass in mind.

To learn more about Corning optical glass, or the many other glasses Corning makes, simply write us—preferably before your planning reaches the blueprint stage, at *Box S 120. Corning Glass Works, Corning, New York.*

CORNING
means research in glass

RESEARCH . . .

Concluded From Page 28

voltage measuring thermistor bridge, absolute reproducibility and agreement have been limited only by the relative complexity of the standards of comparison. Verification of the exact frequency and voltage ranges of the micropotentiometers in terms of other independent standards is still in progress at the Bureau, along with other phases of design and application. Probably the greatest single difficulty encountered in this work has been the lack of stable sensitive receivers which can indicate one microvolt (or lower voltages) at 100 Mc and higher frequencies with accuracies of 10 percent or better.

The new instruments consist essentially of appropriately housed and mounted current-carrying elements together with means for monitoring the currents they carry. Their electrical constants are simply determined by using known d-c voltages and currents. The current-carrying elements are annular membranes, either metallic or nonmetallic, of various radii, thicknesses, and electrical resistivities. Monitoring may be accomplished by means of thermocouples, thermoelements, bolometers, stable vacuum tube voltmeters, or other devices whose indications are independent of frequency. Thermoelements have been used in measurements of 1 to 100,000-microvolt measurements in the region of 1000Mc.

THE DU PONT DIGEST

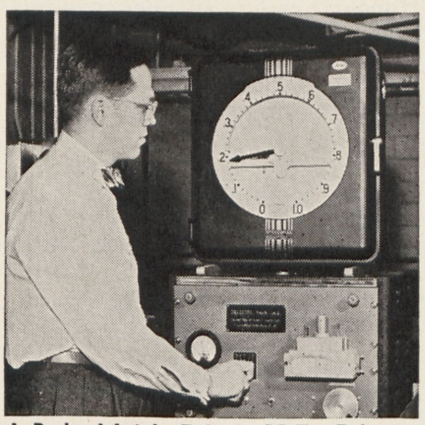
The Brains Behind the "Electric Brains"

How Du Pont Research engineers apply electronics to chemical manufacture

When you hear that a scientist works for a chemical company, it's natural to assume he is a chemist. Oddly enough, the Du Pont Company employs about as many engineers as chemists for normal technical work. Many are chemical engineers. But when it comes to basic research on instrumentation—a very important activity—both chemists and chemical engineers are in the minority.

This fundamental work is largely carried out in a laboratory of the Engineering Department, where electrical engineers, physicists and other scientists are deeply involved in electronics studies. They have some amazing devices to their credit—devices for monitoring industrial operations continuously and automatically.

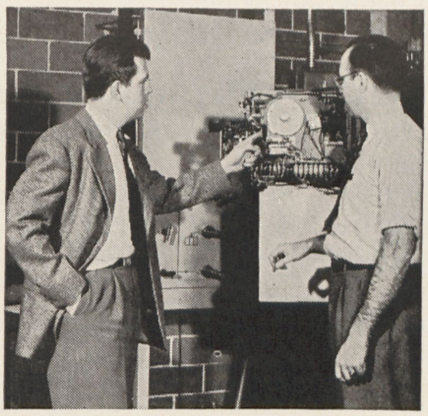
Some of their ideas are spurred by a need in an existing plant. But the design of a new one may also lean heavily on novel instruments. Take, for instance, a new Du Pont plant that uses cyanides. Of course, these compounds are very poisonous. So when the plant was being designed, engineers were aware of the importance of detecting accidental contamination of the cooling water. In fact, the whole question of getting into production hinged on the problem of dealing with plant effluents.



J. Packard Laird, *B.S. in M.E., Princeton 1942, operates Dielectric Yarn Gage in order to determine small changes in the denier of synthetic textile yarns.*

Chemical-electronic watchdog

Once the only way to detect a fraction of a part per million of cyanide was to raise fish in water containing plant effluents. But this required a staff of experts to check constantly on the health of the fish. It was too slow and inaccurate. So the engineers developed a "chemical-electronic watchdog." Twenty-four hours a day, it automatically analyzes for cyanide to one part per million. If an excessive amount is present, it rings an alarm bell. Periodically, the machine pumps cyanide through itself to be sure it is registering. All the plant men have to do is take readings occasionally and fill the tanks with reagents once a week.



Fred R. Studer *(left), B. Met. E., Rensselaer Polytechnic Institute 1950, examines a Pressure Strain Recorder with Allen R. Furbeck, E.E., Princeton 1939.*

This is just one of many electronic devices developed by Du Pont research engineers. Others—ranging from ultraviolet gas analyzers and multivariable recorders to nylon denier gages—play a vital part in improving production methods. Many of them not only "observe" continuously, but automatically correct anything that goes wrong.

