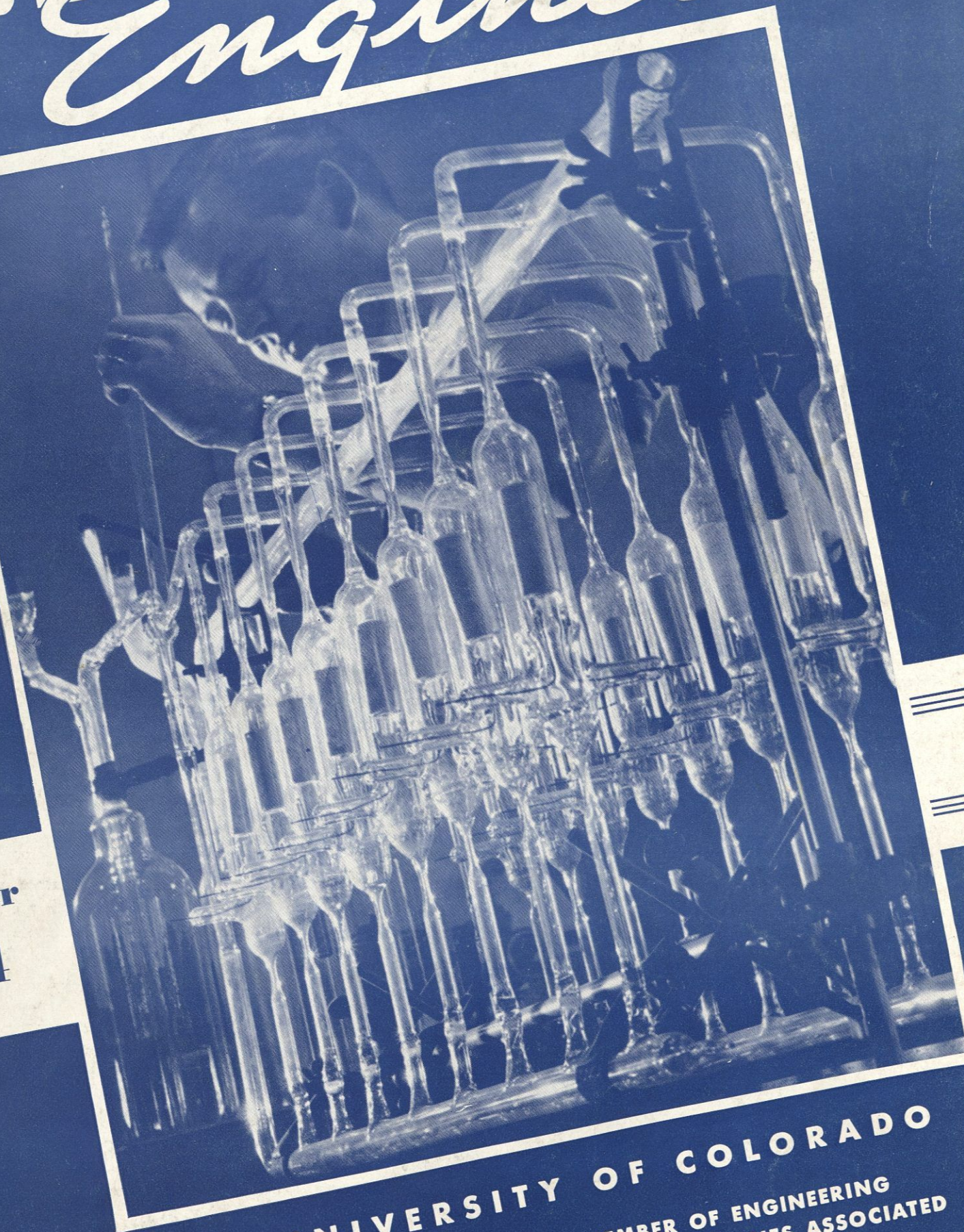
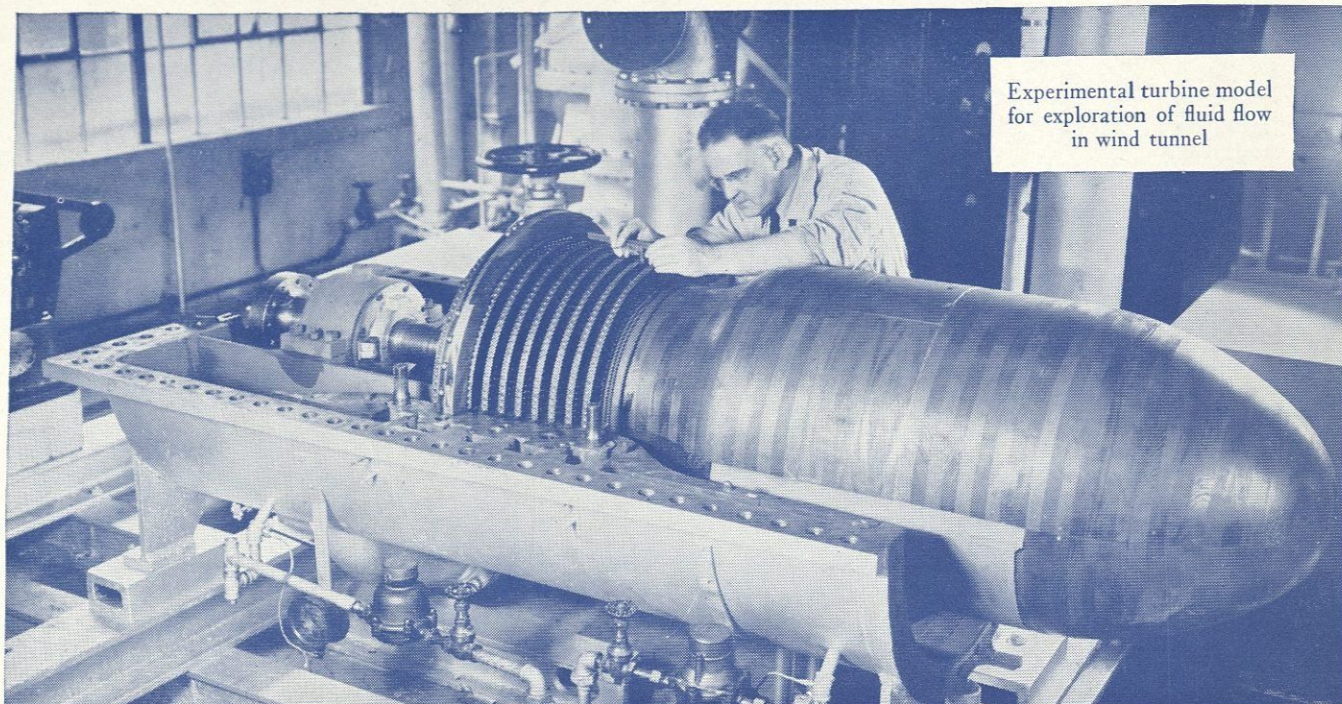


The **COLORADO** *Engineer*

**November
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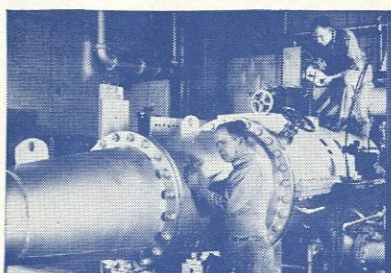


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Experimental turbine model for exploration of fluid flow in wind tunnel

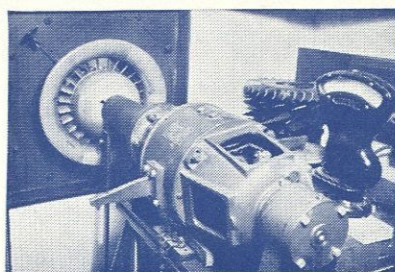
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Wind tunnel for testing model shown above



Photoelastic study of loaded turbine blade root



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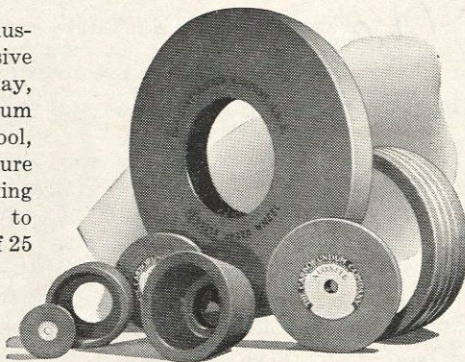


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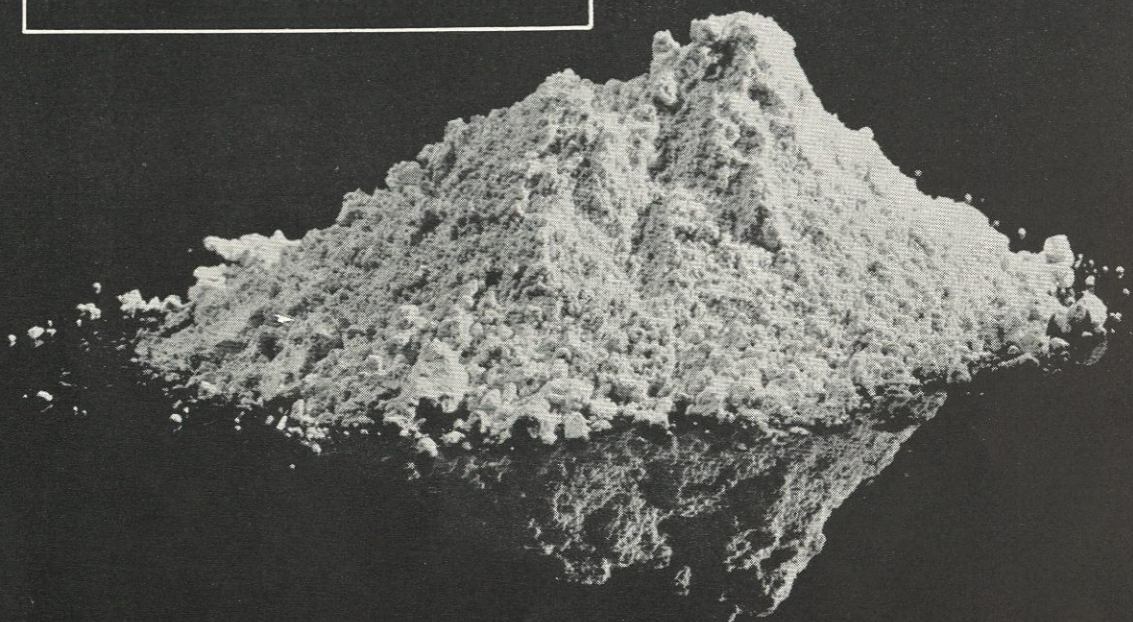


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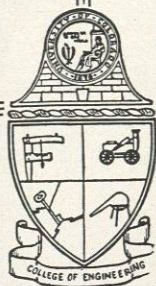
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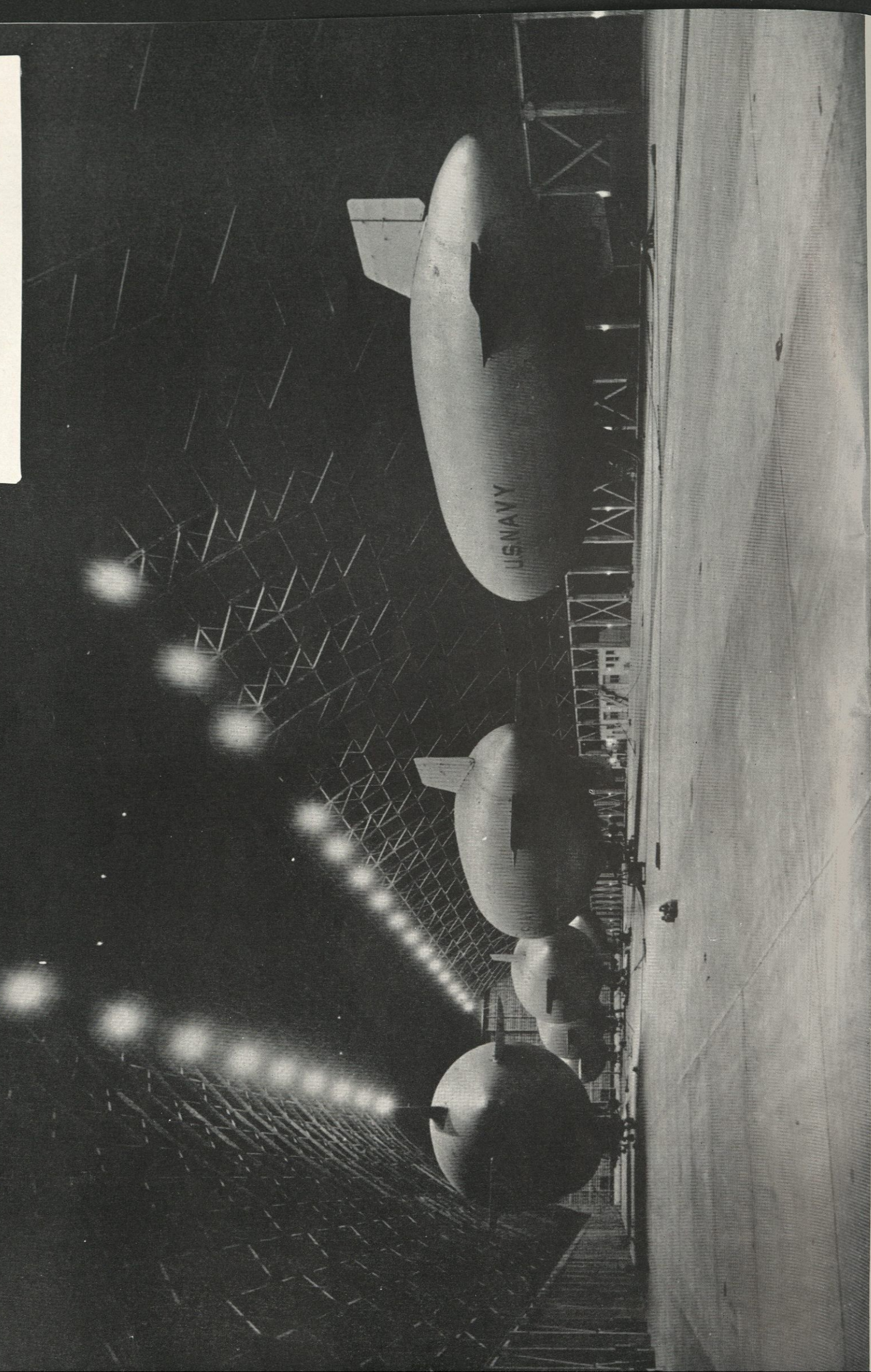
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—cut courtesy Westinghouse.



Air Transportation in the Post War World

By **WAYNE S. BEATTIE**

Professor of Mechanical Engineering
University of Colorado

ANY program looking to conditions in the post-war period must consider the place which air transportation will play in the years ahead. War periods are in themselves emergency periods, and it is difficult to predict post-war practices from conditions existent in years of war. To a comparable degree, the use of pre-war conditions to predict post-war practices leads to only partial conclusions. By extrapolation of these trends, however, we may be able to throw some light on the picture.

We may be reasonably certain of some things. There will be more extensive inter-continent travel, trans-oceanic travel, and inter-United States travel. Of these, our greatest interest will be in the day by day going and coming, the getting from here to there and back again in these United States. Here will arise most often the necessity of deciding whether we shall choose air travel or surface travel.

Taking a glance at pre-war travel, we find that in the five-year period preceding Pearl Harbor the average coach or bus trip was less than eighty miles; first-class rail trip 390 miles; airplane trip 380 miles. The average revenue per passenger-mile for these three classes of travel was, respectively, 1.75 cents, 2.80 cents, and 5.00 cents. However, in any comparison between revenue from air travel and from surface travel, allowance must be made for the difference in air distance and surface distance between points. In practically all cases air distances are less than surface distances, although there are rare exceptions, such as are found between New York and Philadelphia, where the air distance is actually greater than the rail distance. In some instances, depending on location and terrain, the difference may run as high as thirty percent, whereas in others there is no appreciable difference. It would be fair to assume as a national average that surface distances are eighteen percent greater than air distances. This, then, would give a comparative revenue per passenger-mile of 2.07 cents, 3.30 cents, and 5.00 cents.

It is interesting to note that in the five-year period before Pearl Harbor, inter-city rail travel decreased by six percent while the ratio of air travel to the total travel by air and by Pullman increased from one in three hundred to one in forty. Nevertheless, up to the end of 1940 the airplane had made only slight inroads on the total travel; and had

all air travel been returned to the rails, it would have resulted in less than a four percent increase in rail travel.

