TECHNICAL RECORD

OREGON STATE COLLEGE

Mount Jefferson as Seen From the Southwest

Volume 9, Number 3 · MAY, 1932 · Member E. C. M. A.

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Five years ago the United States had telephone connection only with Canada, Cuba, and the Mexican border. Since then, Bell engineers have so developed radio telephony that handling calls to Europe, South America, Australia, Bermuda, Samoa, and Hawaii is daily routine. Today more than 31,000,000 telephones can be reached — approximately 92% of all the telephones in the world!

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THE OREGON STATE TECHNICAL RECORD

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Volume 9 | May, 1932 | Number 3

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Thanks!

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Our Plans

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Mention Them

The engravings which accompany the article on the Grants Pass filtration plant were loaned to us by the Western Construction News of San Francisco through the efforts of Barr and Cunningham construction company of Portland. We wish to express our appreciation to these concerns for their cooperation with us.

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This is the last issue of the Technical Record to be published this year. The new staff is already making plans for the next years magazines, and intend to put out a campus issue to start the year with an appropriate theme. The plan is to include subjects of student interest right here on the campus, removed from the purely technical articles.

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It is largely through the advertising, both national and local, that the student engineers are able to maintain the Technical Record. In reading through the magazine notice the advertisments and mention them when speaking of the publication.

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Dean Rogers

HARRY STANLEY ROGERS, dean of the school of engineering, though still a comparatively young man, has had wide experience in practical and educational engineering. After being graduated from the University of Wyoming in 1914, he spent several years in the educational field which was followed by a period of practical work. In 1920 he was appointed to the faculty at Oregon State College, and in 1927 became dean of the school of engineering, succeeding the late G. A. Covell. Dean Rogers is considered one of the outstanding engineering educators in the United States. He is associated with several professional organizations, is interested in civic enterprises, and is author and associate author of a number of engineering works.

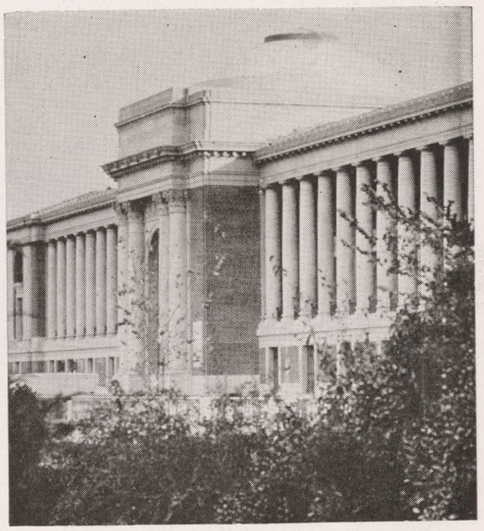
S. P. E. E. Convention

Three Hundred Engineering Educators From 200 Schools to Assemble Here June 29

By Ralph Boden, Freshman G. E.

OREGON State College will be host to 300 delegates of the Society for the Promotion of Engineering Education when they assemble in Corvallis June 29, to begin their fortieth annual convention. This is the first time that the society has held its yearly meeting on a Pacific coast college campus, and members of the local engineering staff, headed by Dean Rogers, are busily engaged in making the event well worth the while of the far eastern members who will travel across the country to be here. Once before a western institution was selected for the gathering when the engineering educators convened at the University of Colorado in 1924, and because of the success of that meeting, the council of the society accepted the invitation of Oregon State College to hold the 1932 convention in Corvallis.

Commenting on the occasion, H. S. Evans of the University of Colorado, president of the organization, wrote, "The extra time and money involved in such a trip will be a sacrifice to some, but there are real compensations to be gained in a better understanding of our national problems in engineering education. A combination of business and pleasure could find no happier setting than the Pacific Northwest, and it is hoped that an unus ually large number of our members will be able to take advantage of this opportunity." Present reports indicate that each of the 200 colleges which have faculty men belonging to the society will send at least one delegate.



Memorial Union Building

Plans are under way for the organization of parties to leave Chicago on special cars at different dates, which will add greatly to the value and comfort of the trip. Arrangements are being made for scenic sidetrips from Corvallis over a portion of the Roosevelt highway along the Oregon coast and over the McKenzie highway to the summit of the Cascade mountains where the great Oregon lava beds may be viewed. Other diversions for the visitors will include tennis on the college courts, golf at the country club, and swimming at the men's swimming pool.

Special entertainment is being prepared for wives of delegates, and this will be announced in the final program. The Girl's room in the Memorial Union building will be a rendezvous for visiting ladies: Representatives of the Corvallis faculty ladies will be in attendance during the convention. In order that visitors may have the most pleasure during the stay here, a special committee to take care of children has been organized.

However, not all of the delegates' visit will be spent in recreation, for the members of the society have an interesting program of conferences, business sessions, and dinners to attend. A preliminary to the convention will be a dinner for members of the council and their wives on Tuesday evening, June 28.

Next morning there will be a conference on research led by R.

(Continued on Page 13)

College Library

Special Frequency Machines

Industry Aided by Development of Converter Set

By Artro Swingle, E. E. '29

WITH the increased use of electricity in industry many applications have been developed where either by reason of economy or performance a frequency of alternating current supply is required which is not a standard frequency. This frequency is usually supplied by means of a special frequency converter set consisting of a generator to supply the desired frequency coupled to a standard frequency or direct current motor as the case may be.

The most important uses for special frequencies may be listed as follows:

(a) Special motor drives.

(b) Signal, radio, and control applications.

(c) Induced voltage coil and transformer testing.

(d) Industrial heating, furnaces, arc welding, and induction coils.

Special frequencies are often used on motor drives in order to obtain either very high or very low speed operation with a standard type motor. Common instances are high speed tool drives, rayon silk spinning mill drives, and low speed steel rolling mill drives, making use of induction motors in most cases.

Several electrified railroads have made use of one hundred cycle signal equipment. Radio and carrier current systems have made use of various frequencies for signaling and control service. Induced voltage testing is used quite extensively by electrical manufacturers.