DID YOU KNOW . . .

While Du Pont is the largest manufacturer of diversified chemicals in the U.S., its share of the total chemical business is only about seven per cent. It has one to fifteen major competitors for all its major product lines.

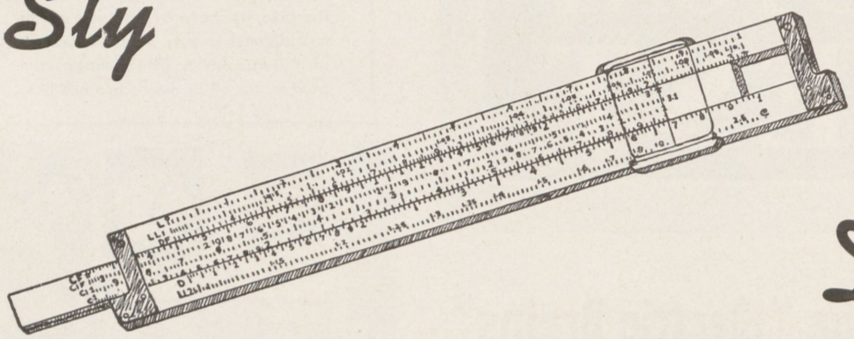
Richard G. Jackson *(left), B.S. in Ch. E., Columbia 1942, and Gregory L. Laserson, Ph.D. in M.E., Columbia 1949, test an Infrared Gas Analyzer which may be used to continuously analyze and control any infrared absorbing gas in a mixture.*

Research engineers at work

The term "research engineer," by the way, is a loose one. It may refer to an electronics engineer working on a new photo-multiplier circuit—or a physicist using his optics and spectrophotometry in designing a color-matching instrument. It may cover the activities of a physical chemist developing a continuous turbidimetric analysis—or a mechanical engineer evaluating a pneumatic servomechanism.

For the versatile young scientist, instrumentation research offers a fine opportunity to turn his talents into faster, better and safer production in the chemical industry.

Sly Droolings



By Richard Myhre, soph., m.e.
and Bud Welling, soph., ch.e.

Soph: "Did you ever take chloroform?"

Frosh: "No, who teaches it?"

* * * * *

Prof: "I believe you missed my class yesterday."

Senior: "Why no, I didn't. Not in the least."

* * * * *

An indignant sorority sent this note to a fraternity house. "Your course in anatomy is not appreciated. Please keep the blinds down.

The house manager returned the note, after scribbling on the back: "Course not compulsory."

* * * * *

M.E.: May I take you home?

She: Sure, where do you live?

Lady (holding a cookie above a dog): "Speak! Speak!"

Dog: "Why, I hardly know what to say!"

* * * * *

Jane: "Why is it that you have so many boy friends?"

Alice: "I give up."

* * * * *

"Lady, if you'll give us a nickel my little brother will imitate a chicken."

"What will he do?" asked the lady, "cackle like a hen?"

"Naw," replied the boy in disgust. "He wouldn't do a cheap imitation like that—he'll eat a worm!"

* * * * *

"Someone left the lid up an' I damn near drowned."

"Did you get home all right after the party last night?"

"Fine, thanks, except that as I was turning into the street, some idiot stepped on my fingers."

* * * * *

Prof.: Hey, don't spit on the floor.

M.E.: 'Smatter does it leak?

* * * * *

The burlesque queen woke up in jail to find herself fully clothed. "Help! Help!" she screamed, "I've been draped."

* * * * *

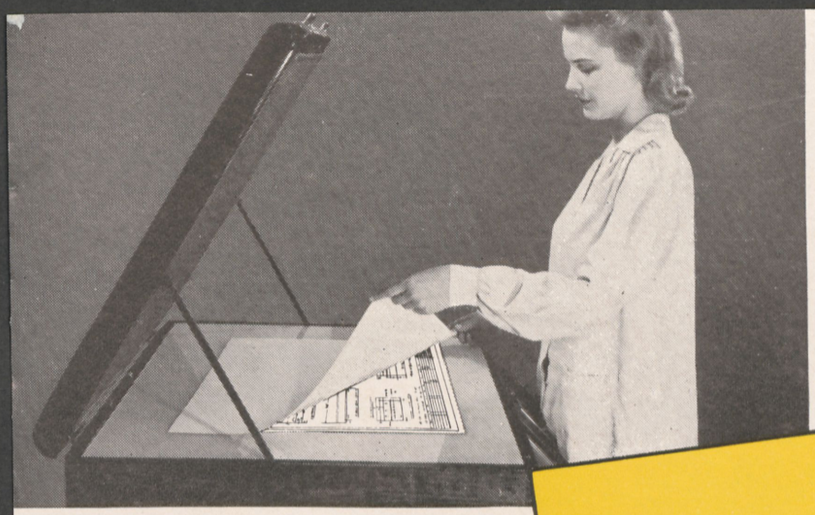
Two men were working on the White House lawn, each supplied with a small push cart upon which was a garbage can. They walked about picking up papers with a long spear. One spied a piece of tissue and started to spear it, when suddenly a gust of wind came up and blew the paper into the White House through an open window.