As late as 1941 people in general were not ready to use air transportation, and in deciding whether to go by airplane or by train it was necessary to weigh the factors encouraging air travel against the discouraging factors. The factors encouraging decisions to travel by air included speed, possible saving in cost, direct travel without change, and prestige of air travel. Factors discouraging air travel included fear, possible cancellation of the flight trip, undependable time of arrival, time and cost of getting to and from the airport, and air sickness.

Speed is becoming more and more an important factor in travel, but the speed advantage of air travel will depend largely on locality and distance. Greensburg, Pennsylvania, is thirty-two rail miles from Pittsburgh and it requires forty-five minutes to get to Pittsburgh by rail. Greensburg is served by a scheduled feeder pickup airplane which makes the trip to the Pittsburgh airport in thirteen minutes. If Mr. Smith from Greensburg is going to take the trunk-line plane from Pittsburgh to Washington he will save one and one-half hours by using the feeder plane. If, however, Mrs. Smith is going shopping in downtown Pittsburgh she will save no less than one-half hour by travelling by train. From New York to Philadelphia train travel has a time advantage over air travel. Baltimore is 184 miles from New York, and from the business district, the two travel methods require the same elapsed time. However, a comparison of air travel to fastest surface travel between New York and Los Angeles shows sixty hours by rail against twenty hours by air. Traffic surveys by the Civil Aeronautics Board indicate that the part of the total passenger travel which moves by air tends to increase with increase in distance up to 1000 miles, but remains fairly constant after that.

In 1941, average travel speeds over the United States were: freight trains and busses, seventeen miles per hour; first-class trains, thirty-six miles per hour; scheduled airlines, one hundred ten miles per hour. You say speed up the trains. Higher train speeds have been demonstrated. Fifty years ago the Empire State Express averaged 112 miles

per hour on a short run. Ten years later the Pennsylvania line reported an average of 124 miles per hour on a six-mile test run. Five years ago a German three-car Diesel-powered train averaged 124 miles per hour on the 186-mile run from Berlin to Hamburg, and on a 55-mile stretch averaged 133 miles per hour. The Santa Fe Superchief maintains parts of its run on a schedule of 108 miles per hour.

Higher train speeds will be realized in the near future. However, important increases in speed will necessitate sweeping changes in roadbeds, rails, track curves, signal systems, and rolling stocks—even possibly requiring the use of double-track systems because of the problems of using a single signal system for the slow and the fast traffic, and because curves banked properly for fast trains are not satisfactory for slow trains. The change-over to meet the requirements of high speeds would involve the investment of billions of dollars, and might reflect in an upward adjustment of passenger-mile costs. It is inherently more difficult to speed up surface travel than it is to speed up air travel.

Travel cost becomes a vital factor in predicting the extent of air transportation. One of the salient facts about air transportation is that it is transportation. The fact that it has been associated with what we call air-mindedness, that it has been glamorized and pictured as a distinct method of transportation is purely incidental. It will justify itself only in as far as it satisfies the basic requirements of transporting swiftly and safely, and pleasantly and economically.

In analyzing relative cost of air travel and surface travel, business travel and pleasure travel may require a different approach. If business time is chargeable, then air travel may prove more attractive where significant amounts of business time are lost while travelling. In general, up to the present time surface travel has proven more economical for day-time trips of 200 miles or less, and night trips of 600 miles or less. For trips involving distances greater than these there would appear to be more advantage to air travel. Comparing air travel to Pullman travel, it is found that costs between New York and Washington are definitely in favor of rail travel. From New York to Chicago travel costs are: airplane, \$50.09; train \$46.78. On this trip no loss of business time is considered. From New York to Los Angeles comparative costs are:

	AIRLINES	FIRST CLASS RAIL
Ticket	\$153.49	\$111.33
Meals and Tips.....		13.90
Lower Berth		28.68
Taxi	2.05	
Total	\$155.54	\$153.91
Business Time Lost	20.00	62.50
		(at \$2.50 per hour)
Total	\$175.54	\$216.41

While there is little difference between the two methods of travel from the point of out-of-pocket expense, the saving in total cost is distinctly in favor of air transportation. With the establishing of an eight-hour over-night schedule between New York and Pacific coast points, the advantage will become even more favorable to air transportation.

On the side of factors discouraging air travel brief consideration will be given to: fears, cancellation of scheduled trips, and air sickness.

Fears have been historic in all new methods of travel, being in many cases more pronounced in members of the family or employer than in the one who travels. Admitting that three-dimensional travel has inherently more possibilities of danger than surface travel, let us inquire just how dangerous air travel is. Civil Aeronautics Board reports covering scheduled airline flights for the year 1943 show twenty-three fatalities in 1,650,000,000 passenger miles flown. This represents approximately one fatality in 72,000,000 passenger miles. Statistically, then, one would have to live to a ripe old age and travel much to meet his first air accident.

Cancellation of scheduled air trips has been a right reserved by the airlines, and it has proven very inconvenient at times. An outstanding example of this was the cancellation, because of weather conditions, of all flights out of New York the four days immediately before Christmas in 1940. With the unlimited fund of experience in instrument flying coming out of the war, flight cancellations give promise of being reduced to a fraction of pre-war figures.

As long as we deal with human kind we shall have problems of travel sickness. It has always occurred to a degree in travel on land and on the sea, as well as in the air. Medical research has contributed much to its solution. More scientific construction; better sound proofing; and better loading arrangement have been vital in reducing air sickness. Reports from airline statistics for the year 1942 show that only one passenger per 1000 suffers from altitude; one in 1800 from ear trouble; and one in 2500 from nervousness.

The question naturally arises as to how much air travel there has been, and how much we may expect in the future. The following table is de-

(Continued on page 30)

The Pueblo Practice School

By **CHARLES A. HUTCHINSON, JR.**

B.S. (Ch.E.) 1944 A.S. V-12 U.S.N.R.

PROBABLY the questions that present themselves more frequently than any other quandaries to the students of the Engineering school are "What does industry mean to me, and how is the theoretical knowledge I am now acquiring to apply to actual situations?" Universities and colleges throughout the country have made valiant efforts to present answers to these problems through laboratory studies of various sorts and courses in the practical application of theoretical knowledge. Unsatisfied, however, with these methods, the University of Colorado has adopted a system that is practically unique in the western part of the United States. This ultimate step in the preparation of undergraduate engineers for the world of industry is the University of Colorado School of Chemical Engineering Practice. This school was originally inaugurated at the Great Western Sugar Company plant in Johnstown, Colorado, but, when the government closed this plant because of the war, the practice school became a thing of the past with no immediately appearing possibility of reopening until after the war. This came as a blow to the Chemical Engineering Department of the University, for it eliminated the best method for presenting to the students the practical knowledge that is of such

great value. A remedy for the situation was immediately sought, and, through the diligent efforts of the faculty, a second practice school was tentatively established at the Minnequa plant of the Colorado Fuel and Iron Corporation in Pueblo, Colorado. Shortly thereafter, contracts for the permanent installation of this school were agreed upon, and Dr. George O. G. Löf, associate professor of Chemical Engineering, once again took over the task of direct supervision.

A question must now naturally arise to the effect that if this school is of such value, in what way does it prove its worth? Probably each person that has anything to do with the school would give an answer to this entirely different from anyone else's. Fundamentally, however, all of these answers would explain that it is an outlet for the theoretical knowledge gained by the students in previous "book" courses, it is a method for developing the student's ability to associate with plant men, and, perhaps most important, it shows the students what may be expected of them in industry.

But once again, this doesn't tell much of the school. This may be accomplished by following one cycle in the operation of the Pueblo school from the time the students start their eight-week course until



Ramon Hood (left) and Charles Hutchison (center), are taking tests of temperatures in sintering machines, while Carl Pinamont (right), is recording data.

the labs and shops are finally closed to await the next session. At the very beginning, the laboratory, work-shop, classroom, and office were constructed and equipped. These places, which practically become the home of the students for their stay at the school, are situated at one end of a bank of coke ovens. It is here that all oral reports are given, all preliminary construction accomplished, and studying and other necessary work done.

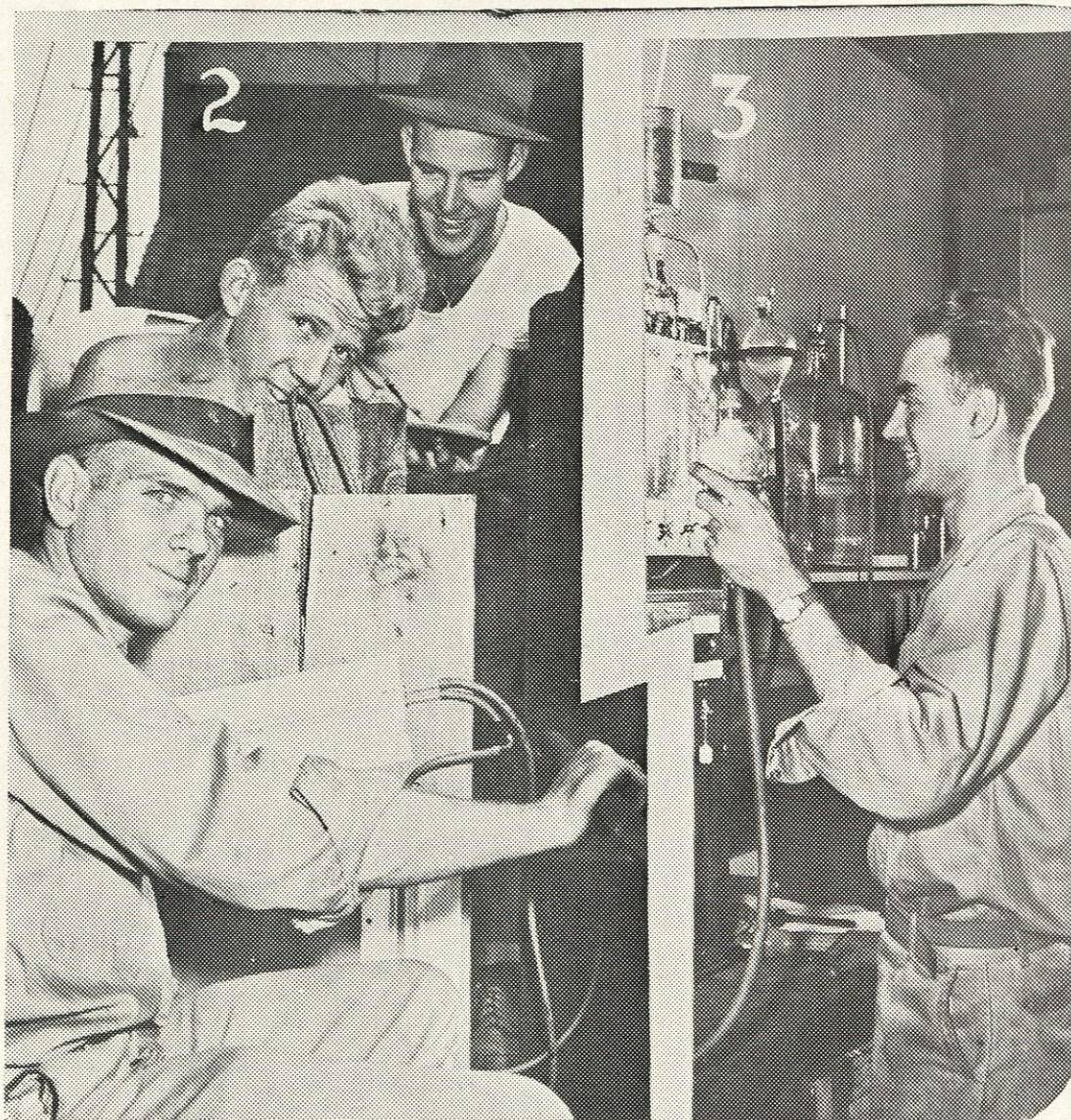
The laboratory is the first part of their new surroundings that the students see, for before anything may be started in the plant proper, the work-shops, etc., must be placed in order. Only then does the actual work of the practice school get attention.

The first week of work at the plant consisted of several conducted inspections of the plant and numerous individual inspections of the various operations. From the information thus attained, complete flow-sheets were drawn including all appa-

ratus and materials involved in the production of steel and its products. The complexities of the future tests and experiments were now evident to the students for practically all operations involved quantities that plant officials deemed impossible to measure.

If the next seven weeks comprising the balance of the practice school session were to be described under a heading such as "The Lives of Practice School Students", without exception, the students would rise and claim that one has to be crazy to call such an existence "living". Sleep was rapidly becoming an unknown quantity, and the heat of the furnaces began to take its toll. The tests that were conducted during this period covered the major portion of the plant. The preliminary short practice investigations included such studies as the quantities of gases produced in the coke-oven banks and the blast furnaces, the temperature of grates in the

(Continued on page 24)



Don Gunther (front), and Al Look (center), are testing the volume of gas produced at coke oven battery "C", while Russ Kenney, (back), records their findings.

Tom Nevins making analysis of coke gas to help determine relative efficiencies of batteries "C", "D".

Post War Engineering Education and the Humanities

By LLOYD A. BINGHAM

Associate Professor of Electrical Engineering
University of Colorado

ENGINEERING education has the following major responsibilities.*

- (a) It is responsible to the public for seeing to it that the students emerge from college with an attitude and background appropriate to effective citizenship as professional men.
- (b) It is responsible to industry for educational programs suitable for professional personnel in engineering and management.
- (c) It is responsible to the engineering profession for the maintenance of proper educational standards and the inculcation of ethical attitudes and conduct among its graduates.
- (d) Finally, it is responsible to the students themselves for an educational program in which they will be treated as individuals and helped to achieve maximum development of mind and character.

Question: If we agree with the above statements, should we advocate that engineering students be required to take the equivalent of one academic year in a designed sequence of university courses dealing with the humanistic-social studies?*

The responsibilities of the engineering educator, as listed above, mean that he must be concerned not only with the scientific-technological development of the student, but also concerned with what is often known as the student's general culture.

In discussing the quality of the output of our engineering colleges, many have assumed that the cultural development of a student is measured largely by the number of courses he has taken in the humanistic-social stem during his four undergraduate years. It has often been suggested that a student who has taken a "narrow technical course" is uncultured in proportion to the deficiency of the humanistic-social studies in his curriculum. Data which contradict this assumption will be presented later in this article. These data indicate that other means to culture, exclusive of formal university courses, contribute significantly to the total education of many engineering students. Emerson, in his essay "Culture", listed as the "means to culture" the following elements: education, books, compan-

ionships, personal accomplishments, cities, and solitude.

Concrete definitions of education and culture are given by Dr. A. N. Whitehead, mathematician and philosopher, in his essay "The Aims of Education." He writes: "Education is the acquisition of the art of the utilization of knowledge. Culture is activity of thought, and receptiveness to beauty and humane feeling. Scraps of information have nothing to do with it. A merely well-informed man is the most useless bore on God's earth. What we should aim at producing is men who possess both culture and expert knowledge in some special direction. Their expert knowledge will give them the ground to start from, and their culture will lead them as deep as philosophy and as high as art."

The record of engineering graduates in industry indicates that the traditional engineering curricula have been reasonably successful in providing education in the technical field, since students have apparently acquired the art of using technical knowledge. Dr. R. H. Spahr, as director of General Motors Institute, stated that of 235 college-trained presidents in leading American industries, 151 were trained in engineering colleges and 84 in colleges of all other types. Considering the fact that the number of graduates of all other types of colleges is many times greater than the number from engineering colleges, he concluded that the probability of an engineering college graduate becoming president of an American industrial organization was 10-20 times as great as the same probability for a man of different college training. He stated further that if we consider all officers in American industrial organizations, including finance, production, engineering and sales, the probability of an engineering graduate becoming an officer was 25-30 times greater than this probability for a man of different college training.

Do engineering courses have value in the field of *general* culture, if we accept Dr. Whitehead's 3-part definition of culture? Obviously it is possible for any university course, regardless of department within the university, to be so taught that it is devoid of all cultural value, even to requiring no activity of thought. Engineering courses usually have the reputation of requiring activity of thought

* Statements and recommendation of a committee of the Society for the Promotion of Engineering Education, Journal of Engineering Education, May 1944.

in the scientific field. Also, they can be taught so as to develop some receptiveness to the beauty of concise mathematical statement and the elegance of mathematical operations, as, for example, finding the area under a curve by means of integral calculus. There is certainly beauty in the exactness and order of physical phenomena. Considering the activities of engineers in harnessing natural forces to the service of mankind, abolishing human slavery by labor saving machines, protecting man from the perils of floods, droughts, fire, and transportation, and reducing unemployment by the creation of new industries, engineering courses should develop some receptiveness to humane feeling.