Applications Listed

Heating applications include various uses of high frequency induction coils for heating electrical conducting materials placed in their magnetic fields. High frequency is also sometimes used in the stitch welding of pipe. One application has made use of a frequency of 8.57 cycles on a core type induction furnace. The largest heating application, however, is in the use of the coreless induction furnace.

Since the induction furnace application is of major importance in the whole field of special frequency application, it may be of interest to briefly discuss its development and use. In recent years, rapid advancement in all types of manufacturing has created a large demand for high quality steel and numerous alloys, which in turn has led to the commercial development of the coreless induction furnace as one of the best means of obtaining these products.* It has been demonstrated that the theoretical minimum frequency for use with a coreless induction furnace is represented by the expression $fm = \frac{25 \times 10^8 \times P}{d^2}$

Where fm=Minimum frequency.

P=Resistivity of charge in ohms per cm^3.

d=Diameter of charge in cm.

The frequency may be as much higher than this value as is economically feasible from the standpoint of other factors. These factors include principally furnace size, cost, efficiency, and performance. Capacitors are used to correct the power factor so frequency will have a direct bearing on capacitor cost. As an example of the performance factor, it has been found that a 60 cycle furnace will not, in general, start a cold charge and at low frequencies the stirring of the charge is too violent for best product composition and furnace maintenance.

In present day furnaces of reasonably large capacity, 1000 cycles has been found to be the most practical frequency. With such an installation, properly designed, the furnace efficiency has been made to approach 75 or 80 per cent which is comparable with the efficiency of the frequency changer set used to supply it. These installations melt from two to three pounds of metal per hour per kw. input to the furnace and there have, to date, been a number of installations with a capacity of 3000 pounds and at least one of 4500 pounds in this country.

High Temperatures Reached

Two furnaces are commonly operated alternately on one power supply and several of the present installations are so powered that one entire melt is completed in one hour or less. The metal may be held at a constant temperature of over 2000 degrees C. for any length of time desired if the operation is one requiring a refining action. When one considers

(Continued on Page 15)

*An article on the theory and construction of the coreless induction furnace may be found in G. E. Review, April 1928.

The Author

Artro W. Swingle was graduated from Oregon State College in 1929 with honors of which any man might justly be proud. He was a student in electrical engineering, and maintained an average of 95 for his career in this institution. During his senior year he presented an article "on the neon stroboscope" which he and V. E. Kerley prepared, to the Portland section of the American Institute of Electrical Engineers. He and his co-author gained no small recognition for this writing.

Swingle is a member of Tau Beta Pi, Phi Kappa Phi, Scabbard and Blade, Sigma Tau, and Eta Kappa Nu, being secretary-treasurer of the latter two during his senior year. He also served as cadet colonel of the field artillery unit in the military department, and was a member of the rifle team for four years.

Research In Gasolines

Octane Rating Affects Efficiency of Product

By William Hanley, Senior M. E.

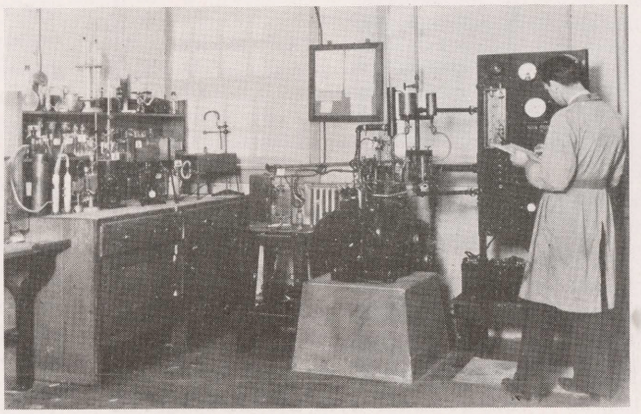
THERE is probably less known about gasoline than any other item upon which the public spends an equal amount of money. The purchaser of an automobile seldom realizes that he is, at the same time, contracting to buy gasoline about equal in cost to the purchase price of his car, based on the average yearly consumption and the average car life of seven years.

Although very little is actually known about gasoline by the motoring public, there is no easier way to start an argument than to mention the subject of gasoline. Most of the arguments advanced are the result of personal experience based on insufficient data or are the result of the profusion of gasoline advertising, much of which is misleading if not actually untrue.

Gasoline is not a simple definite substance, such as pure water, for example, but is a complex mechanical mixture or mutual inter-solution of some tweny-three individual liquid hydro-carbons which vary in boiling point from 93°F. for isoprene (one of the diolefins), to 412°F. for dedecylene (olefin group) and vary in specific gravity from 0.630 for pentane (paraffin group) to 0.882 for xylol (one of the aromatics). For this reason no one simple test, such as specific gravity, will suffice, although the state of Oregon at one time used this test in an attempt to regulate gasoline quality.

Before deciding on the tests required to evaluate the utility value of a gasoline it is first necessary to arrive at the qualities desired. These may be placed in two divisions, the first including purity, quick starting, lack of vapor-lock, and freedom from crankcase dilution. The second includes mileage, acceleration, hill climbing, speed, and anti-knock properties.

In determining purity, sulphur and gum content are the most important. The Bureau of Mines found that of 158 gasoline samples taken from all parts of the United States only one would discolor a polished copper strip when immersed in the sample for three hours at 122°F., which indicates that the corrosive element in gasoline is not "free acid." The government recognizes this fact by making no mention of "free acid" requirements in its gasoline specifications but does require the sulphur content to be less than one-tenth of one per cent.



Hanley at Work in Fuels and Lubricants Lab.

Sulphur is not of itself corrosive but when gasoline containing sulphur is burned in the cylinder the sulphur oxidizes to sulphur dioxide, which in combination with the condensed water in the crankcase will form corrosive sulphurous acid. In the last Bureau of Mines gasoline survey published in December, 1931, test results of nine gasoline samples taken in Seattle were reported. All of these but one were found to contain less than one-tenth of one per cent sulphur; the remaining one had less than two-tenths of one per cent. Since no corrosion will result unless water is present and the amount of water condensed in the crankcase is not great unless the temperature is below the dew point, in temperatures such as experienced in Oregon the one-tenth of one per cent limitation is probably more stringent than is necessary.