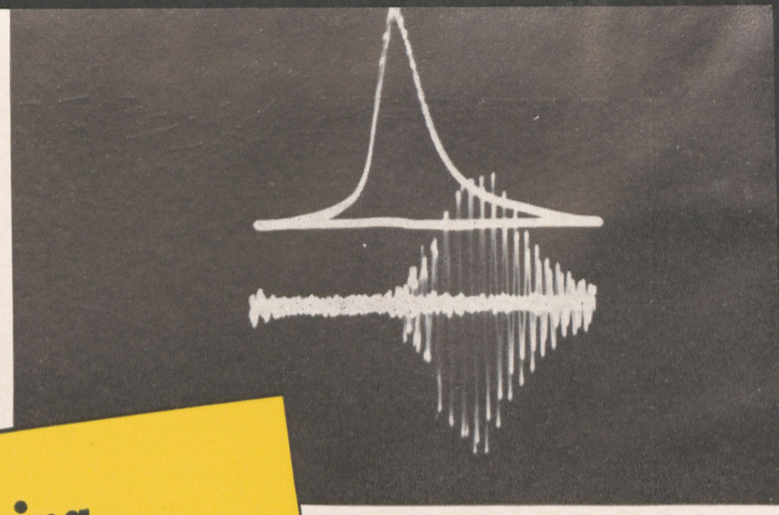
The man became frantic and rushed into the building. He returned shortly after and said: "I was too late. He had already signed it."

* * * * *

The small town barber was more willing than expert. After being shaved, the customer asked for a glass of water. "Are you thirsty, sir?" asked the barber.

"No," answered the customer weakly, "I just wanted to see if my face still holds water."

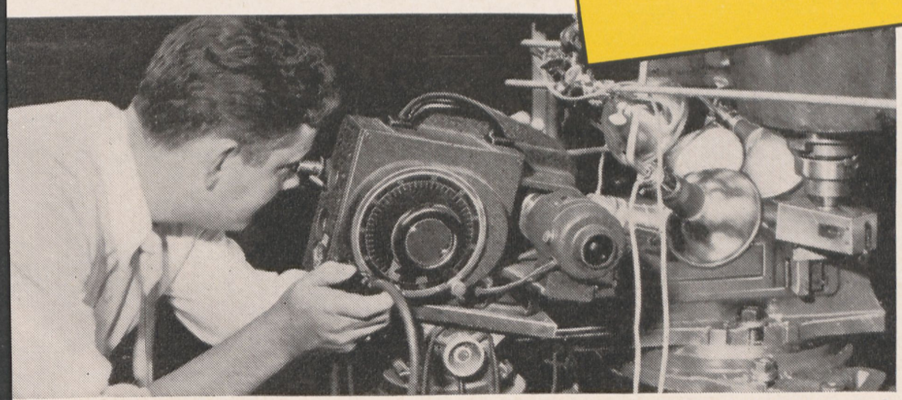


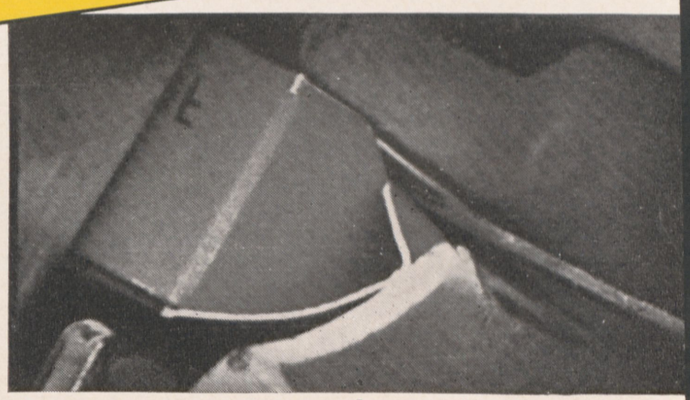


Engineering makes good use of photography's flashing speed

Reproduces Drawings In Seconds. Data, drawings, shop orders, specifications—all can be photocopied fast and accurately. Kodagraph papers, cloth, and film save time, protect originals from wear and tear—even produce legible copies from faded and worn material.

Captures The Flick of Instruments. The flash of the cathode-tube beam and the swift swing of the galvanometer mirror are not too fast for photography. It captures and records readings so that they can be analyzed and reveal all the information they contain.