How do engineering seniors measure up in general culture after pursuing traditional four-year curricula in which they concentrate on fundamentals in the scientific-technological stem instead of devoting 25% of their studies to the humanistic-social stem period. The Carnegie Foundation for the Advancement of Teaching sponsored a 10-year study called the Pennsylvania Inquiry. The report was published in 1938 after conducting a large number of tests and carefully analyzing the results. Nearly 45,000 different individuals in Pennsylvania took one to three 8 or 12-hour examinations prepared and graded by college professors teaching general science, language, literature, fine arts, and social studies. Originally, those in charge of the study planned to excuse engineering students from taking the tests, as they thought it would be unfair to them on account of the concentration of these students on science and engineering during the last two years of the usual engineering curriculum. However, at the last minute, it was decided to require essentially all students seeking the baccalaureate degree to take the tests. Consequently, over 1,100 engineering students took the tests along with about 9,000 other college students. It is claimed that "no comparable mass of trustworthy information as to the product of American higher education has ever been brought together." The 400-page report,* with over 100 involved charts, substantiates this claim.

In the Pennsylvania Inquiry, the "college senior examination, an inventory of the baccalaureate mind" consisted of four three-hour tests. Of the questions, 21% were on mathematics, physics, chemistry, biology, geography, astronomy, and science methods, 33% were on language, literature, and fine arts, 46% were on social science including ancient civilization, pre-industrial civilization, and modern civilization. In this battery of examinations, there were 580 engineering students among the total of 4,566 examinees. These engineering students, as a

group, led all other groups in their scores. The other groups included those seeking degrees in arts, education, business administration, science, and philosophy. Another test was known as "the general culture test." As the name suggests and the report states, one objective in this test was to eliminate more advanced special topics such as mathematics, physics, and chemistry, which subjects favored high scores by certain curriculum groups of examinees. In this test the questions were 28.3% on history and social studies, 27.2% on translated literature from languages other than English, 23.9% on *general* science, and 20.6% on fine arts. Again the engineering students, in the 7 schools of the 49 participating, led all other curriculum groups.

These above results amazed the non-engineering educators who conducted the study. They stated in the report that selected minds, while specializing in the third and fourth years, will keep up and extend their general education provided a positive cultural attitude is recognized and emphasized by the institution in such a manner as to encourage them. It was an engineering student who made the top score of the state in the general-culture test. When interviewed by the examiners, he ascribed his knowledge in general culture *not* to local opportunities, but to a constant and diligent study of the Sunday edition of the New York Times.

Neither the engineering graduate nor the graduate of any other college possesses enough culture for the best interests of the public. We need to understand better the social and economic world in which we live. All men need to be more receptive to humane feeling if future wars are to be prevented. Most engineering educators would like to see their students take more of the humanistic-social courses and there should be incentives set up to encourage students to take more work in this stem. In the past and now, the number of these courses which a student could take has been limited only by the number of years the student could afford to invest. But, assuming the student can afford only four years in the university, might it not make for higher efficiency in the educational process to leave the present distribution of studies between the scientific-technological stem and the humanistic-social stem substantially unchanged in the engineering curricula? Various arguments supporting this view are presented in the following paragraphs.

The core of fundamental scientific knowledge, which students must be able to use on entering the modern engineering profession, has reached formidable dimensions and is continually expanding. Engineering education should devote more time, rather than less, to the study of these fundamentals. During the last two decades, on advice of engineers in

(Continued on page 32)

* "The Student and His Knowledge," Bulletin 29, Carnegie Foundation for the Advancement of Teaching, 1938.

The Dean's Page

BY DEAN C. L. ECKEL

ALTHOUGH war experience has not indicated the need for radical modification, post-war engineering curriculums will vary quite appreciably from pre-war curriculums. If the recommendations of the Society for the Promotion of Engineering Education's Committee on Engineering Education after the War are followed the principal changes will involve the inclusion of more of the humanistic-social studies, a more positive indoctrination in civic and professional responsibility, and an increased emphasis on graduate study and research.

SECONDARY EDUCATION

It has become increasingly clear that secondary education, especially in mathematics and science, must be strengthened if it is to be used as preparation for collegiate engineering education. Large numbers of students with high scholastic aptitudes, selected for engineering training through the aid of Army and Navy qualification tests, have failed to make good largely because of poor preparation in mathematics and science. The results of these tests also show wide variation in the quality of secondary school preparation in various parts of the country and indicate the need for better coordination between secondary and collegiate education. Furthermore, evidence in the war training programs clearly indicates the need for greater selectivity. The tests for determining scholastic attainment and engineering aptitude have been greatly improved, and they are likely to be used more extensively by the engineering profession.

UNDERGRADUATE TRAINING

At the University of Colorado, post-war undergraduate engineering curriculums are being drawn to fit the needs of those students who prefer to follow the usual pattern and graduate in eight semesters with the baccalaureate degree, those who are preparing for careers in the operation and management of industry, and those who are fitted for unusual scientific and creative accomplishments and will work for an advanced degree.

In general, the first three years of all these programs will be quite similar with only the variations that are in accord with the major branches of engineering. For the regular and industrial groups of students, the last two semesters will be different in nature and functional purpose. The regular group will concentrate on studies in the scientific-technological field while the industrial group will



DEAN C. L. ECKEL

give major attention to matters relating to production and operation. The content of humanistic-social studies will be essentially the same for both groups, as will the total time (eight semesters) to earn the baccalaureate degree.

For the scientific and creative group, the last two semesters will provide more fundamental preparation in scientific principles and methods than is needed for the general run of students. This program will be longer in duration than the others and will involve one year or more of advanced study leading to a graduate degree.

SCIENTIFIC AND HUMANISTIC STEMS

The scientific-technological and the humanistic-social stems are currently recognized as major divisions in engineering education.

The objectives of the scientific-technological division include a mastery of fundamental scientific principles and a basic knowledge of a branch of engineering, together with an understanding of the engineering method, ability to recognize and present significant results of engineering study, and an

interest in continuing professional development.

The aim of the humanistic-social division of studies is to inculcate an understanding of our social organization and of the effects of science and engineering on it, recognition of and ability to analyze social and economic elements of engineering problems, ability to organize thoughts logically and to express them in written or oral English, a development of moral, ethical and social concepts essential to a satisfying philosophy and an appreciation of the factors that contribute to a full life of service.

The Society for the Promotion of Engineering Education at its meeting in June, 1944, adopted the above-mentioned committee's report in which it is proposed that a minimum of approximately twenty percent of a student's educational time be given to a designed sequence of humanistic-social studies extending throughout the four undergraduate years. The studies which fall in this group are found in the fields of history, economics, government, literature, philosophy, psychology and fine arts. Of greater importance is the acquisition of ability to understand and analyze the essentials of an economic, social or humanistic problem, and to appreciate the relationship of such problems to the engineering profession. The student should be required to read, to question, and to express the results of his efforts in oral or written form both in academic and life situations. To accomplish this will require faculties with more than ordinary ability to stimulate engineering students in these areas through the student's interest in engineering problems. Briefly, the old formal expository methods are not likely to be successful. The success of the venture into this area of study is conditioned on sympathetic treatment by both faculty and administration officers, but it will depend largely on the teacher.

The breadth of the field of engineering and consideration of the aims and purposes of an engineering education make clear the difficulty of achieving the goal in the limited time available. It is quite clear that our entire educational program will have to be scrutinized for the purpose of eliminating all dead wood and concentrating on essentials. In a word, streamlining will be necessary.

Proper selection of subject matter influences the attainment of mastery of fundamentals, but development of power to apply basic principles depends largely on the method of instruction. General principles and basic concepts are taught in the fields of physics, mechanics, fluid mechanics, electrical circuits, and thermodynamics. Empiricisms are studied in the laboratory, and derived principles and specifications are taught in courses such as structural design, electrical machinery and heat

power. Students must learn to appreciate that facility in the application of principles is based on thorough understanding of these tools of engineering thought. The young engineer must learn to integrate the application of these laws, assumptions, data, and specifications so as to accomplish the desired result safely and economically. The art of engineering thus requires a combination of resourcefulness, skill, judgment, and experience which at times almost amounts to intuition.

Processes of instruction are: lecture-recitation, laboratory, and design. Methods of instruction and use of these processes in presenting a course as an integrated whole will vary with individual teachers. The engineering method, discipline in engineering habits of work, and the cultivation of creative ability are objectives of all engineering education.

GRADUATE WORK AND RESEARCH

Colleges of engineering should offer instruction in the existing knowledge of science and the arts, and they should also participate in the creation and dissemination of new knowledge.

In the past the College of Engineering at the University of Colorado has conducted its undergraduate program on a high plane, but, in common with many institutions, it has not been equally effective as a major agency for the training of research workers in basic technological research and in applied science. In the past, creditable graduate work has been accomplished at the master's level, but with the development of the Engineering Experiment Station and attendant opportunities for engineering research, the College of Engineering proposes to offer a rigorous treatment of advanced engineering science. A program of research in cooperation with certain regional industries and national agencies has been inaugurated and graduate scholarships and research fellowships are available for advanced students.

PROFESSIONAL IDEALS AND ETHICS

Appreciation of engineering ideals and ethics is of tremendous importance. National engineering societies and state registration boards have promulgated and stand ready to enforce standards of qualifications and of conduct; consequently, the cultivation of professional ideals and obligations has assumed increased importance in engineering education. And even beyond these, there lies a moral obligation to place excellency above quantitative considerations, loyalty above individual aspirations, and service above personal gain. Through attitudes such as these comes pride in membership in the engineering profession with devotion to its ideals and cheerful acceptance of its recognized obligations.

Campus News

By DON AHRENDT, C.E. '46

A. S. C. E.

At the last meeting of A.S.C.E. officers elected for the November term are:

President.....M. H. Gardner
Vice-President.....R. L. Lisco
Treasurer.....R. M. Powell
Secretary.....W. L. Weaver

The presentation of the Ketchum award to the outstanding graduating Civil Engineer was made at the annual dinner at Blanchard's Lodge, October 7. The banquet this year also served as an occasion to bid farewell to the Marines who were civil engineers here.



The many distinguished guests present included the following: M. C. Pirnie, A.S.C.E. President; H. S. Crocker, honorary member and ex-A.S.C.E. President; G. T. Seabury, Secretary A.S.C.E.; J. E. Jagger, Assistant Secretary A.S.C.E.; S. Wilmot, Mgr. of Pub. A.S.C.E.; H. Peckworth, Assistant Secretary A.S.C.E.; F. Thomas, Vice-President A.S.C.E.; A. J. Ryan, contact member; Dean I. C. Crawford, U. of Mich.; Dr. S. O. Harper, chemical engineer U.S.B.R.; Prof. Breed, M.I.T., and Captain Roberts.

Dean Dyde gave the address of welcome and Prof. Raeder introduced the guests. Col. H. S. Crocker, in a short speech, told of his association with Milo S. Ketchum, one-time Engineering Dean at C.U., in whose honor the award is made. The Ketchum award of a junior membership in A.S.C.E. was made to Ewalt P. Anderson, naval trainee.

A. S. M. E.

After a period of relative inactivity, the student branch of the American Society of Mechanical Engineers was reorganized with the following officers:

PresidentTom Taylor
Vice-PresidentBob Belknap
TreasurerWillard Bair
SecretaryTom Kiddas
Faculty Advisor.....Professor Mallory

Because of the rapid turnover among naval trainees, sophomores and juniors have been encouraged to become members more than heretofore.



During the July term of 1944 speakers discussing various topics of interest to mechanical engineers were presented, supplemented by films. D. J. McQuaid spoke on the new "air view" drawing process which he has developed. F. C. Allen, Bureau of Reclamation, brought some films showing the construction of

Boulder Dam and power developments for the city of Seattle. Mr. E. A. Froese of the York Ice Corp. explained some of the quick freeze installations made in the West by his company.

The long-standing feud between the civils and mechanicals came to a climax when the A.S.M.E. challenged the A.S.C.E. to a softball game. The civils lost 8-5 after a bitter struggle. A joint picnic followed and a good time was had in spite of the inclement weather.

In the near future the A.S.M.E. will hold election of officers, and a joint meeting of the C.U., Mines, and Colorado A & M branches is tentatively planned.

PI TAU SIGMA

The summer term proved to be a busy one for Mu chapter of Pi Tau Sigma.

Eta Kappa Nu was challenged to a softball game. The members immediately accepted and the affair took place on Varsity Field with a fine turnout from both organizations. Pi Tau Sigma fortunately emerged the victor.

In August nine men were tagged with the traditional red and blue ribbons. Pledge books were then circulated and during the late afternoon of September 8th these men became members. They are: LeRoy R. Cain, Richard C. Morrow, Robert B. Rogers, James R. Miller, Lucas J. Kimes, Reid S. Barker, Rowland E. Brown, Kenneth C. Gruber, and Leo R. Buroker.

After initiation a banquet was held at the Albany Cafe. Professor Beattie was speaker of the evening, delivering an enlightening talk, "By Train or by Plane." The evening was concluded with a bit of dancing at Memorial.

The chapter regrets losing the following men among the graduating seniors: Edward E. Adams, Kenneth B. Green, Herbert E. Johnson, Thomas W. Kidd, James B. Backlund, James E. Howard, and Charles Schmidt.

ETA KAPPA NU

Eta Kappa Nu, national electrical honorary, on August 11, 1944, initiated the following pledges: Isaac Cullick, George D. Doty, Raymond R. Fillenberg, Richard J. McCoy, William B. Otto, and Lester E. Weinberger. The banquet following the initiation was held at Wayne's Cafe at which Robert W. Devore presented the evening speaker, Justice Wiley B. Rutledge, who gave an informal speech on the responsibility



ity and debt of the engineer to society.

The officers for the present school year are:
 President.....J. Richard Minden
 Vice-PresidentIsaac Cullick
 Recording Secretary.....Raymond R. Fillenberg
 Corresponding Secretary.....Jack E. Bridges
 Treasurer.....William B. Otto
 Bridge Editor.....Lowell E. Hadley

SIGMA TAU

Early in the July term, Sigma Tau general engineering honorary, pledged and initiated five junior engineering students: LeRoy R. Cain, J. Richard



Minden, Leon T. Silver, Charles R. Walker Jr., John A. Wilson, and Henry A. Winter. Charles H. Prien and Charles A. Wagner were initiated as honorary members of the fraternity. After the initiation a dinner was held in honor of the new members. Charles A. Wagner gave the principle talk of the evening.

At the last meeting of the term new officers were elected for the coming college year.

President.....John A. Wilson
 Vice-President.....Palmer W. Carlin
 Secretary.....J. Richard Minden

ALPHA CHI SIGMA

At the last election new officers were elected as follows:

Master Alchemist.....Joseph Perrella
 Vice Master Alchemist.....Harry Hoyt
 ReporterPaul Cronkhite
 RecorderJames Pollock
 TreasurerJohn Wilson
 Master of Ceremonies.....Duane Ragsdale
 Alumni Secretary.....James Rath

Due to the lack of eligible men, Alpha Chi Sigma did not pledge any men in the July term; however, pledging is expected to take place in this term.

CHI EPSILON

Chi Epsilon, Civil Engineering honorary, recently initiated the following men: LeRoy Davis, Max Hueftle, Farnum Kerr, Joseph Loop-er, Blake Mackin, William Myers, and Roland Rautenstrauss.



The initiation ceremonies were held September 12 in Memorial and were followed by a banquet at Wayne's Cafe. The guest speaker at the banquet was F. O. Repplier, civil engineer and former naval officer.

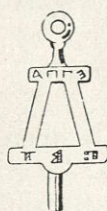
New officers for the next year are:

PresidentLee Silver
 Vice-PresidentDon Ahrendt
 SecretaryBlake Mackin
 TreasurerDalton Brown
 Associate Editor of the Transit.....LeRoy Davis

Chi Epsilon subscribed \$25.00 to the College of Engineering Alumni Graduate Scholarship Fund.

TAU BETA PI

Tau Beta Pi, honorary engineering fraternity, pledged the following men last term: Ewalt Ander-son, Willard E. Bair, Richard Binder, Jack Bridges,



Palmer Carlin, Ralph Clark, Kenneth Green, Leonard Greger, Everett Irish, John Minden, Joseph Perella, John Wil-son, and Henry Winter. Initiation on August 18 was followed by a banquet at Wayne's Cafe, at which Dr. George Löff spoke on the research work on solar ener-gy which is carried on under his direction. Dr. Löff was elected an honorary member.