The other objectionable impurity, gum, may be present in two forms, preformed and potential. The potential gum is of interest to the refiner as it will result in actual or preformed gum after a certain period of storage. The motorist is interested in the preformed gum in the gasoline at the time it is purchased, since it will not be subjected to much additional storage in the car tank before it is used. This gum content should be not more than 10 mg. per 100 cc. of gasoline, as an amount in excess of 10 mg. may result in sticking valves or clogged fuel induction systems. All of the gasolines had less than the allowable 10 mg. per 100 cc.

The 10 per cent point of the A. S. T. M. distillation corrected for loss was used to measure the quick starting quality. Satisfactory starting has been defined by Dr. G. G. Brown of the University of Michigan, as starting with four revolutions of the motor with full choke (1:1 air-fuel ratio). Of the nine gasolines tested by the writer (samples taken locally on Jan. 9, 1932) the ten per cent point temperature varied from 127°F. to 142°F. Applying Dr. Brown's correlation between the A. S. T. M. 10 per cent point and quick starting, the gasoline with the 127°F. ten per cent point would start the motor with

four revolutions at an atmospheric temperature as low as 6°F., and the gasoline with 142°F. ten per cent point would start the motor at 16°F., temperatures seldom experienced in this locality.

Vapor-lock occurs when the vapor pressure of the gasoline exceeds the hydrostatic pressure on it, which is usually atmospheric pressure plus or minus a pressure head necessary to cause movement of the gasoline out of the fuel tank into the carburetor float bowl. When vapor-lock occurs a bubble of vapor is formed in the fuel line which lodges in the metering jet of the carburetor or in the bends of the fuel line and interrupts the supply of gasoline, thus causing the engine to stop. The tendency for a gasoline to vapor-lock will be increased if the temperature of the fuel line is raised, thereby increasing the vapor pressure, or if the hydrostatic pressure of the fuel line is reduced, which will occur at high altitudes. Since in this locality the atmospheric temperature is not high and the elevation above sea level not great, vapor-lock does not often occur, at least not in the later model cars. Since the tendency for vapor-lock depends on the design of the fuel induction system as well as the gasoline, the vapor-locking temperatures are correct for comparative purposes only and are only approximate as to absolute value. However, the extreme vapor-locking fuel line design has been used as a basis for comparison in order to provide a factor of safety.

The Effect of Temperatures

Again taking the two gasolines of highest and lowest 10 per cent point, vapor-lock will occur at an atmospheric temperature of 77°F. for the gasoline with the 127°F. ten per cent point and at 89°F. for the gasoline with the 142°F. ten per cent point. Since the highest atmospheric temperature for the week the samples were purchased was 55°F. vapor-lock would not occur.

Although crankcase dilution is a function of the gasoline, there was very little variation in volatility of the heavier fractions of the gasolines. For this reason there would be but little difference in crankcase dilution due to the gasoline. Crankcase dilution is more a function of the mechanical condition of the motor and the operating conditions rather than a function of the gasoline and may vary from 10 to 50 per cent for this reason.

Conclusion Reached

It may be concluded that for the first group of qualities: purity, quick starting, lack of vapor-lock, and freedom from crankcase dilution all of the gasolines were about equal with the exception of a slight variation in quick-starting and vapor-lock. However, the quick starting and lack of vapor-locking tendencies were adequate for the atmospheric temperatures encountered.

OCTANE NUMBERS

Of the coast major non-premium gasolines.

Ultimate Performance				
Gasolines	A	B	C	
Octane numbers	71	71	70	
Satisfactory Performance				
Gasolines	D	E		
Octane numbers	67	65		
Below minimum recommended by leading car manufacturers.*				
Gasolines	F	G	H	I
Octane number	62	61	61	59

*According to letters from 8 leading car manufacturers.

In testing the gasolines for the second group of qualities entirely different road or block test results will be obtained depending on whether test conditions are such that detonation or knocking will or will not occur. Mileage, hill-climbing, speed, and acceleration all depend on the power output obtained when a given quantity of gasoline is burned in the engine, provided that the distillation curve is properly proportioned. If the engine is operated at a constant medium speed and at part load so that no detonation occurs, the power developed by a given quantity of gasoline depends on its thermal value or heat content. The heating value is directly proportional to the specific gravity of the gasoline and may be calculated quite closely by the formula:

$$\frac{\text{B.t.u.}}{\text{lb.}} = 18{,}320 + 40\ (\text{Baume' gravity} - 10).$$

For the gasolines tested the Baume' gravities varied from 54.1 to 57.6. These gravities substituted in the formula give heating values of 20,084 and 20,224 $\frac{\text{B.t.u.}}{\text{lb.}}$ or a variation of about one per cent.

Since, if the 90 per cent point is sufficiently high, speed, mileage, hill-climbing, and acceleration all depend on the B.t.u. content which varied only one per cent, these four qualities would not vary more than one per cent regardless of which of the nine gasolines is used if the engine is operated so that no detonation occurs. This means that if 20 miles per gallon were being obtained with the heaviest gasoline, 19.80 would be obtained with the lightest gasoline. However, when the car is operated under knocking conditions, that is, rapidly accelerating or under full load at low speeds, there will be a decided difference in power output depending on the anti-knock value of the gasolines.

Detonating Conditions

With the present crowded condition of the highways and congested traffic in cities much of the driving is done under knocking conditions, that is, rapid accelerating. Therefore, since there will be no appreciable difference in performance with any of the coast major gasolines unless detonation occurs, and there will be a decided difference in performance if detonation does occur and much of the driving is done under detonating conditions, gasoline should be compared under detonating conditions of operation. If this is done the performance of a gasoline will vary directly as the anti-knock value which may be expressed in terms of octane numbers. The higher the octane number the less will be the tendency for the gasoline to knock.

(Continued on Page 11)

New Filtration Plant

Grants Pass Installs Water Purifying Equipment

By Graham Townsend, Sophomore E. E.

MUDDY and sometimes contaminated Rogue river water is converted into pure drinking water by the new filtration plant which was recently installed at Grants Pass, Oregon.