Records Motion Far Too Fast To See. With the Kodak High Speed Camera a second of motion is spread over three minutes. You can analyze rapid movement, detect faulty action, spot points of wear, see ways to improve design and make a stronger, better product. (Illustration above shows part of a box carton sealing machine in action.)

All through his work, the engineer finds photography an important aid. Its speed saves him time everywhere from learning the strength of materials to improving design and reproducing his drawings. Its accuracy and its ability to enlarge and reduce permit him to have data, plans, and specifications in any size—in any quantity. And with microfilming he can record and keep important material ready for instant reference in about 2% of the usual filing space.

Eastman Kodak Company, Rochester 4, N. Y.

Send for this Free Book

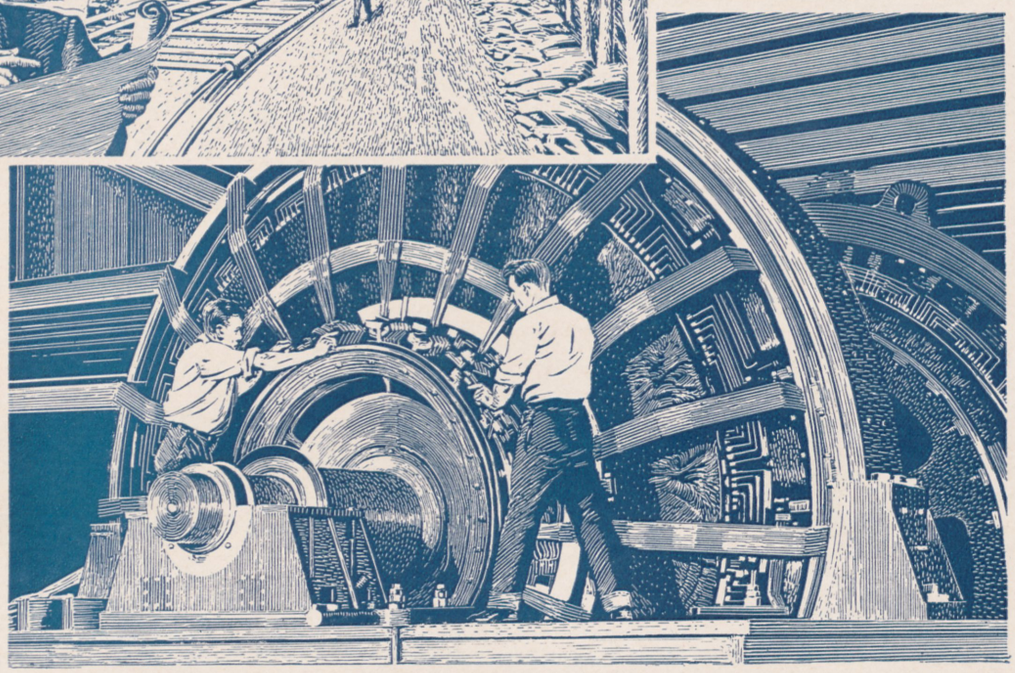
It tells how photography is used to:
Speed production • Cut engineering time • Assure quality maintenance • Train more workers faster • Bring new horizons to research

College graduates in the physical sciences, engineering, and business administration regularly find employment with Kodak. Interested students should consult their placement office or write direct to Business and Technical Personnel Department, Eastman Kodak Company, 343 State Street, Rochester 4, N. Y.

Kodak
TRADE-MARK

PROBLEM: INSTALL CABLE UNDER GREAT DIVIDE.

G-E engineers devised system for using irrigation tunnel to carry power cable. Al Lee, U. of Denver '37, directed project.



PROBLEM: BUILD MOTORS, CONTROLS TO POWER A STEEL MILL.

Modern mills equipped by General Electric handle hot steel rolling at 60 miles per hour.

Specialists at General Electric tackle many of America's toughest technical problems

Some of the G-E products that serve you best are those we make for others—for the armed services, for the utility companies, and for industry generally.

It's estimated that during 1951 more than one-third of G-E production will be for the armed services—to help fill America's military needs.

For the Air Force, for example, General Electric builds jet engines, instruments, gunnery systems. For the Army: such products as radar and equipment for guided missiles. For the Navy: turbines to propel ships, electric drive and controls for turning turrets, etc.

For industry, General Electric builds the motors that drive steel mills, logging mills, printing presses . . . the electrical equipment for mines and textile mills . . . the turbine-generators that increase the nation's supply of electricity.

The hundreds of G-E engineers, physicists, chemists, and other specialists assigned to these projects are challenged by some of the most difficult, most complex technical problems that men are asked to solve. They work with the assurance that their contributions are meaningful and important.

You can put your confidence in—

GENERAL ELECTRIC