The officers who are to carry on the activities of this fraternity are:

PresidentHerbert Hubbard
 Vice-PresidentCharles Walker
 Recording Secretary.....Everett Irish
 Corresponding Secretary.....Joseph Perella

PI MU EPSILON

The newly elected officers of Pi Mu Epsilon were selected from the members initiated last June:

PresidentFloyd Becker
 Vice-PresidentNiels Beck
 SecretaryLowell Hadley
 TreasurerHenry Winter

Others initiated then and still active are: Palm-er Carlin, Werner Herz, Herbert Hubbard, Law-rence Knight, J. Richard Minden, Wm. B. Otto, Ralph Scruby, Betty Tucker, and John Wilson.

Fifteen men to be initiated Nov. 24 are: LeRoy Cain, Gordon Campbell, Kenneth Classen, Jack Craig, William Dunbar, Edward Fox, Alan Fricke, Bill Nixen, Joe Perrella, Bob Roylance, James Shan-er, Charles Walker, Dan Winter, Roderick Messen-ger, and Melvin Hendrickson. A banquet and a short program will follow the initiation.

A. I. E. E.

Under the splendid leadership of Jack Fuller, members of the American Institute of Electrical Engineers were provided with several very inter-esting and instructive meetings during the July semester. Outstanding among the programs was an address and demonstration on communications given by Dr. Prien of the American Telephone and Telegraph Company. Other meetings of interest included a slide-illustrated address on the construc-tion of Green Mountain Dam, an address given by Mr. Nelson of the Denver Tramway Company on "An Engineer's Responsibility to Society," and a talk given by Mr. W. W. Lewis of General Electric, "Father of the Peterson Coil," on problems of trans-mission.

Officers for the November term are: George Doty, Chairman; Dick Minden, Vice-Chairman; Ike Cullick, Treasurer; Dick McCoy, Secretary.

Alumni News

By JIM MILLER, M.E. '45

Whether in civilian or military service, engineering graduates of the University of Colorado are establishing enviable records and distinguishing themselves in the service of the public and their country. In the following alumni notes stars are placed by those alumni who have especially gained distinction.

1910

*Carl Louis Mosely is a Civil Engineer who has distinguished himself in many ways. At the University he was a charter member of the Boulder Chapter of Tau Beta Pi honorary fraternity. He has been city manager of Colorado Springs since 1930 and is president of the Municipal League, a position he also held last year, and is a member of the executive committee of the power division of the A.S.C.E. At an alumni banquet following this year's homecoming game with Colorado College, he was honored by being the recipient of an award.

1915

*Samuel Judd, over eighteen years an employee of the U. S. Bureau of Reclamation, was given the award of excellence by the U. S. Department of the Interior. The Grand Coulee Dam power plant needed two turbines, and the inlet pipes had been constructed for turbines of clockwise rotation. In order to avoid two years delay in building the necessary turbines, two turbines were obtained from the Shasta Dam power plant in California. These were the only turbines available. However, they had been built for counter-clockwise rotation. By developing a plan for changing the course of the inlet pipes at Grand Coulee, Mr. Judd put the Shasta Dam turbines to use in the power plant which thereby produced more than 2 billion kwh of electricity than would have been possible otherwise.

1918

*Arthur J. Boase, Civil Engineer, is in South America as a special editorial representative of "Engineering News Record" to study and report on practices of South American engineers and architects in regard to reinforced concrete construction and building design. Mr. Boase's entire professional career has been devoted to structural design work. Following his graduation from college, he designed tunnels and dams for the Boston Colorado Power Company and was afterwards manager of a Denver concern engaged in the design and construction of reinforced concrete bridges in Colorado. He joined the staff of the University of Pennsylvania's Civil Engineering Department and later became head of the Civil Engineering Department at the

Pennsylvania Military College. Resigning this position, he affiliated himself with the Portland Cement Association's Structural Bureau, of which he became manager in 1932. At present he is chairman of two committees and a member of several others dealing with concrete construction and is author-chairman of the A.C.I. "Reinforced Concrete Design Handbook."

1921

Colonel Harry Meyer, B.S. (C.E.), formerly of Fort Belvoir, is overseas.

1922

Albert F. Clark, B.S. (Ch.E.), is with the General Petroleum Corporation of California in the Process Laboratories Department. His work includes water chemistry, boiler water control, and crude oil demulsification.

1923

Harold W. Richardson, B.S. (C.E.), C.E. '43, is western editor of "Engineering News Record" and gave a lecture on the campus in August on military construction in Alaska and the Aleutians.

*Lt. Col. Stanley Lomax, B.S. (C.E.) with honors, was in command of the 861st Aviation Engineers Battalion when he died in England in June of this year. His battalion had successfully established landing fields for airborne troops in the first wave of the invasion of Europe. Lomax also saw action in five engagements in World War I. Two years ago, before his enlistment, he was an engineer in the design department of the city of Chicago.

1924

*W. Melvin Frame, B.S. (M.E.), is manager of the Armbridge Plant of the National Supply Company at Pittsburg. This plant recently forged its fifteenth-million high explosive shell.

Lt. Comdr. Charles A. Lewis, Jr., B.S. (C.E.), is at the indoctrination school at Norfolk, Virginia, after being at the naval air station at Tongue Point, Oregon.

Ralph C. Peters, B.S. (E.E.), is an engineer with the Gibbs-Hill Consulting Engineering Company in New York City.

1925

E. J. Davis, B.E. (M.E.), is district manager of the Gates Rubber Company in St. Louis.

1926

*Dr. Kenneth A. Browne, an electrical engineering graduate, is Dean of Doane College, Crete, Nebraska, and was previously a member of the Hastings (Nebraska) College faculty for ten years.

(Continued on page 28)



Engine Ball a Success

HIGHLIGHTING the social events of the year was the Engineers' Ball presented by the Combined Engineers, September 30, in the men's gymnasium. Evidence of the popularity of the Ball is shown by the fact that all four hundred tickets were sold a week in advance, and there was some anxious scrambling for the sacred tickets until the 30th. Emmett Ryder and his orchestra provided the music for the occasion, featuring some special

arrangements which added much to the evening's performance.

Climaxing an evening of outstanding entertainment, George Bardwell awarded the title of "Engine Ball Queen" to Elna Ruth Beck, freshman from Amarillo, Texas. Out of a group of sixteen candidates, five were selected by members of the Engineering faculty to compete as finalists, one to be elect-

(Continued on page 38)

Authograms

By ELLIS WILLIAMS, M.E. '47

IN this issue of the Engineer there are articles contributed by some of the *outstanding men* of the University. Included are: Charles Hutchinson, Jr., '44, graduate Chemical Engineer; Associate Professor Lloyd Bingham of the Electrical Engineering Department; Wayne Beattie, professor of Mechanical Engineering; and Clarence Eckel, Dean of the College of Engineering. We give here a brief biographical sketch of each contributor.

Charles A. Hutchinson, Jr., attended Boulder High School before entering the University of Colorado. While at the University, he became a member of the Tau Beta Pi fraternity, having received the outstanding freshman award, the president of the Sigma Tau fraternity. In connection with his course in Chemical Engineering, he was adjudged the outstanding Naval V-12 Engineering graduate of his class; and he also received the graduate award of the Colorado Society of Engineers. He took part in countless activities on the campus. He held the position of business manager on the Colorado Engineer for the past two years. Mr. Hutchinson, Bachelor of Science in Chemical Engineering, is now training at Midshipman's School in the Navy.

Associate Professor Lloyd Bingham graduated from Northeastern University with a Bachelor of Science in Electrical Engineering in 1924. During the years 1924-1925 he was an instructor at Northeastern University. In 1928 he received the degree, Master of Science in Electrical Engineering, at the Massachusetts Institute of Technology, and he taught there as an instructor in electrical engineering. At the University of Nebraska, he became an Assistant Professor of Electrical Engineering in 1931. Associate Professor Bingham is co-author, with F. W. Norris, of a book on power and transmission lines, and he is Vice-President of the American Institute of Electrical Engineers. He has just been placed on the Advisory Board of the Colorado Engineer to take the place of Professor Eastom.

Professor Wayne S. Beattie of the Mechanical Engineering Department began his education in Greeley, Colorado, where he graduated from high school with honors. He received his Bachelor of Science degree in Mechanical Engineering from the University of Colorado in 1917. He acted as coordinator of the Civil Aeronautics Authority in connection with the War Training Service Program at the University during the years 1939-1944. This terminated with the transfer of the Naval V-5 detachment from the University. Mr. Beattie has

spent most of his professional career with the Mechanical Engineering Department in the University of Colorado.

Clarence L. Eckel, Dean of Engineering, attended Denver public schools and the University of Colorado, where he graduated in 1914 with a Bachelor of Science degree in Civil Engineering. He was a member of Tau Beta Pi, Sigma Tau, Alpha Sigma Phi, and other fraternities. He is president of the Colorado section of the American Society of Civil Engineers and a member of other engineering organizations. Dean Eckel was an instructor in Civil Engineering at the University of Colorado during the three years preceding the World War. In 1917 he became commander of the First Battalion 115th Engineers with which he served overseas. After the war, he became an Associate Professor of Civil Engineering at the University of Pennsylvania. In 1923, he returned to the University of Colorado to be Professor of Civil Engineering. Mr. Eckel became Consulting Engineer of the Construction Department in charge of structural design and plans for the new buildings on the University campus. A year ago, he became Dean of the College of Engineering.

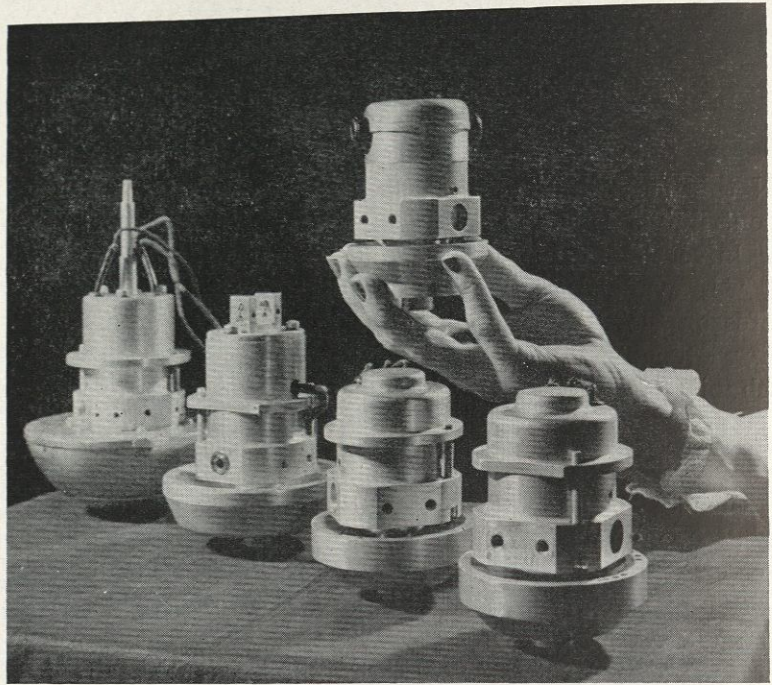
KETCHUM AWARD—

The Ketchum Award was established in 1936 in honor of Dean Milo S. Ketchum, who was dean of the College of Engineering from 1905 to 1919. Shortly after the Dean's death in 1934 some of his friends and former students, notably Dean C. L. Eckel of the University of Colorado and Professor W. C. Huntington of the University of Illinois, conceived the idea of a memorial to the dean which would not only honor his memory but also serve as an inspiration to young civil engineers. A trust fund was collected and set up, the income from which defrays the expenses of the award. The award itself consists of payment of the initiation fee for Junior membership in the American Society of Civil Engineers. The recipient is chosen by the staff of the department of Civil Engineering on the basis of his undergraduate record of scholarship, activities in the A.S.C.E. chapter, other extracurricular activities, personality, appearance, loyalty, initiative, resourcefulness, etc.

The award was given this year to Apprentice Seaman Ewalt P. Anderson, Jr., at a meeting of the A.S.C.E. attended by 88 student and other members.
(Continued on page 24)

MOTORS KEEP GYROS SPINNING

These small motors have been designed to drive gyroscopes in many types of war machines. One motor, which weighs but 10.5 pounds, is called upon to bring its gyro flywheel to full speed of 12,000 r.p.m. in two-tenths of a second. Because ordinary varnish might soften at the high operating temperatures and deform and thus destroy the necessary precise balance, special thermosetting varnish that will not shift when hot is used in the motors.



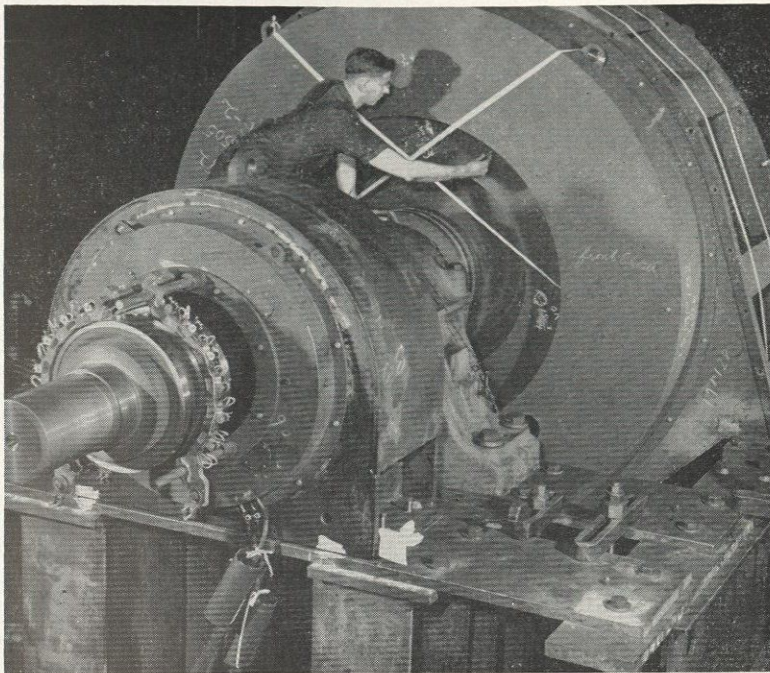
NEWS

By LEON BRIN, Arch.E. '46



REMOVING RUST AND SCALE

Steel pellets slightly larger than the head of a pin are driven at hurricane speed by compressed air to remove rust and scale from transformers and marine battery cases before pointing. The operators are protected from the splatter of steel shot by heavy jackets and tight fitting hoods, and breathe air through a special type of respirator. After falling through the perforated floor, the steel shot is collected and used again.



POWER FOR BOEING WIND TUNNEL

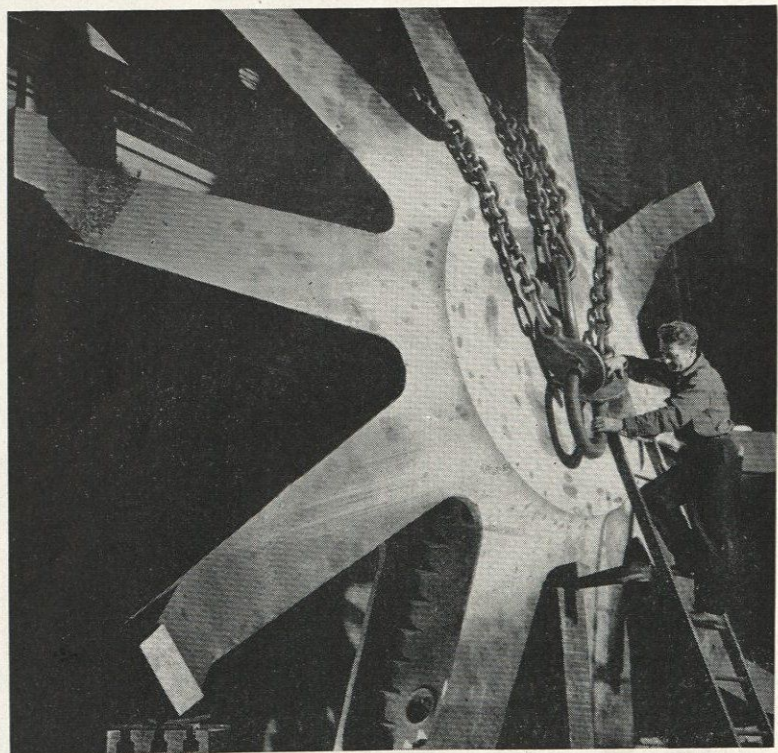
Driving a 16-bladed propeller, 24 feet in diameter, this giant 18,000-horsepower Westinghouse electric motor will produce a wind tunnel at the Seattle, Washington, aeronautical laboratories of the Boeing Aircraft Company. By the use of models, engineers will be able to investigate the behavior of planes of new design. The workman is taking the temperature of the air stream which cools the inner parts of the huge motor when in operation.