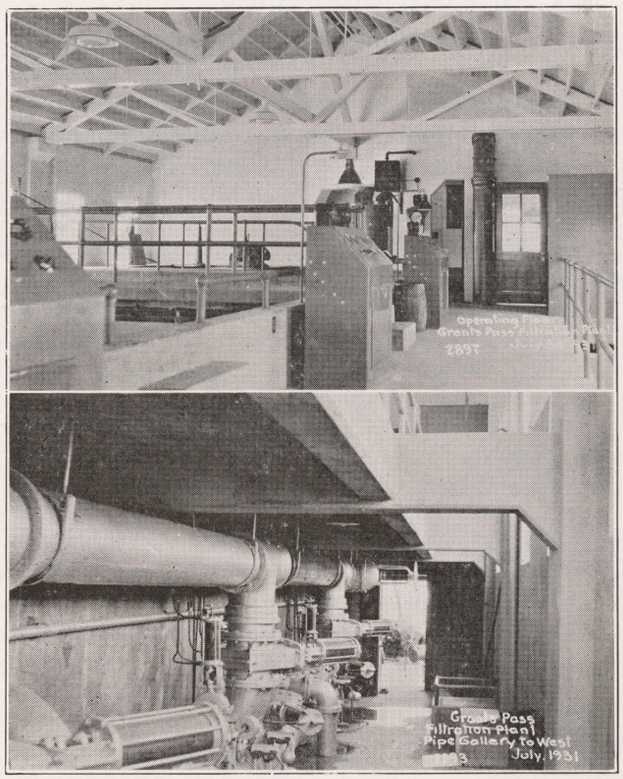
The system of that city has been quite inadequate in the past. It was formerly owned by a private company who screened and chlorinated the Rogue river water and distributed it to the consumers. The foreign matter often was not properly removed and excess chlorine sometimes gave the water a disagreeable taste. The main pipe lines were not of sufficient size to maintain a good pressure in all parts of the city during sprinkling hours, and fire protection was very inadequate.

These conditions have been greatly improved by a modern filtration plant which was built in the city. Larger distribution mains were installed. New fire hydrants replaced the old ones, and many additional hydrants were installed to insure fire protection. The two reservoirs in the city were well located but required complete renovation. They were relined with concrete, and their capacity was increased by building walls with sloping sides. These reservoirs were covered with galvanized iron to prevent algae growth.

New facilities for using the Rogue river water have been provided within the city limits of Grants Pass. The buildings which house the filtering equipment are in Spanish style, being built of concrete with red tile roofs. Adjacent to the buildings are the settling basins, and provision has been made for the addition of aeration equipment if it is ever necessary.

A pumping plant on the bank of the river supplies the filter plant with water by the use of three pumps which are rated at 520, 780, and 1040 gallons per minute.

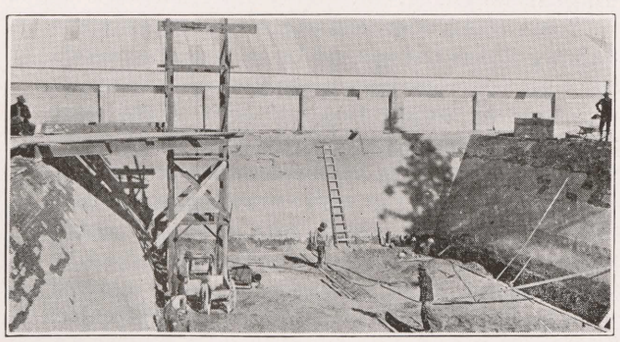
At the filter plant ammonia, chlorine, alum, and hydrated lime are added to the water. The ammonia helps to remove the chlorine taste. The chlorine sterilizes the water. The alum is for the removal of foreign matter. It precipitates in the water forming a gelatinous mass which sinks, taking with it all foreign particles present. Lime is added last for softening the water. The chemicals are thoroughly mixed with the water in tanks of a new design. The water flows down in the center of the mixing tanks and upward around the sides, and is kept whirling by the use of large ship propellers. When the tanks are thus filled to maximum capacity the propellers are turned off and the mixture is allowed to settle in the basin for four hours.



Interiors of Plant

From the settling basins the water is drawn off and run through three gravity filters composed of sand and gravel. The layer of gravel is two and one half feet deep, and is covered by a layer of sand one and one half feet deep. The filters are designed for two gallons per minute per square foot. An interesting new method of cleaning the filters is employed to take the place of manual labor formerly used. The dirt is taken out by backwashing through the filter. This backwash agitates the sand in the filter. floating the dirt off through the sewer. Water for the wash is supplied from the main tower of the plant which houses a tank of 32,-

(Continued on Page 16)



Relining Concrete Reservoir

EDITORIAL

Our Editorial Policy

The life of the student engineer deals to no small extent with a fundamental conception of engineering technique which is gained through research. By this process many ideas and conclusions are reached, which should be voiced for the benefit of all. This is perhaps one of the chief purposes for maintaining a magazine of this sort, backed by the association of student engineers, and edited by them.

For the last three or four issues there has been a tendency to publish more student articles in the contents of the magazine, and it is the aim of the new staff to promote this important idea of enlightening the reader with subjects with which he is in contact, and which cannot help but be of interest to him.

With an increasing number of the so-called "technical articles" written by the students of this school, it is reasonably expected that the present staff will uphold the standards of the past and push ahead toward a more interesting magazine which will be read and enjoyed by the students who have made it possible.

A New Scale For Labor

Readjustment is inevitable in this industralized economic world of ours; that is an accepted fact. Newspapers tell us so every day; magazines repeat the tidings weekly and monthly, and numerous books have been issued with the avowed purpose of telling us that readjustment is inevitable.

Many and devious are the forms which will be taken by this readjustment, if information divulged by all the above sources may be accepted. To the engineer, this new order of things in the economic world is of more than passing interest, for who but the engineer can be picked to lead a puzzled industrial world out of the fog of maladjustment in which we are now enveloped?