BRIEFS

Cuts Courtesy Westinghouse

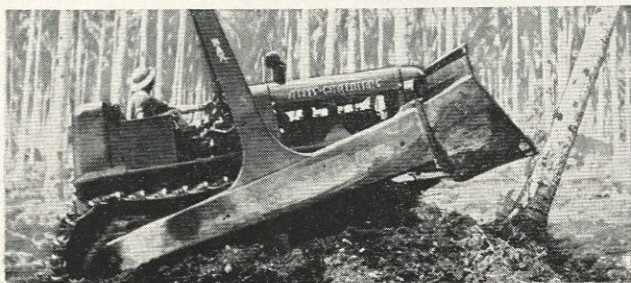
"STARFISH FOR T V A"

Resembling a giant starfish, this 27-ton mass of steel was machined at the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Company. It is the skeleton of a waterwheel generator for the Watt's Bar Project of the Tennessee Valley Authority, which will supply power to aluminum, aircraft, and other war-busy industrial plants in that area. The starfish is 22 feet in diameter and will whirl around 95 times a minute inside the generator.



Three "Not-so-Secret"

THAT HELPED SURPRISE



1 ALLIS-CHALMERS TRACTORS—

have helped Uncle Sam's Seabees hack airports and roads out of densest South Pacific jungles, with almost "impossible" speed.

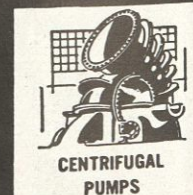
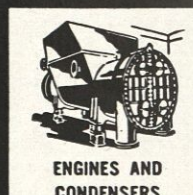
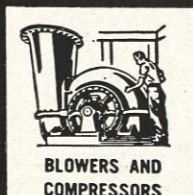
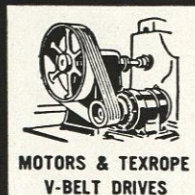
Among the first pieces of equipment to land on island beach-heads, they have helped beat the Japs to the punch time after time.



ENGINEERING THAT AIDS
ALL INDUSTRY— FURTHERS
AMERICAN GOOD LIVING

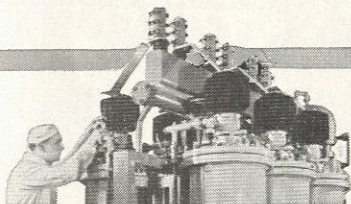


ALLIS-C



et" Weapons

THE JAPS!



2 ALLIS-CHALMERS MERCURY ARC RECTIFIER—

quickly provided a vitally needed method of converting alternating current—one of the keys to mass production of aluminum that made possible U. S. air supremacy.



3 ALLIS-CHALMERS TEXROPE V-BELT DRIVES—

Multiple V-Belt Drives, invented by Allis-Chalmers, drive 75% of all U.S.A.'s war production machinery—speed a gigantic flow of planes, tanks and guns to U. S. troops!



What will YOU want to make?

TODAY, Allis-Chalmers' great productive capacity is directed toward the winning of the war...

But after Victory, the same knowledge and resourcefulness that have engineered over

1600 different industrial and farm products will be ready to tackle your peacetime problems... to provide gas turbines, electronic devices, many other new types of equipment to meet your specific post-war needs.

VICTORY NEWS

Gas Turbines Take Up To 50% Less Space: Plans for a 5000 HP locomotive powered by 2 complete gas turbines have already been drawn up by Allis-Chalmers. Because of simple, compact construction, these turbines require just *half the space* needed by conventional engines—deliver their power with unusual economy.

Engineers predict widespread use of these revolutionary new A-C Gas Turbines in ships, planes, locomotives and other machines.

Simplifies Unit Substation Planning:

To aid industry in visualizing power distribution needs, A-C field engineers now use accurate scale models of Allis-Chalmers Prefabricated Unit Substation apparatus.



This "Unit Sub Builder" set eliminates guesswork—means far more accurate calculations. No bogging down in charts, diagrams or tables. Call your nearby Allis-Chalmers District Office for full details.

TUNE IN THE BOSTON SYMPHONY

Allis-Chalmers' coast-to-coast radio program dedicated to the men and women of American Industry!

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INDUSTRIAL TRACTORS
& ROAD MACHINERY

KETCHUM AWARD—

(Continued from page 19)

bers, including national president, Malcolm C. Pirnie; Vice-President, Franklin Thomas; Secretary, George Seabury, and many of the Board of Direction.



Dean C. L. Eckel and Professor Warren Raeder congratulate Ewalt Anderson, winner of Ketchum Award.

PRACTICE SCHOOL—

(Continued from page 10)

sintering machine, the temperatures that the open hearth surfaces attained, the numerous gas compositions. Many of these small tests led to valuable information for the major studies that were to follow.

The first two major investigations of plant operations were conducted simultaneously by two groups composed of three and four members. The four man group set out to complete heat balances over two coke-oven banks to determine any differences in their operations, and to recommend possible improvements. This test involved the measurement of all possible sources of heat to the ovens and all possible methods that this heat left. It was during this test that the plant workers began to wonder what sort of strange beings had come amongst them, for no matter at what time they looked during a period of three days, these students were still there taking peculiar measurements. Probably the measurement that caused the most doubt to the workers was the measurement of surface temperatures. These measurements were accomplished by means of thermocouples and millivolt potentiometers. Many was the worker that would ask what was going on. Upon being told that surface temperature measurements were being made, they would look rather doubtfully at the thermocouples and ask, "with a wire?" and go off with a shrug of their shoulders and a good horse laugh for the fellows.

The fellows weren't too sure themselves that they were not going slightly crazy. Some very excellent technical information was given to the plant as a result of this investigation.

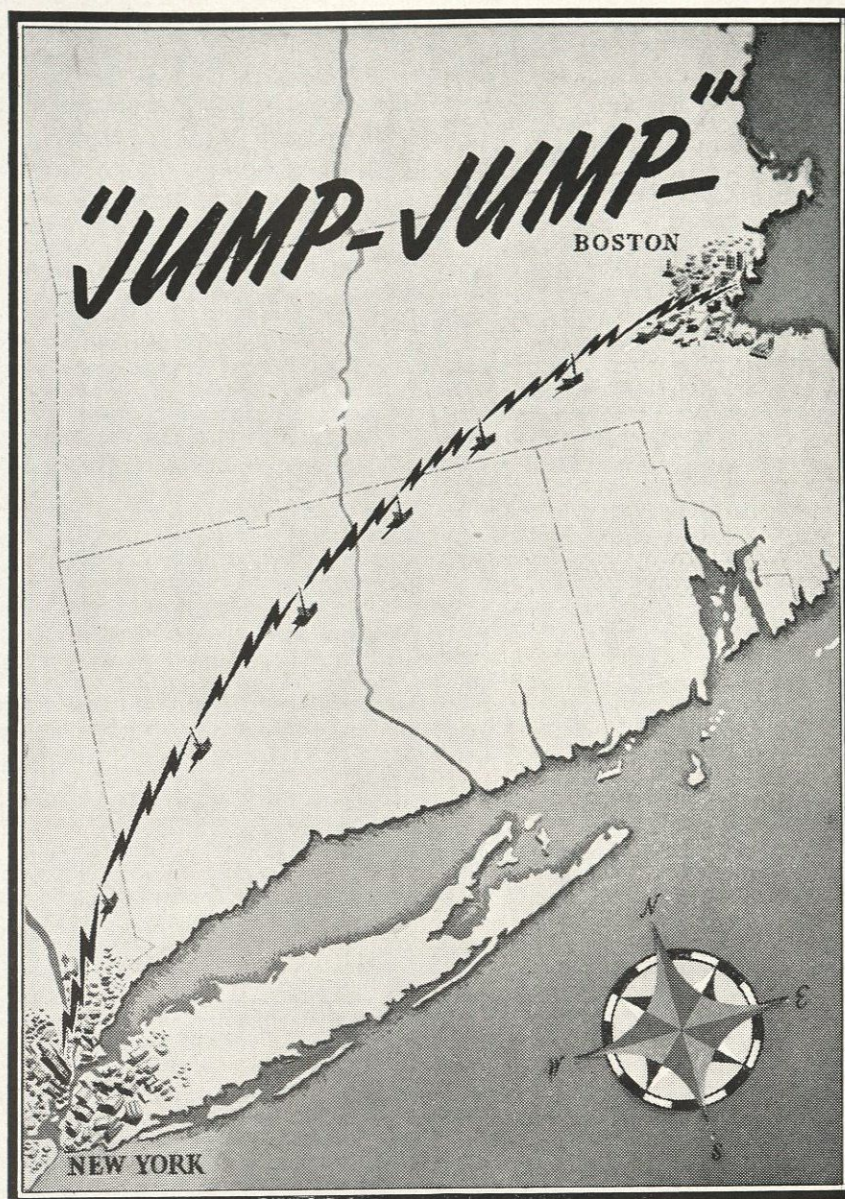
Meanwhile, the three man group was conducting experiments to determine the cause of excessive grate bar failure in the sintering machine and methods for eliminating this failure. This test involved measurement of every quantity relative to the operation and a comparison with standard practices. Thermal gradients through the bar were determined and possible stresses calculated. It was finally determined that these stresses were the cause of the bar failure, and the installation of a system to provide grate bar insulation was recommended as a method for elimination of the failure.

When these two major tests were completed, only three weeks remained for the final investigation. This last study was a comparison of the operation of two of the open hearth furnaces, and all members of the school worked in a group on it. As a method for establishing a basis for comparisons of the two furnaces, complete heat balances were made over each furnace. As in the previous heat balances carried out by the students, this involved measurement of all possible heat quantities in and out of the furnaces. Special water-cooled gas sampling tubes and high velocity thermocouples, surface thermocouples, meters, and orifices were a few of the pieces of equipment that had to be constructed. Plant meters were calibrated, and gas analysis equipment was put in order. All-in-all, a very busy week was spent in preparation for this test. The investigation proper was carried out over a period of three heats in each furnace which means a duration of approximately 60 hours. Once again the

(Continued on page 26)



At Ketchum Award Dinner George Hood presents George Seabury, National Secretary of A.S.C.E., with Application of Junior Membership in A.S.C.E. from the graduating class. Left to right: Sec'y. Seabury, Capt. Frank Roberts, Hood, Dean Ivan C. Crawford.



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PRACTICE SCHOOL—

(Continued from page 24)

plant workers were assured that it was a crazy group of men that was running the tests. A typical attitude of the workers toward the students was expressed in a bit of conversation between the senior melter of one shift and that of the next as the first introduced the leader of the student group. "These fellows," he said, "are just plain nuts. They work twelve hours and sleep six and then are back on the job, but the boss says they are doing a valuable job, so get them all the help you can." The fellows, likewise, began to feel as though they were going nuts for although six of every eighteen hours were to be spent out of the plant, analyses and other auxilliary tests came up that required that time, and very little sleeping was done. Probably the most exhausting work that was done was the measurement of regenerated gas temperatures and compositions. This required that three of the men spend most of the time around the regenerators where the room temperatures were as high as 167° F. This was what the fellows called "George's (Löf) Hell-Hole", for the dust, heat, and fumes made it impossible for them to stay on the job over a very long period of time. They were always more than glad to return to the surface and have a cup of coffee that the steelworkers cooked on a piece of hot scrap.

(Continued on page 28)

CAN'T BE BEAT FOR HEAT

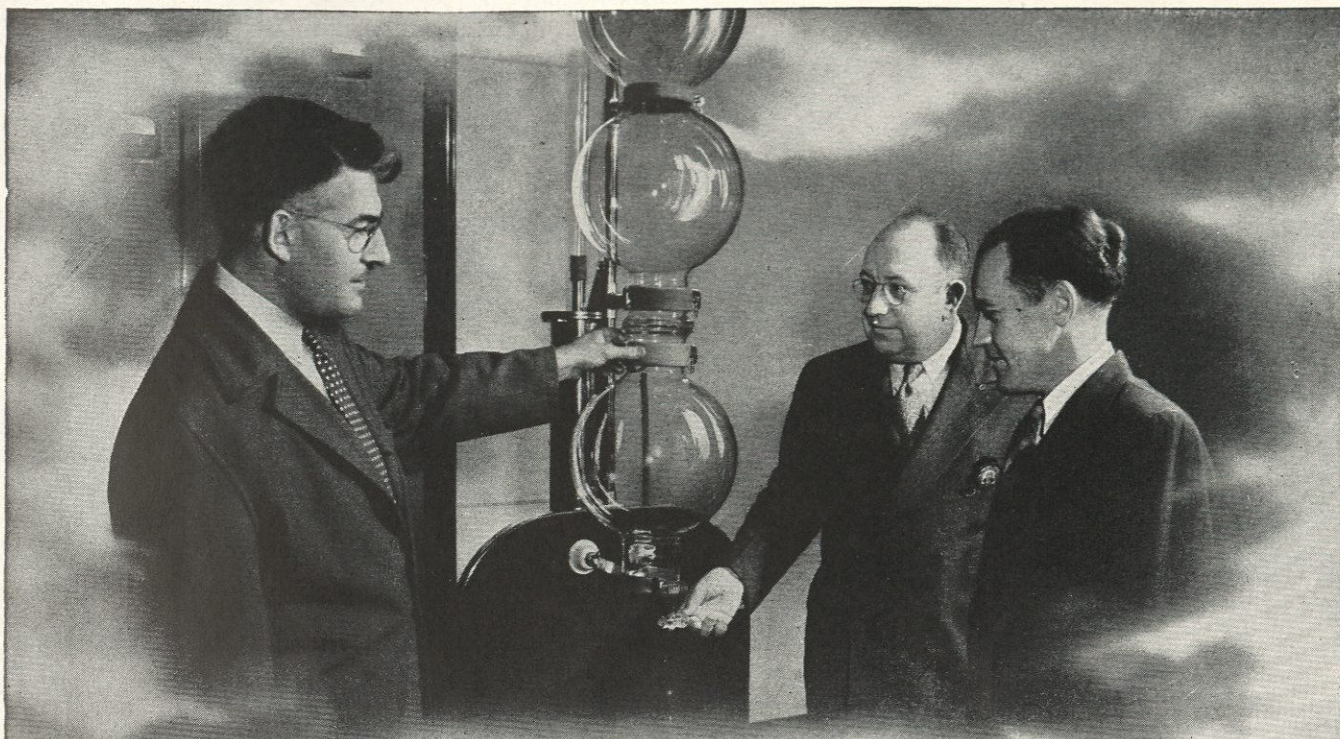
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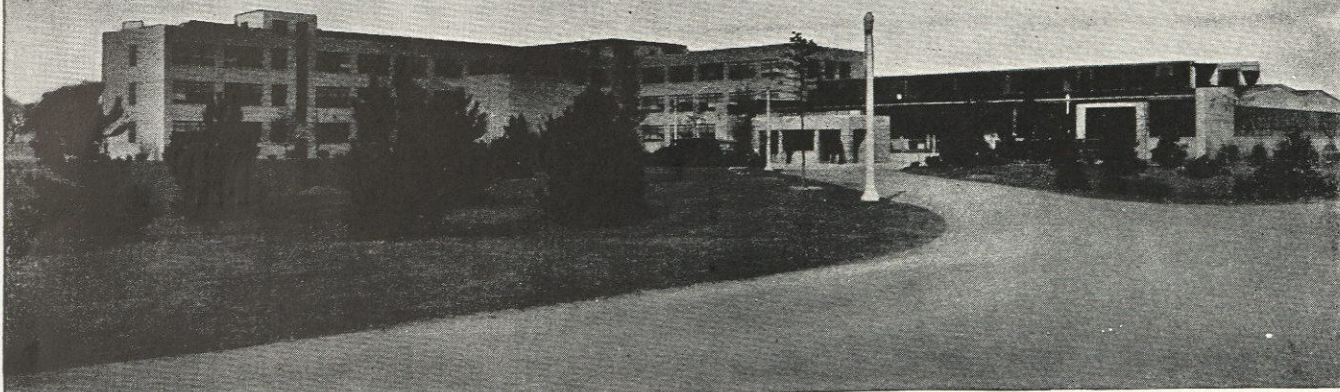
New RCA Penicillin Process Speeds Production!

TODAY, when the wonder-drug penicillin is so vitally needed on the fighting fronts and in the home-front sickrooms, the Radio Corporation of America reveals that a revolutionary method of production has been perfected in RCA Laboratories.

Tests at the Squibb Penicillin production center at New Brunswick, N. J., show that a single RCA electronic installation can concentrate two billion Oxford units of Penicillin in 24 hours—enough to administer 100,000 individual doses.

Besides streamlining the elaborate evaporation method, the new RCA Electronic system includes these important advantages: reduction of operation costs, lowered maintenance costs, less possibility of mechanical difficulties and production delays, great savings in floor space, and impressive reduction in initial equipment costs.

The new RCA electronic dehydrator of penicillin is shown here in regular operation at the plant of E. R. Squibb & Sons.



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COLORADO ENGINEER—November, 1944

PRACTICE SCHOOL—

(Continued from page 26)

It was a tired group of fellows that came away from the open hearths after that test was finished. Eyes were blood-shot; feet were blistered; beards were long; and a goodly supply of open hearth dirt covered all. But only half of the sleepless nights had been finished, for now the calculations, correlations, and reports had to be made. Once again excellent technical material was derived for the plant.

Not all the students' time at the practice school, however, was taken up with tests, report writing, and other work of this sort. Many were the games of pool and frequent was swimming. These lighter diversions were the main force in keeping the students as well as the instructor going. As a side line, it might be mentioned that Dr. Löf handles a wicked cue. Let this be sufficient warning to future practice school students.

The final day at the last session of the practice school was used for oral reports and personal conferences between the instructor and each student. It was at similar oral reports throughout the session that the students presented their findings not only to the other groups, but to the instructor and an assemblage of plant officials. Criticisms of the technical material and presentation were then made

to improve both.

The laboratory, class room, office, and workshop at Pueblo are now closed to await a new class. Probably without exception, the members of the last class feel that this school has been one of the most valuable components of their engineering education. Once again in accord, they most certainly would all agree that each would gladly purchase just one Orsat gas analysis outfit to smash in the most horrible manner, for it was these outfits that caused the most trouble by getting out of order at very crucial moments. Overall, however, everything connected in any way with the practice school carried out very satisfactorily, which indicates excellent planning and management. The relationships of the school and the Colorado Fuel and Iron Corporation were also excellent. The plant went out of its way to help in every way and to make the course as valuable as possible.

This, then, is the University of Colorado School of Chemical Engineering Practice as it exists today. Though it may now be unique to the Western United States, practice schools will probably be common in the future, for this one has proven its worth well.

ALUMNI NEWS—

(Continued from page 17)

1927

*Albert L. Cervený, Civil Engineer with the Colorado State Highway Department since 1930, died July 25th in Denver. He was an expert bridge designer and was an associate engineer in the department's bridge division.

1930

H. B. Van Valkenburgh, B.S. (M.E.), M.S. '43, is an engineer with the Maritime Service.

1931

Sgt. Argyle Cambell, B.S. (Ch.E.), is stationed at Camp Ellis, New York, after being hospitalized 16 months with rheumatic fever.

Lt. Fred E. Cornwell, B.S. (E.E.), is with a radar unit at Camp Davis, North Carolina.

(Continued on page 34)



Every mining engineer should carry a CF&I Vest Pocket Shape Book full of valuable engineering data, now on the press...72 pages of CF&I hot rolled products with specifications, 86 pages of tabular data.

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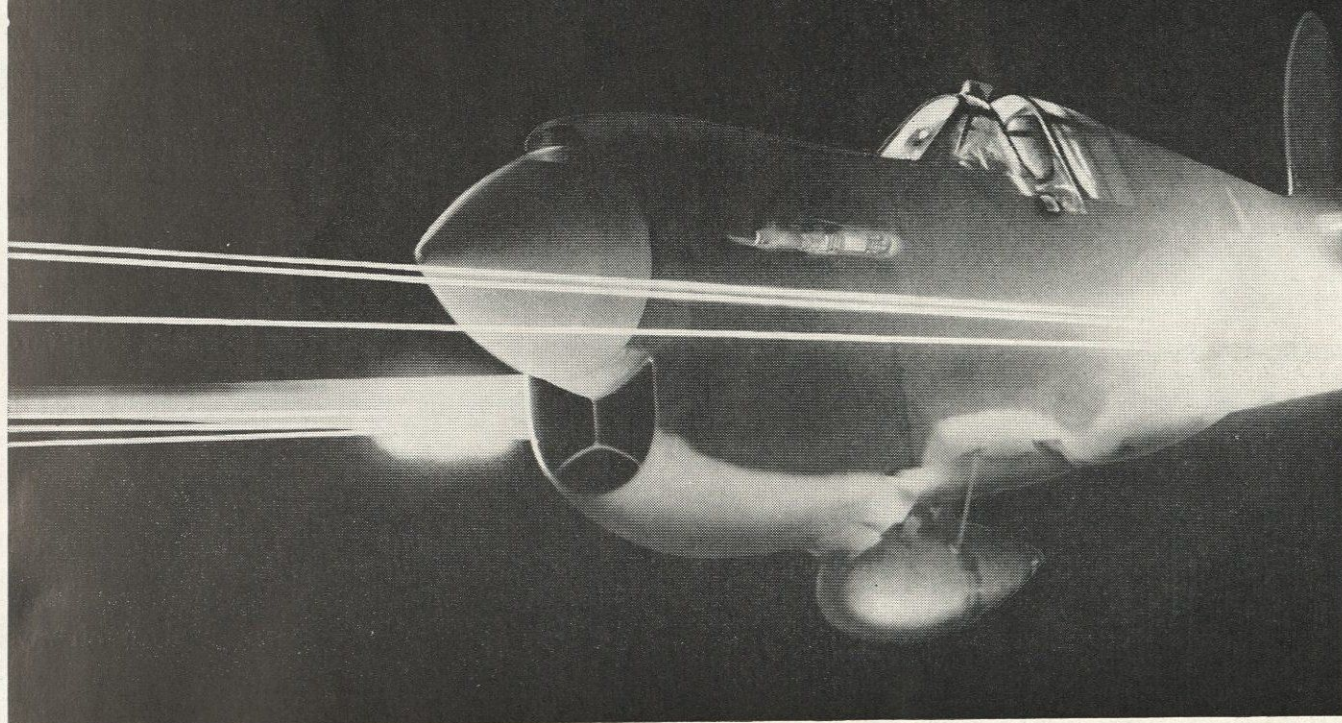
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The glass that breaks over Germany...



YOU'VE seen pictures of long range fighter planes with their "belly tanks" that carry extra gasoline. But have you ever wondered how the pilot gets rid of those tanks when they're empty, to decrease weight and gain extra speed and maneuverability?

The big problem in dropping the tank is to sever a tight pipeline connection from tank to plane quickly and positively. This isn't easy with metal, but Corning now makes a fitting from glass tubing that does the trick. The minute the pilot releases the mechanical grips that carry the weight of the tank the glass tubing breaks cleanly and the tank falls free!

War and Corning Research have put glass

in a lot of strange places. For instance, there was a time when almost all piping in chemical plants was alloy of one kind or another. Now chemical people have discovered that glass piping is better for many purposes, and Corning has even developed a method for welding it into continuous lengths.

Many of the new uses to which Corning has put glass will persist after the war. For many users have discovered for the first time how really versatile glass is as a material. They are finding out that it has unexpected strengths. That it resists abrasive wear and corrosion. That it is so fatigue proof Corning has even made springs of coiled glass 

for certain conditions. Perhaps after the war, in whatever business you choose to follow, you will also find that an intelligent application of glass can improve your product or production — Corning Glass Works, Corning, New York.

CORNING
—means—
Research in Glass

AIR TRANSPORTATION—

(Continued from page 8)

rived from airline data for the year 1941:

Ratio of Air Travel to Total
Airplane-Pullman Travel

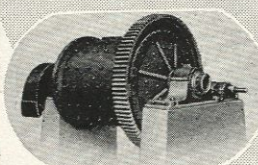
New York—San Francisco.....	1 to 8
New York—Los Angeles.....	1 to 4
New York—Seattle	1 to 4
Kansas City—Los Angeles.....	1 to 10
New York—New Orleans.....	1 to 5
San Francisco—Seattle	1 to 4
New York—Detroit	1 to 5
San Francisco—Los Angeles.....	1 to 7

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There seems to be little agreement on the degree of post-war air travel. Predictions, perhaps optimistic, run "as high as twenty billion air passenger miles per year"; "as much as two-thirds of all Pullman travel absorbed by air transportation"; "thirty-times growth in the next twenty years"; "80 percent of first-class travel for distances in excess of 400 miles". These are given to indicate how thinking runs along these lines.

During World War One aviation was potential, but not demonstrated; in the present war aviation is both demonstrated and decisive. We are just beginning to emerge as a nation of air travel. Five million people in the United States are now closely associated with the field of aviation. Two and one-half million of our armed forces are thoroughly trained in one or more of the branches of this industry. In dollars of products, the aviation industry has risen from forty-fourth place in 1939 to top rank today. Speed and accessibility will be prime factors in the race to recapture world markets. Post-war airplanes are even now in production—airplanes to meet every need in a peacetime world. Already global maps have been covered with a network of projected air routes, designed to serve every place of importance in the world. In many cases descriptive literature is available, with fares listed.

Transportation must be a mass movement to be economical. In 1941 domestic airlines flew routes of 44,400 miles and provided direct transportation to 270 cities. Only 65 cities with a population of more than 25,000 were located more than 25 miles from a scheduled airline. Ten years after the close of this war the United States may reasonably expect 100,000 miles of modern airways, regularly serving 1,000 cities. Thousands more cities and towns will be served with mail, express, and passenger pickup. It is not out of reason to expect one-hour service between New York and Boston, with scheduled flights every half hour; two-

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hour service between New York and Chicago; eight-hour service between New York and Pacific Coast points, with hourly departures; overnight service to London. Speeds may well approach 350 miles per hour; airplane capacities may well reach 80 passengers as a daytime plane and 50 passengers as a sleeper plane. Jet propulsion, and rocket assistance for take-off are past the stage of idle dreams. The number of privately owned airplanes should increase rapidly, and might well reach a total of 250,000 to 300,000 within a ten year period.

If air transportation could speak its philosophy it might be something like this. "My field is the world. My sky roads cover land and sea alike. I have the possibilities of annihilating time and space. I can change the living habits of men. I can be to the big-city life what the automobile was to the small-town life. I brought Churchill from London to Washington in less time than the earth-bound traveller required to go from New York to Chicago. I transported Secretary Hull to Moscow in less time than the earth-bound traveller requires to go from Washington to Los Angeles. I have transported 'over the hump' more cargo per month than was ever carried on the Burma Road in a similar period of time. I have transferred armies to strategic points back of enemy lines where other methods were impossible. From war fronts where other means of transportation were neither available nor possible, I have evacuated tens of thousands of wounded men quickly and many times far, to modern hospitals—thereby saving thousands of lives. I have made it possible for casualties from Africa and Normandy to convalesce in modern hospitals in the United States. I have in a single night dropped on enemy positions more bombs than the total tonnage of robot bombs rained on England during the entire active period of the German launching platforms.

"I can create new opportunities for trade; I can stimulate new desires for travel. With twenty-five times as many good airports as before the war, I can make possible daily commuting distances up
(Continued on page 32)

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AIR TRANSPORTATION—

(Continued from page 31)

to 200 miles, and week-ends in London, Paris, or Moscow for New Yorkers. To do these things I must be assured the freedom of the air. I must be understood both as to my possibilities and my limitations. I must be encouraged, not abused. I must be given the virility of competition.

"Each form of transportation has its own utility, and by no stretch of the imagination can I handle all forms. I will supplement, and must be supplemented by, other forms of transportation. I can promote a better understanding among peoples, and, just as I have been used as a terrible implement of

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destruction in war, so can I be made the implement of peace, prosperity, and happiness for all people of the world."

POST-WAR EDUCATION—

(Continued from page 12)

the profession, the major amount of collegiate instruction in engineering practice has been eliminated in favor of a more thorough study of the fundamentals. It has been found that, with thorough preparation in fundamentals, engineering practice is readily learned after graduation. However, engineers say that young graduates find it exceedingly difficult to bolster up their ability to use the fundamentals of mathematics, physics, and engineering if they start their post-graduate careers with a serious deficiency in this ability.

By the time student approaches graduation, it seems reasonable to insist that he be able to read understandingly the monthly journal of his own professional society. The vast amount of intensive study on fundamentals which is an indispensable prerequisite to this ability should be apparent to anyone who will page through a few issues of these technical journals. Certainly we should not graduate men for whom these periodicals, the principal sources of information for properly trained graduates, will be practically closed books. I believe most graduates of the traditional engineering curricula can read these technical journals and that they can, by home study after graduation, round out their education in the humanistic-social studies.

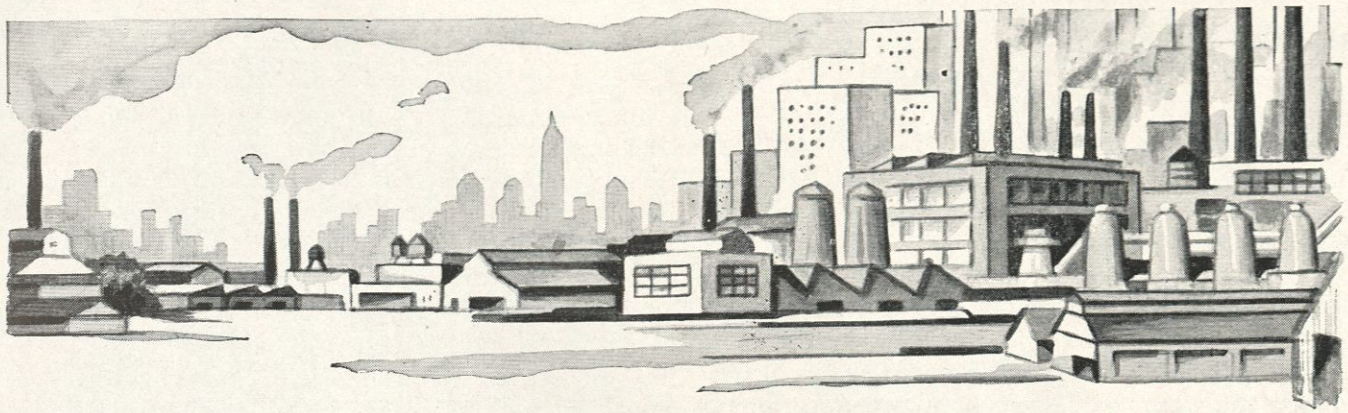
Whether or not a student will round out his education by post-graduate study is merely a question of his own choice. He would not be attempting to specialize in the humanities so the omission of the humanistic-social studies as an undergraduate should not seriously handicap him in this home study. On the contrary, continued self-improvement in the advanced engineering field requires more than the mere desire to improve; it must be founded on a long arduous apprenticeship in which the student needs the help of skilled teachers and

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the encouragement of sympathetic classmates. The fear that "if the engineering student doesn't get these liberal courses while he is in college, he is not likely, in his busy professional life, ever to acquire the basic training in literary, historical, civic, and economic fields that marks the well-educated man and the efficient citizen of our republic" seems to me to be unfounded. The Pennsylvania Inquiry indicates that engineering students are interested in general culture and my own contacts with students verifies this conclusion. The present global war has made everyone more interested in history, government, geography, languages, and economics. Therefore, we can expect in the future even more interest by engineers in cultural subjects.

The results achieved in teaching any subject depend in a large measure upon the receptiveness of the student. He must be ready to undertake the subjects of the curriculum or the teaching will be inefficient. Most students, when they choose an engineering curriculum, feel that they are thereby earmarking four years of their life for the specific purpose of learning to use technical knowledge. Generally they are more eager to study the scientific-technological subjects than to study in other fields. I do not believe they belittle the other fields of study, but they feel a greater need for help in the scientific studies. Therefore, they feel that they

(Continued on page 34)

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ALUMNI NEWS—

(Continued from page 28)

1934

Capt. Charles H. Clark, B.S. (C.E.), is at Camp Bowie, Texas, with the 332nd Ordnance Battalion.

Lt. Sterling S. Huyett, B.S. (E.E.), is a radar officer on duty in the Pacific.

L. G. Latronico, B.S. (Ch.E.), is a process technician with Kaiser's company at Fontana, California.

Lt. (jg) Waldron H. Yarger, B.S. (Ch.E.), is now on the west coast after being on duty on the Atlantic.

1935

*Lt. Boyd Brown, B.S. (C.E.), arrived safely in the United States after surviving the sinking of his minesweeper in the Mediterranean in July.

A picture of Lt. Comdr. J. D. Burky, Civil Engineering graduate, and an article telling of the second renewal of the Army-Navy "E" award to the Eureka (California) Yard of the Chicago Bridge and Iron Company is featured in the publication of the company. Burky made the formal presentation speech of the "E" flag.