From the scores, hundreds, yes, thousands of causes which are advanced for our many economic ills, a few stand out. One of these is under production in its relation to employment. Production today is approximately at a point of 35 per cent in volume of plant capacity. Few will agree that the 100 per cent point will ever again be reached, or at least not in the present decade. A feeling of satisfaction will gradually spread over the nation if the 50 per cent goal is reached, provided that most wage-earners are back in harness and are receiving from industry enough to feed, house, and clothe their families, with a modest balance left for a luxury or two.

But how, we ask, can production be set at 50 per cent of its former maximum, and yet allow for employment of all the former labor? There is only one answer; working hours per week for each man must come down in ratio with production; yet the buying power of each man's working week must not be decreased. Therein, it seems, lies the greatest retarding force to such a readjustment, for it is obvious that to reduce production without a corresponding reduction in the allotment made by industry to labor must call for a new scale of production costs.

This new scale will provide that approximately double the amount of production cost formerly allotted to labor must thereafter be given for that purpose; this, of course will mean that mass production with its enormous advantage to machine over manual methods will lose a part of that advantage. Yet no industrial leader has yet advanced a plan which does not contemplate such a readjustment taking place. —G.W.H.

Ghosts

We have been talking about the depression for over two years. It is wagered that the word has been thought of, written, and uttered more times since September, 1929, than any other word in a like period since the beginning of the English language.

There was a southern negro who was always talking about the ghosts he saw in the woods at night. His master made him promise one day that he would stop and look at the next one he saw. A few nights later, while followingly a lonely path on his way home, he suddenly saw a ghost in white robes passing stealthily through the trees. In a flash the negro was running as fast as his feet would carry him. He ran until thoughts of safety calmed his fear, then he remembered his promise.

Is Engineering English Essential?

A Brief Discussion by O. Laurgaard, City Engineer of Portland

It is becoming more and more apparent that in order to become successful in his chosen profession, the engineer must be able to express himself properly and correctly. Not only is it necessary for him to give orally, and promptly when required, a clear and concise expression of his thoughts on technical subjects, but it becomes necessary at times to transfer ideas, views or mental pictures to written form for the uneducated or for individuals who are not versed in scientific terms. In my judgment, our technical, educational institutions cannot place too much importance on the correct teaching of English in its various phases. The engineer, of all professions, should not only be able to think clearly and to express himself on the public rostrum, but should also be able to write a grammatically correct report in interesting style on subjects in which he is trained and qualified.

Engineers as a rule are self-satisfied in their own particular field, and are too prone to devote their time exclusively to technical investigations and studies. They do not assert themselves when occasion requires, nor do they, as a rule, submit the results of their analytical studies and conclusions on important questions of public interest and concern in a manner which is beneficial to the public.

During his period of training and education, the young engineer should, in my judgment, assume a part in social and political activities. He should become acquainted with human nature by rubbing elbows with his fellowmen, and become accustomed to public speaking, and also prepare as often as possible written discourses and articles on subjects of public interest.

By review and survey of the engineers who have made a marked success in their chosen fields, it will be found that they are men who have taken keen interest in the affairs of college life, or have developed a cooperative spirit in the communities in which they reside, or have become authorities on various technical subjects by careful research, investigation or studies, and have made public expressions thereof in an accurate, clear and understandable style in published articles or reports. The time has come, in my judgment, when the engineer should assert his rightful position in society and crawl out of his shell of self-satisfied technical seclusion.

Slowly, carefully, he crept back—and found a harmless spotted calf.

How much of the depression ghost is a spotted calf and how much of it is a reality?

—The Iowa Engineer

A Bright Future

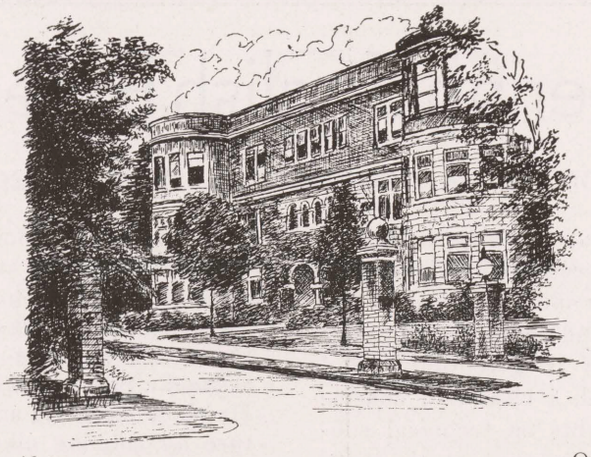
A great future is in store for Oregon State college. Many doubting individuals fail to see the importance of the newly accepted policies for the ensuing years on the campus. They maintain it will ruin the spirit for which we are so well noted. But careful consideration seems to show a marked advantage in this new arrangement. One fact is outstanding, namely that the State Board is in a much better position to judge the advantages of such a plan. They are all men of mature judgment and training, as well as judges of sound economy.

The various departments on the campus will be increased considerably in their scope of training. Professors of mathematics maintain that the required two years of experience in their department provides the student with a tool with which he is barely able to scratch the surface of powerful and extensive mathematics. Next year several advanced courses will be given in this field, and a degree will be given for a certain requirement in the course.

Another source of training will be gained through the combination of the chemistry departments of the two schools in this state. Ample facilities for specialization and advancement will be available for those who choose to delve farther into this interesting subject.

Broadminded consideration removed from the petty jealousies of rivalry between the schools, seems to point to a better organized and specialized policy of training, and will go to make stronger and more unified institutions of both.

Notes from the Engineering Quadrangle



Associated Engineers

L. Thomas

C. F. Swigert, president of the Pacific Bridge company, spoke to the engineering students on April 11 concerning the Hoover dam, illustrating his lecture with slides and moving pictures.

The dam will be the largest ever built in the United States and twice as high as any other in the world, according to Mr. Swigert in his speech. It will hold the flow of the Colorado river for 2½ years and will create a lake 110 miles in length. The dam will cost $6,000,000 more to build than the Panama canal.

It will serve to protect the Imperial valley from flood, to irrigate the valley, to provide the water supply of Los Angeles, and to generate much electric energy.