1936

H. L. Armentrout, B.S. (M.E.), is with the A. M. Lockett Company in New Orleans.

(Continued on page 36)

POST-WAR EDUCATION—

(Continued from page 33)

can safely postpone enrollment in formal courses dealing with the humanities. After all, there are extra-curricular means to culture which will extend the beginning made in the humanities through twelve years of secondary schooling. Instead of forcing these students to devote one-fourth of their time to formal courses in the humanistic-social stem, it should be more effective to make the most of the student's eagerness to study in the scientific-technological stem. Any intelligent mind craves to understand the bearing of present effort on eventual attainment. The most immature mind understands the bearing of mathematics on engineering. When the student enters industry, he cannot fail to appreciate the bearing of many humanistic-social studies on engineering. Then is the golden moment for teaching the humanities, instead of forcing these subjects upon students when they are intent on fitting themselves technically to enter their chosen profession. When adult education, by evening courses for employed people, enriches its offerings beyond literacy courses, vocational courses, or business arithmetic, the problem of broadening professionally trained graduates of all types will be solved.

If the traditional engineering curricula must

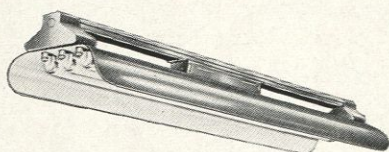
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DayBrite

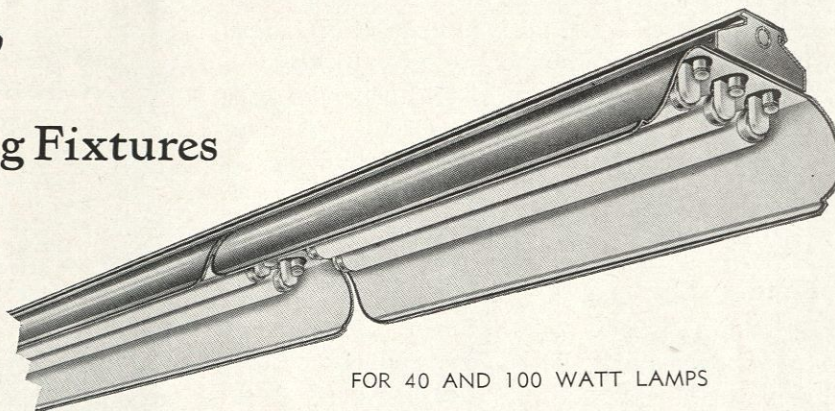
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W-Series units for two and three 40-watt and two 100-watt lamps. Fixture body is gray baked enamel... reflectors are white inside, gray outside. For complete details, see Bulletin F-76.

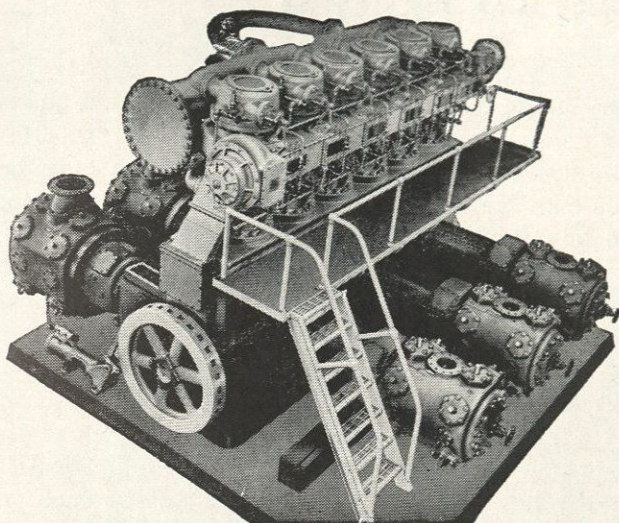


Complete fixtures, approved by RLM, for single unit or continuous installations. Accommodate two and three 40-watt and two 100-watt lamps. Sockets, starters and ballasts are fastened in the fixture hood, leaving reflector free for complete removal for servicing and cleaning. Reflector is fastened to the fixture hood by two wing nuts, hand-operated and non-removable... and is finished in porcelain enamel; gray outside, white inside. Die-formed hood is finished in gray baked enamel. Furnished wired complete. See Bulletin F-77.

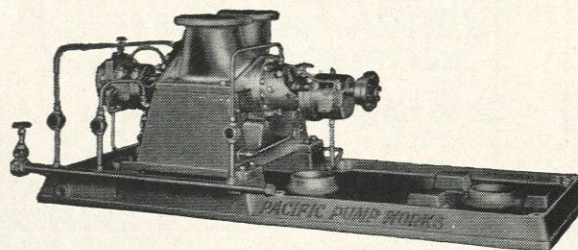
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POST-WAR EDUCATION—

(Continued from page 34)

be changed, I believe more emphasis should be given to the responsibility listed as (d). Why not allow the student enough electives so that he may build his own "minor" in a designed sequence of courses in any field he chooses? If he prefers to take as his minor a sequence of courses in advanced mathematics, in business, in economics, or in government, he should be allowed to do so and still be granted the B.S. in engineering for successful completion of his major in engineering. The student has to learn eventually, in spite of our present complex civilization and mass consciousness, that "underneath all is the individual." The development of each individual depends upon the wisdom with which he plans a sequence of concentrations on subjects and things to be done which will promote the highest degree of progress toward the objectives of his career. In the university the whole faculty is available to advise him in his choice of courses for his minor. Whatever the student takes as his minor and major, there are still the extra-curricular means to culture. These are apparently very effective in the cultural atmosphere of an engineering school located within a university, and in the cultural atmosphere of a university community.

ALUMNI NEWS—

(Continued from page 34)

*There is a 7-page illustrated article, "Spillway Erosion at Grand Coulee Dam" by Kenneth B. Keener, B.S. (C.E.), in the July issue of the "Engineering News Record." Mr. Keener is a designing engineer on dams in the U. S. Bureau of Reclamation in Denver.

1937

G. Gordon Wolcott, B.S. (M.E.) with special honors, is an aerodynamic engineer in California.

(Continued on page 38)

STEEL, BRASS, COPPER AND ALUMINUM

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A Million Jobs are Waiting



... for the Hardest Metal
Made by Man

(Starting as a metal powder, Carboloy Cemented Carbide is transformed, under heat and pressure, into an endless variety of shapes and forms—tool tips, dies and machine parts with the super-hardness that is vital to high-speed, low-cost industrial production.)

STRAIGHT through industry, after the war, there will be jobs that only the "hardest metal made by man" can handle.

Why? Because the cry is for better, longer lasting products and parts. Because closer tolerances will be combined with mass production.

And because industry knows that postwar profits will depend largely on the cost at which goods of top quality can be produced in top volume.

Work No Other Known Metal Can Do

Urgent war production needs brought Carboloy Cemented Carbide into its own. Its *super-hardness* was needed in tools to machine *super-tough* alloys—in dies to draw wire and tubing and to form sheet metal.

Carboloy Cemented Carbide works at speeds once thought impossibly high, to tolerances never before practical in mass production—and

it commonly doubles or triples the output of machines and men.

It is a matter of war record that the use of this magic metal made possible production of three times the number of aircraft engine crankcases and gears with the same equipment and manpower. And this is only one of many examples.

In peacetime production, it is certain that the usefulness of Carboloy Cemented Carbide will be greatly expanded, in widely varied fields—not only for tools and dies but for "wearproofing" parts that must stand up under modern machine speeds and stresses.

A "Must" in Tomorrow's Competitive Race

The hardest metal made by man may well write the price tags in tomorrow's "battle of costs." You are invited to take full advantage of Carboloy engineering, facilities and experience in planning products for tomorrow.



CARBOLOY COMPANY, INC., DETROIT 32, MICHIGAN



CARBOLOY

TRADE MARK

CEMENTED CARBIDE
THE HARDEST METAL
MADE BY MAN

ENGINE BALL—

(Continued from page 18)

ed by the engineering students to be their "Queen". The candidates in addition to Miss Beck were Pat Muir, Marilyn Bridges, Helen Carrigan, and Barbara Jeanne Jessup. After having been presented with a black velvet cape, "Miss Engine Ball Queen" and her court led the crowd in a Grand March.

"Starlight Serenade" was the theme of the formal and the decorations very appropriately exemplified the theme. In the center was a rotating, mirrored cylinder from which long streamers reached to the star-studded, draperied walls. Soft lighting, palm trees, and plenty of easy chairs helped to fill the decoration bill.

The committee members to whom the credit is due for making the dance so successful are Herb Johnson, Business and Finance; Ewalt Anderson, Publicity; Wayne Wilson, Chaperones; George Bardwell, Queen; Leonard Gregor, Decorations; Charles Hughson, Programs; and Ren Read, Orchestra.

Chaperones for the evening were Prof. and Mrs. W. S. Beattie, Prof. and Mrs. L. A. Bingham, Prof. and Mrs. C. A. Hutchinson, and Prof. and Mrs. A. J. McNair. Also present as guests were many members of the Engine school faculty.

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Engineers

Contractors

Designers

Manufacturers

DENVER, COLO.

ALUMNI NEWS—

(Continued from page 36)

1938

Second Lt. Lucian J. Bissey is with the Signal Corps at Crystal River, Florida.

Major William E. Boyd, B.S. (E.E.), is at Peterson Field, Colorado Springs.

*Lt. Elmer Maul, B.S. (E.E.), won the Distinguished Service Cross for leading a group of 6 dive bombers which scored hits on 5 Japanese cruisers at Rabaul.

Lt. Carrol W. Griffin, B.S. (C.E.), visited the campus recently. Lt. Griffin is the son-in-law of Dean Eckel of our Engineering Department.

1939

Charles E. Hikes, B.S. (C.E.), visited Boulder recently.

Lt. Anthony Tisone, B.S. (M.E.), has recently been promoted to Lieutenant with the Navy in the Pacific.

Lt. Thomas Trask, B.S. (C.E.), is stationed in India.

1940

Capt. Robert M. Ancell, B.S. (M.E.), is supervisor of maintenance at the Gila Bend Army Field, Arizona.

Thomas E. Dalby, B.S. (A.E.), graduated honor man of his company recently at Great Lakes Naval Training Station.

Capt. G. W. Lovering, B.S. (M.E.), is stationed in Venice, Fla., at the AAF Base Unit.

Lt. Gayle T. Martin, civil engineering graduate who recently visited the campus, has been at the Naval Architectural School at the University of Michigan and is being transferred to a west coast unit.

Marshall K. Wood, B.S. (A.E.), is in naval training at Farragut, Idaho.

Major R. D. Wright, B.S. (E.E.), who served in the Marine Corps in Iceland before Pearl Harbor, is now on duty in the South Pacific after having served a period of training recruits in San Diego.

(Continued on page 40)

WASHINGTON

MORRISON

COALS

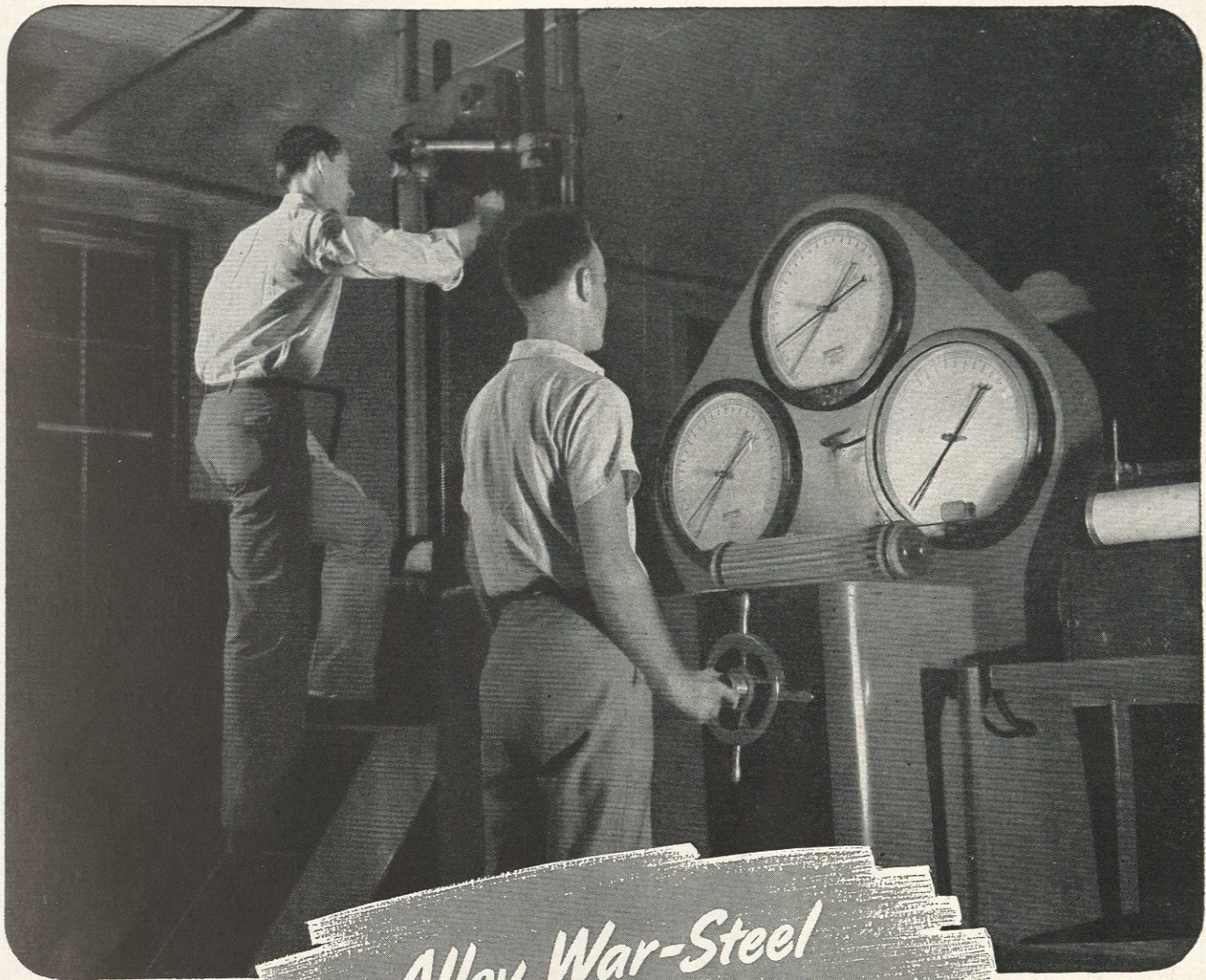
A Coal for Every Heating Problem

PIONEER COAL CO.

BOULDER, COLORADO

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Phone 25



Alloy War-Steel reports for its physical

OWI Photo by
Palmer, in an
Allegheny Ludlum Plant

TESTING is an integral part of steel production at Allegheny Ludlum mills, because one of the "must" requirements for an alloy steel today is that it possesses—to the full—every one of the special properties desired by the user.

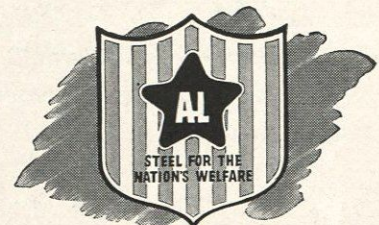
To help prevent failure of a part during operation, amazingly accurate machinery, worth thousands of dollars, is on the job at each Allegheny Ludlum mill, testing each lot of steel before it is shipped out to become fighting parts of planes, tanks, guns, ships or munitions. These steels *must* be right, for in the urgency of battles tremendous stresses are put upon the key parts

for which alloy steels are chosen—and those parts must not fail when men's lives are at stake.

It is under such war conditions that Allegheny Ludlum steels have proved their worth. Right now they're helping to uphold the traditions of a free America, so that all of us may retain them in the future. When peace is restored, Allegheny Metal and other alloy steels will take their rightful place again in the enrichment of the post-war world.

But now—today—these metals are supporting the attack. Be sure you are also supporting our fighters, from your place behind the

lines. Buy war bonds regularly! Top that ten per cent . . . buy them to the limit of your ability.



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BRACKENRIDGE, PENNSYLVANIA

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News, Music, Drama, Comedy and Daytime
Serials over—

★ ★ ★

KOA - 850 ON YOUR DIAL

ALUMNI NEWS—

(Continued from page 38)

1941

*Capt. Donald E. Clark, B.S. (M.E.), has been overseas 22 months in North Africa, Sicily, Italy, and islands of the Mediterranean as engineering supervisor of an airplane repair and maintenance unit.

*Capt. Hal M. Harrison, B.S. (Ch.E.), wearing the Air Medal, two Oak Leaf Clusters, and the D.F.C., has returned after 11 months service and 30 combat missions in a B-24 with the AAF in England.