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Honor Groups

A. Greenlaw

TBΠ Three faculty men and eleven students were chosen for membership into Tau Beta Pi, national honor society in engineering. This group was chosen from the upper one-eighth of the engineering students, as is the policy of that organization. Faculty members selected for membership to Tau Beta Pi were J. H. Hance, dean of the school of mines; A. L. Albert, assistant professor of electrical engineering; and F. Merryman, assistant professor of civil engineering.

The students who were chosen included Richard Mather, Melvin Kofoid, Howard Beckendorf, George Borkowski, Robert Reisner, Elden Carter, Fred Hunt, Carl Merryman, Claude Christianson, Marion Shellenbarger, and Norman Rudd. These men are all juniors in four departments of engineering; civil, electrical, mechanical, and chemical. Henry Odeen, CE. 1914, was also taken into the group.

HKN At an initiation to be held in the very near future four men will be taken into Eta Kappa Nu, national honorary fraternity in electrical engineering. The men who will be initiated at that time will be Tracy W. Applegate, Fred Helber, John Godman, and Alton F. Everest. The plans for the event will include a trip to Mary's Peak.

ΣT At a recent meeting of Sigma Tau officers were elected for next year. The men chosen to head the group are; Elden Carter, president; Alfred Jaquot, vice-president; and Adolph Benscheidt, secretary. These men were taken from the junior class, and will manage the affairs of the group until elections next spring.

The men who were initiated into Sigma Tau this year included the following list, M. J. Kofoid, R. J. Mather, R. H. Reisner, Fred L. Hunt, and John Geren.

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Civil Engineers

C. Merryman

Research work has occupied the attention of a number of advanced students in civil engineering this year. Howard B. Stanley, graduate student, and Roy G. Anderson, senior in civil engineering have completed a joint research project on structural welded angle connections. This project was in cooperation with The Linde Air Products Co.

Thomas R. Cantine, senior in civil engineering, has conducted a research project on the physical properties of building plaster. Norman Kennedy, also a civil engineering senior, has studied the problem of combined stresses in reinforced concrete members. Kennedy completed his bachelor's degree requirements during the winter term.

Robert C. Smith, civil engineering senior, has conducted a photo-elastic study of beams and hollow rings and their stress distribution. Smith has been awarded a scholarship at the California Institute of Technology for next year.

Orville Kofoid, senior in civil engineering, has completed the construction and testing of a Banki type water turbine, the only one know to be built and tested in the United States. This turbine operates in the field between the ranges of Pelton wheels and the simple impulse turbine. The type of gate control, which produces an almost constant efficiency in its operating range, may revolutionize the current type of gate control in the ordinary reaction turbine.

The Hydraulics department has recently received a Stevens Telechron-operated water level recorder as a gift from Mr. J. C. Stevens, of Stevens and Coon, Portland, Oregon.

The Oregon Section of The American Society of Civil Engineers will hold a joint meeting with the O. S. C. Student Branch of A. S. C. E. in Corvallis on May 21st. Each year the Oregon Section has offered three prizes for the best senior research project. The prizes consist of the payment of initiation fee and one year's dues in A. S. C. E. The prize winning papers will be read at this joint meeting on May 21st.

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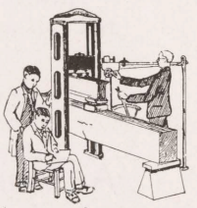
Mechanics and Materials



D. Finlay

Professor J. C. Othus, assistant professor of mechanics and materials, was recently elected to membership in Sigma Xi, national honorary in research. Professor Othus is at present on sabbatical leave, and is studying for an advanced degree at the University of Illinois.

Norton L. Peck, ME, '31, successfully completed the requirements for a Master of Science degree in mechanics and materials on April 25th.

A photo-elastic apparatus for determining stresses and their distribution has been constructed by Professor S. H. Graf and was demonstrated by Ro-

bert C. Smith, senior in civil engineering, at the recent joint meeting of the Oregon section and student group of the American Society of Mechanical Engineers. The equipment is arranged at present only for qualitative tests, but auxiliary units for quantitative determinations are being planned. This addition to the department equipment will be available for future demonstrations and research work.

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Industrial Arts

F. Hartford

The industrial arts department will conduct its fifth consecutive summer session this year. The enrollment has increased with each successive summer, starting with 42 in 1928. The second year, 48 enrolled, which increased to 76 in 1930. Last year there were 104, and as many, if not more, are expected this coming summer.

The enrollment in the summer course is made up largely of instructors in industrial arts who come for further study and training. Few regular session students enroll. Many parts of the northern half of the Western hemisphere are represented, students coming from as far East as Pennsylvania, from Hawaii on the West, Cuba, Texas, and Arizona on the South, and the Dominion of Canada on the North.

The faculty of the department will be augmented during the summer session by Professor A. C. Newell, Director of Industrial education at the Illinois State Normal University.

O. D. Adams, State Director of Industrial Education, will again be a member of the staff.

The department will lose eight seniors and four graduate students with the close of school in June.

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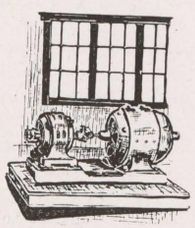
Electrical Engineers



P. Winkelman

A trionide gas-filled sweep tube oscillator was designed and constructed in the electrical laboratory for use in the study of the corona currents around insulators of high tension lines. The frequencies developed in the oscillator are of such a nature as to make them particularly advantageous for use as the time axis in the oscillogram studies of the corona currents.

Mr. Copely, Pacific West coast engineer manager of Westinghouse, gave a dynamic speech on recent developments in electrical equipment at an engineering meeting held April 11 in the Memorial Union building. During his talk he assembled a model high voltage transformer, explaining its particular features of the insulations and core laminations. This talk was of particular interest to the juniors in electrical engineering who were at the time studying the mysteries of transformers.

The ninth annual general meeting of the engineering section of the Northwest Electric Light and Power association was held in Portland on April 13, 14, and 15. Professor F. O. McMillan of Oregon State college presented a paper on "The Co-ordination of High Voltage Transmission Lines With Radio". Professor E. C. Starr, also of Oregon State college, presented a paper on "Lightning Protection for Distrubtion Transformers". Several students taking electrical engineering attended the meetings where they made many contacts with prominent engineers. A trip to Vancouver was taken on the 16th to inspect the installation of the 115 Kv. oil-filled submarine cable then being installed by the Northwest Eectric company across the Columbia river. An auto trip was made in the afternoon of the same day to the Ariel hydroelectric development of Inland Power and Light company on the Lewis river.

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A breakfast was held by the student chapter of the American Society of Civil Engineers on April 17. O. Laurgaard, city engineer of Portland was the speaker of the occasion. Mr. Laurgaard talked of various phases of the application of engineering within the state, and explained the requirements of the Oregon State Board of Engineering examiners. He also stressed the importance of English in the curriculum of a student engineer.

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Research in Gasolines

(Continued from Page 6)

Detonation Conditions

This conclusion was verified by a road test of a model A Ford and a block test of a Studebaker engine. When using one particular gasoline severe detonation occured when the car was accelerating rapidly. With this gasoline the accelerating force was measured by means of a Tapley accelerometer and found to be 170 pounds at the instant of maximum acceleration. The octane number of the same gasoline was raised sufficiently to eliminate all traces of detonation. The maximum accelerating force increased to 195 pounds or an increase in acceleration of 14.7 per cent.

The throttle and load were adjusted on a Studebaker engine connected to a Sprague dynamometer so that 14.4 horsepower was developed at 550 r.p.m. with the gasoline of lowest octane number (61). The spark angle of advance was less than that for maximum power. All adjustments were left set and the gasoline of highest octane number (71) was substituted. All audible knock was completely eliminated and the power output increased to 15.2 horsepower, or a 5.5 per cent increase.

Statements from the leading car manufacturers indicate that if the car is in average mechanical condition any of the three highest octane number gasolines (70 to 71) will give the necessary performance and that a premium gasoline is not necessary except in the case of some of the optional high compression heads which are specifically designed for a premium fuel.

In a low compression engine a loss of power may actually result when treated gasoline is substituted for a non-premium gasoline, because the rate of combustion is slowed down excessively. This conclusion was proven by means of test of a 1928 Studebaker and a 1931 Ford engine connected to a Sprague dynameter. This factor has been generally overlooked, the assumption being that the higher the octane number the better. Although none of the commercial non-premium gasolines have reached an octane number too high to be appreciated by some of the lower compression cars now in use, the same cannot be said of some of the premium fuels.

Data based on tests made in the fuels laboratory of the Department of Mechanics and Materials.

News From Graduates 'Round the World

By A. Greenlaw and G. Townsend

Osborne is Superintendent

CHARLES P. OSBORNE, ex '97 in mechanical engineering, is superintendent of light and power for the Portland Electric Power company, which is one of the most responsible and important positions in that company. Osborne began his connection with the company in 1902 when it was known as the Portland General Electric company, and was employed in various departments until 1916 when he was made superintendent of power. In 1924 his scope of authority was enlarged to its present status.

After his period at Oregon State, Osborne went to Alaska where he remained for two years as a U. S. mail carrier. His route of 1700 miles took him over a territory of which 1350 miles had to be be made with dog teams and which he ran at the rate of 50 to 60 miles a day. He returned to Portland in 1902 and worked for a time with the Oregon Packing company.

GEORGE CAMPBELL, CE, '31, has been awarded a $1000 fellowship by the University of North Carolina textile foundation. He will make a special study of waste in the manufacture of textiles.

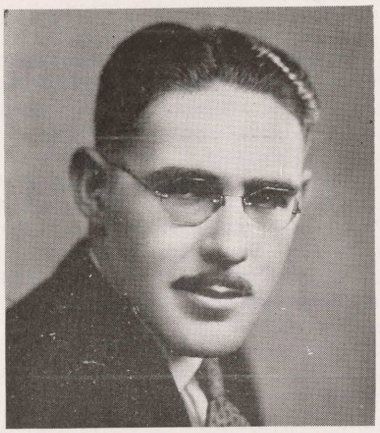
THOMAS H. IVES, CE, '27, is employed in the cement laboratory of the California State Highway department at Sacramento.

HOWARD B. STANLEY, graduate student in civil engineering, and Roy Anderson, senior in civil engineering, have completed a series of tests pertaining to the distribution of stress in welded structural angles for the Linde Air Products company of Chicago.

The 600,000-pound Southwark-Emery structural testing machine, which was installed in the engineering laboratory last year, was used to make the physical measurement of the stresses within the weld. Mathematical analyses were also made in accordance to the theoretical stress distribution, and were used as a basis of comparison with the actual results obtained from the tests.

HARRY GORESLINE, ChE, '26, is doing bacteriological research work for the U. S. government at Silver Springs, Maryland. Previous to taking his present position Goresline was an instructor in the bacteriology department at Iowa State college.

Leihy Works on Publication



C. Willard Leihy

C. WILLARD LEIHY, EE, '26, is associate editor of the Electrical West, a journal of electricity published in San Francisco. He confines his work on the staff to the engineering phases of the electrical industry.

After graduation, Leihy started working for the General Electric company at Schenectady, New York. Upon completion of six months experience, he was appointed to the position of designing engineer in the alternating current design section of the company. Later, he was transferred to the industrial commercial department.

Leihy spent four years with the General Electric company. The last two years of that period, he held a sales engineering position in the Seattle office of the company.

Technical articles were contributed by him to various engineering publications. The San Francisco technical journal took cognizance of his articles and appointed him to his present position.

Leihy is a member of Tau Beta Pi, Eta Kappa Nu, and Sigma Tau, national honorary fraternities.

K. MINER CUMMINGS, ex'30 in engineering, is doing experimental work for the United Air Lines. He was transferred from drafting work in Oakland, Calif., to the radio engineering laboratory in Chicago.

Alumni With P. T. & T.