Ensign Kenneth Ray White, B.S. (Arch.E.), former instructor in civil engineering, is in training at the University of Arizona.

1944

Ensign J. M. Bickford, B.S. (C.E.), is at Harvard University in training.

Ensign L. Mino Busby, B.S. (M.E.), former V-12 student, is taking further training in Norfolk, Va., after graduating from Columbia University's midshipman school.

Pvt. Jack J. Dalton, B.S. (E.E.), is at the Par-
ris Island, S. C., Marine Barracks.

Ensign Raymond H. Fields, B.S. (M.E.), is stationed at Memphis, Tenn.

Ensign Alvin J. Pearson, B.S. (M.E.) with honors, is at the Naval training school at Tucson.

Ralph William Reed, B.S. (M.E.), is with the National Advisory Committee on Aeronautics at Lakewood, Ohio.

Ensign Robert G. Rockwell, B.S. (E.E.), and Lieut. (jg) Ray Robertson, B.S. (E.E.) '42, are on board a carrier in the Pacific.

Walter E. Smith, Jr., B.S. (Ch.E.), is a chemist with the Honolulu Plantation Co.

Ensign Barton H. Spring, B.S. (E.E.), is at 50 S. Battery, Charleston, S. C.

Ensign Robert E. Wilson, B.S. (C.E.), was married in Denver recently and reported to the Bureau of Yards and Docks in San Francisco in September.

Colorado Builders' Supply Co.

FIREPROOF BUILDING MATERIALS

REINFORCING STEEL FOR CONCRETE

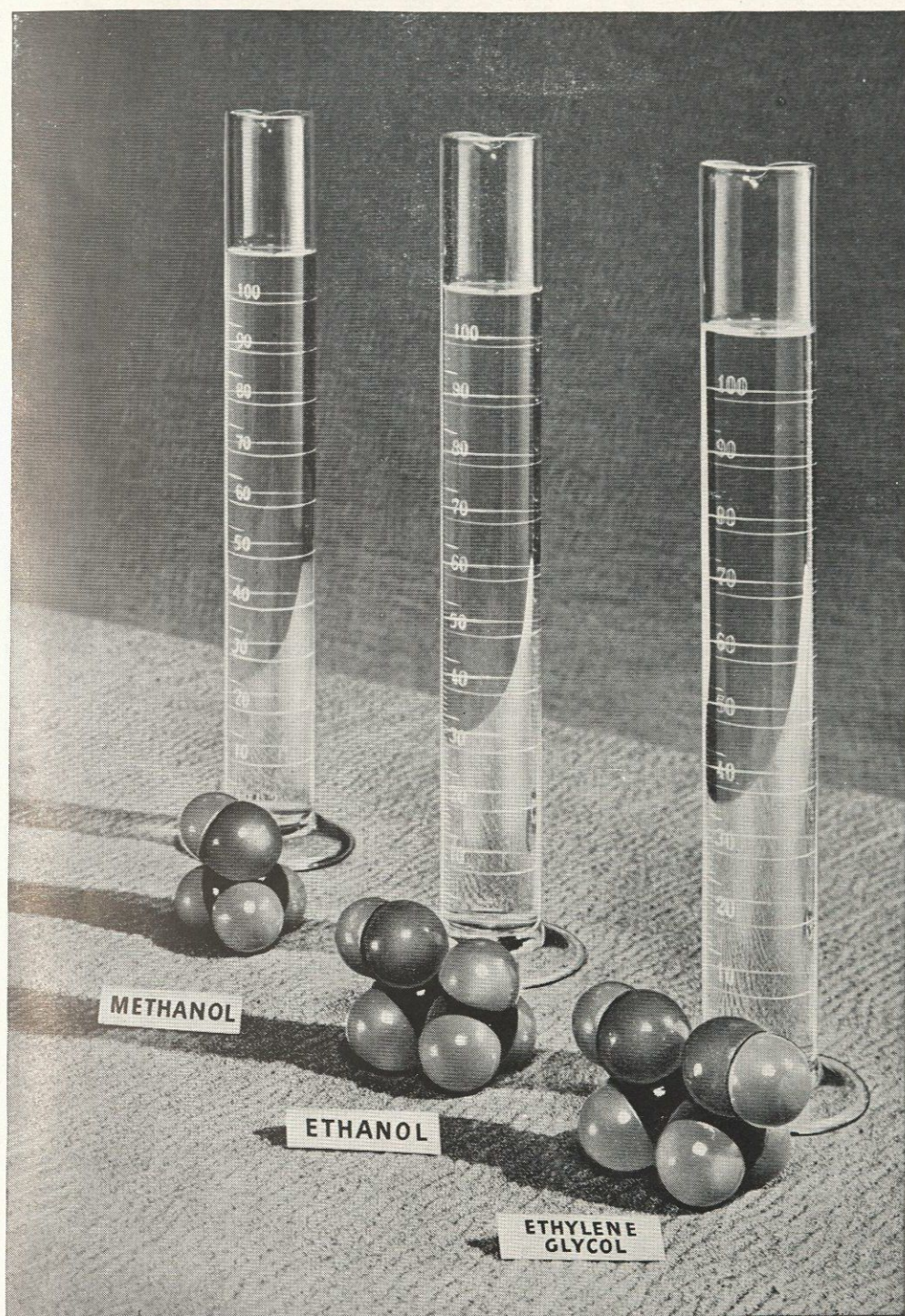
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Chemicals that protect your car!



HERE ARE THREE CHEMICALS that you are probably better acquainted with from the way they *act* as anti-freeze in your car than from the way they *look* in print.

These chemicals are manufactured in large quantities by CARBIDE AND CARBON CHEMICALS CORPORATION. Uncolored, they are water-white. To the chemists, who must know what they will do in your car, they are compounds of carbon, hydrogen and oxygen, the atoms of which are shown here in the molecular models.

ETHYLENE GLYCOL, ETHANOL and METHANOL are the bases of anti-freezes—and they help to take one of the worries out of winter for millions of motorists.

TODAY AND TOMORROW

Over the years, CARBIDE AND CARBON CHEMICALS CORPORATION and other Units of UCC, notably NATIONAL CARBON COMPANY, INC., have kept at their research—both in the laboratory and on the road—for the constant improvement of anti-freeze and anti-rust protection for your car. This is an important reason why you can depend on the following whenever and wherever you find them:

"Prestone" ethylene glycol-base anti-freeze. One "shot" gives all-winter protection.

"Trek" methanol-base anti-freeze, which is again available to the extent that the production of methanol has caught up with its war-critical uses.

"Blue-Flo" ethanol-base anti-freeze. Not being manufactured this year because ethanol (ethyl alcohol) has a bigger war job to do.

Certain other anti-freezes formulated and manufactured by Units of UCC for large national distributors.

"Rustone" corrosion preventive which, when added to the water in a clean cooling system, inhibits the formation of rust.

Car owners are invited to send for the booklet P-11, "Manual of Cooling System Service." It will be sent without cost or obligation.

BUY UNITED STATES WAR BONDS AND STAMPS

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OIL



CAN

THE HONORARY SOCIETY OF
LUBRICATION ENGINEERINGLubricity shall lack no champion . . .
Friction shall not thrive unopposed

An officer approached the young man in the neatly fitting blue uniform and asked:

"What's the eighth general order?"

"I don't know," the fellow admitted.

"Have you ever been on watch?"

"Nope."

"Don't you know enough to say 'sir,' either? What outfit are you in?"

"Me? I'm the Coca-Cola man."

"You're an apt boy. Is your sister apt, too?"

"If she gets a chance, she's apt to."

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

Dog: "What'll I say?"

Drunk at pay phone: "Number, hell! I want my peanuts!"

When the corporal went out to buy a paper the British barmaid leaned over the bar towards the shy young private.

Putting her face against his, she whispered: "Now's your chance, darling."

The private looked around the empty room.

"So it is," he remarked; and promptly drank the corporal's beer.

"May I kiss your hand?"

"What's the matter, is my mouth sticky?"

Marriage is like a cafeteria—grab something good looking and pay for it later.

She was just an optician's daughter — two glasses and she made a spectacle of herself.

"What engines shall we use in this boat?"

"Oh, Diesel do."

It is said: "The noblest kind of dog is the hot dog—it actually feeds the hand that bites it."

She: "Say you love me—say it! Say it!"

He: "You love me."

There once was a maiden from Siam
Who said to her lover, young Kiam,
"If you kiss me, of course,
You will have to use force,
But God knows you are stronger than I am."

I'm all done with dames
They cheat and they lie;
They prey on us males
To the day that we die.
They tease and torment us
And drive us to sin—
Say—Look at the blonde
That just came in.

A dainty foot, a lovely torso
Can make a friendly feeling more so.

Of all the seasons of the year,
I like the summer best.
It isn't that the girls are sweet,
But just the way they're dressed.

We never were able to find Grandma's glasses,
but now she leaves them just where she empties them.

"Only last week you said it was a great life if you didn't weaken."

"Yes, but since then I've found out it's greater if you weaken just a little bit."

"Watt-hour you doing there?"

"Eating Currents," replied the apprentice, "anode you'd catch me at it."

"Wire you insulate this morning?" asked the boss.

"Leyden bed. You'dn't that jar you?"

"Can't your relay-shunts get you up?"

"Amperently not."

"Fuse going to do that every day you can go ohm," said the boss, and the circuit was broken right there.

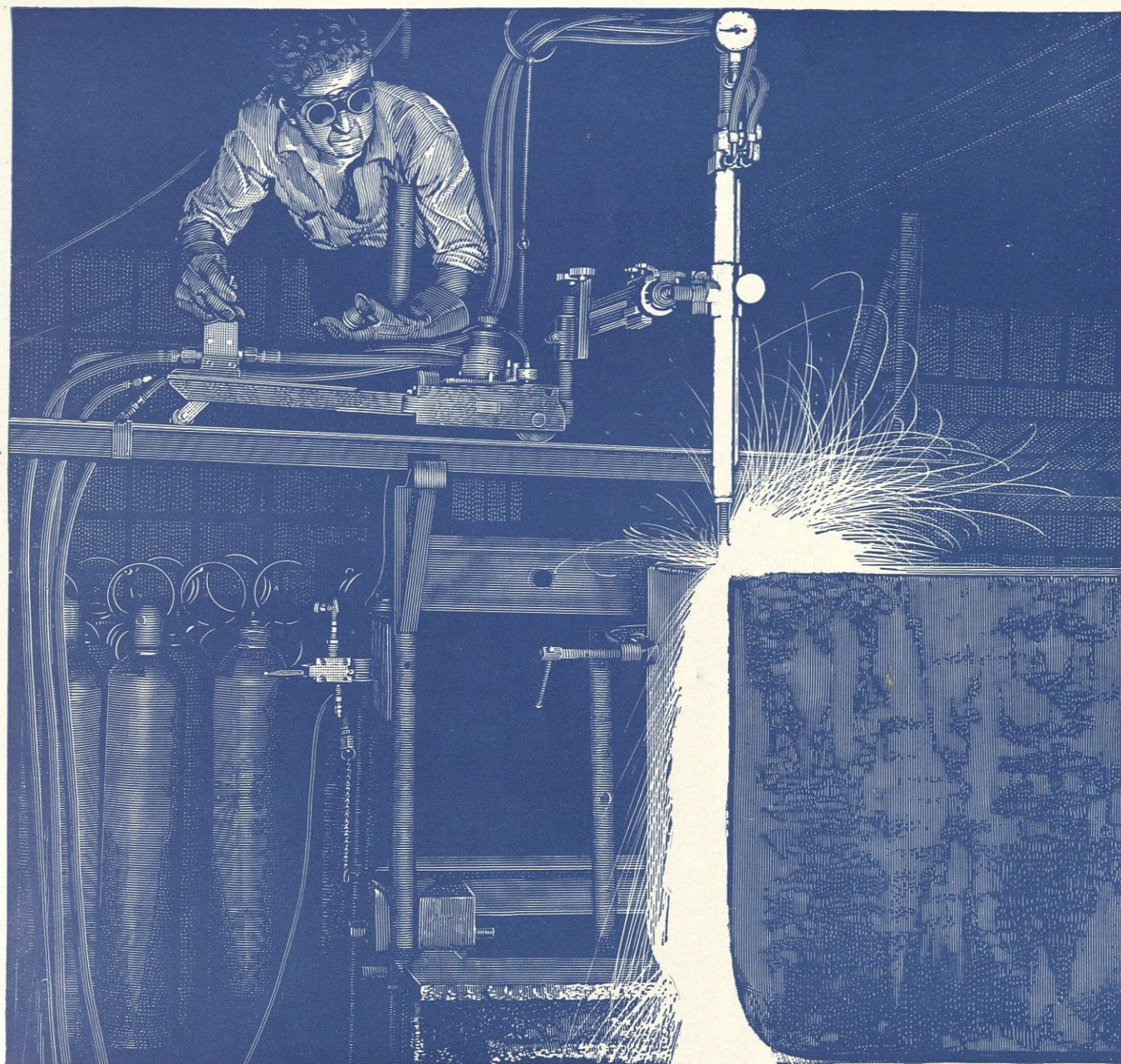
"What's the matter, little boy?"

"Ma's gone and drowned all the kittens."

"Dear me, that's too bad."

"Yeah, she promised me I could do it."

The wonderful love of a beautiful maid,
The love of a staunch, true man,
And the love of a baby, unafraid,
Have existed since life began.
But the greatest love—the love of loves,
Even greater than that of a mother,
Is the tender, passionate, infinite love
Of one drunken bum for another.



Cutting 1000 Hours Off an Ordnance Schedule

Under the piercing heat of the oxy-acetylene cutting flame, thick metals like this 32" alloy steel block are shaped into parts for heavy weapons faster than ever before.

For example, the flame cutting operation shown here saves more than 1000 hours machining time in producing

one heavy part for ordnance use. Similar valuable savings in time and labor are being achieved on hundreds of other war production schedules by this method . . . cutting steel up to 51" thick on a fast, production basis.

Air Reduction engineers have pioneered in the development of many

machine flame-cutting methods to speed operations in war and peacetime industry.

If you would like to receive our informative publication "Airco in the News," we shall be glad to send a free copy. Write to Mr. G. Van Alstyne, Dept. C. P., Air Reduction, 60 East 42nd Street, New York 17, N. Y.

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Campus News

RESEARCH AND ENGINEERING KEEP GENERAL ELECTRIC YEARS AHEAD



TANKERS ON PARADE

IT would take 1,900 miles of tank cars to equal the capacity of all the tankers built since Pearl Harbor which are powered by General Electric propulsion equipment. At any rate, that was the figure through July of this year.

General Electric first built turbine electric drives for the Navy in 1909. Chief advantages then and now have been speed and efficiency. In wartime these are especially important. Tankers must move fast to keep up with the swiftest ships in the fleet, keep ahead of enemy subs, and utilize their carrying space fully.

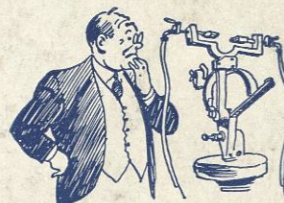
General Electric is building three-quarters of the drives for the high-speed tankers ordered by the Maritime Commission since the United States entered the war. Speed of the 6,000-hp tankers is better than 15 knots, the 10,000-hp ones can do over 17 knots—both are considerably faster than a submerged submarine. The new high-speed tankers move fast enough and are sufficiently armed to run free on the long treks across the Atlantic and the Pacific. They no longer wait for convoys.



DOUGHNUT MOTOR

IN the nose of some fighter planes, right in the middle of the motor that feathers the propeller, is a 37-mm cannon. Building a motor with a hole where the shaft ought to be was a brain twister, but G-E engineers solved this problem with an electric motor shaped like a doughnut.

The motor which automatically changes the angle of the propeller blades as flying conditions change has been designed with a hollow shaft. It is one of the many unusual motors that General Electric has designed and built to meet some specific need of America's fighting men.



BRAIN CHILD

ALMOST everyone likes to experiment now and then. It's fun, and in addition, worthwhile results are sometimes obtained. There is one machinist at the General Electric plant in Bridgeport whose experimenting brought real results recently.

The device shown above is his brain child. It may look a little grotesque, but it has proved very useful. A brazing fixture which can be rotated around three different axes, it has speeded up production on ignition parts for aircraft and earned a \$750 cash suggestion award for the inventor. *General Electric Co., Schenectady, New York.*

Hear the General Electric radio programs: "The G-E All-girl Orchestra" Sunday 10 p.m. EWT, NBC—"The World Today" news, every weekday 6:45 p.m. EWT, CBS.

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