A number of the graduates with the Pacific Telephone and Telegraph company in Portland are holding important positions, according to information received from the telephone company. J. M. Riddle, EE, '21, is an engineer in the chief engineer's organization in the Oregon area. He has the very important assignment of compiling data for the provisional estimate. L. L. Smith, EE, '22, is exchange transmission engineer in the chief engineer's organization. His duties consist of engineering studies on exchange transmission and of special maintenance problems in regard to exchange transmision. Another, K. M. Hawke, EE, '24, is traffic toll line engineer in the general traffic engineer's organization, Oregon area. Hawke's work is largely confined to toll line studies, toll traffic routings and all inter-office trunking studies. A fourth engineering graduate who, although he has been out of school only a short time, holds a good position with the telephone company is PAUL KLEV, EE, '28. He is staff assistant in the general traffic supervisor's organization and is at present devoting his time to the development of local operating practices.

GUILFORD MACK, ChE, '27, has accepted a position as associate in research at Geneva, New York, with the New York agricultural experiment station connected with Cornell University. He is doing research in chemistry of plants and fruits. Mack received his Ph.D. degree in chemistry at the University of Michigan last June, and previous to that had received his master's degree from Rice Institute in Texas.

MARK M. CLAYTON, ChE, '25, who is an instructor in mechanical engineering at the Oregon Institute of Technology at Portland, has invented and patented a combination steam-gasoline engine which it is claimed will enable motorists to realize much greater mileage on a gallon of gasoline. Clayton has built eight of these machines and claims each has functioned perfectly. He has spent five years on the theory of the new motor and made his first successful test January 2, 1932.

GEORGE BERTRAM, CE, '29, has been transferred from the hydraulics to the engineer's department of the United States engineers in New Orleans.

S. P. E. E. Convention

(Continued from Page 3)

A. Seaton, chairman. Following a report of the work of the research committee for the past year, discussion will be opened on the relationship between engineering and engineering education, including the advantages to the student, both graduate and undergraduate. The relationship of research in engineering colleges to the development and advancement of science and the art of engineering will next be considered. The morning will be concluded by devising ways and means of stimulating engineering investigation in technical schools and appraising its value.

Evans Presides

President Evans will preside over the first general session which will be opened in the library auditorium in the afternoon by Dr. William J. Kerr, president of Oregon State College, giving the address of welcome. Evans will then deliver the presidential address, "Coordinated Engineering Education." Following this the history of engineering college development in the west will be reviewed by Ivan C. Crawford of the University of Idaho, to acquaint the visitors with conditions existing here.

President Entertains

The late afternoon will be featured by a reception and tea given by President and Mrs. W. J. Kerr in the lounge of the Memorial Union building, and later the dinner for the division of drawing will be held.

On Thursday morning there will be the second business session, with D. S. Anderson, vice-president, leading the meeting. Varying widely, the subjects of the speeches range from an address on the peaks of research by Maurice Holland of the National Research Council, to a talk by R. I. Rees of the American Telephone and Telegraph Company on the co-operation of the S. P. E. E. with other engineering societies. The business and administrative aspects of engineering will also be given by Dexter S. Kimball of Cornell University. Representing engineering schools on the Pacific coast, Charles Derleth, Jr., of California, C. E. Magnussen of Washington, and H. S. Rogers of Oregon State, will conclude the morning session with discussions.

Thursday afternoon will be devoted to a conference of institutional members over which H. H. Jordan, vice-president, will preside. B. M. Woods and Raymond E. Davis, both from the University of California, will present the junior college movement on the west coast and tell what it can do for engineering education. Discussion of this new addition to higher educational institutions, the junior college, will be given by R. G. Tyler of the University of Washington and J. T. Davis from John Tarleton College. Institutional members of the soci-

ety will then hear Robert H. Spahr of the General Motors Institute of Technology speaking on, "Technical Institute Education in a Coordinated System of Engineering Education."

Annual Dinner

In the evening the annual dinner for all members will be given in the ballroom of the Memorial Union building. Following the presentation of the Lamme medal, Karl T. Compton, president of the Massachusetts Institute of Technology, will give an address.

Friday morning five conferences will be held simultaneously in different rooms of the Memorial Union. Before the civil engineering division, Albert Reichmann, assistant chief engineer of the American Bridge Company, will present an analysis, in the structural field, of the performance of college men after graduation.

Two men will address the co-operative engineering education division, Allan R. Cullimore of the Newark College of Engineering, speaking on" Modern Educational Philosophy and the Co-operative Idea," and R. F. Stockdale, Cincinnati University, explaining co-operative training in the applied arts. An informal round table discussion of current problems of the division will be led by R. C. Disque, chairman.

An exhibit and competition of drawings made in the local engineering classes will form a part of the program of the drawing division. What constitutes a practical problem in descriptive geometry will be considered by the drafting instructors.

The industrial engineering and English groups have no stated program other than that E. B. Morris and Amy V. Hall will be chairmen. No doubt papers and discussions in these fields are yet to be announced.

Friday afternoon will mark the conclusion of the fortieth meeting of the organization when the delegates sit in the final business session. Dean Derleth of California will again be a speaker. His "Instruction in Industrial Relations on the Pacific Coast," will be followed by a discussion of "Engineers, Managers, and Engineering Education" by W. E. Wickenden of the Case School of Applied Science, and Elliot Dunlap Smith of Yale University. An innovation in courses in mechanical properties of materials will be explained by Franklin L. Everett of the University of Michigan. Finally George F. Corcoran of the State University of Iowa is going into an explanation of the Graeffe method of solving equations.

Completing the convention proceedings, election of officers will be conducted and reports received from the numerous committees.

Special Frequency Machine

(Continued from Page 4)

the speed, flexibility, temperature control, and accurate predetermination of product composition possible with this method of refining the best grades of metal, it may readily be seen why it has reached its present importance in steel making and metal refining.

Special frequency machines may be considered in three general classes according to the physical construction as listed below:

Type	Frequency (Cycles)
(1) Pole excited	1-2500
(2) Inductor	500-25,000
(3) Reaction	Above 10,000

Pole excited machines are machines which are built with rotating field windings designed to excite each pole as in the case of a standard machine. There are, of course, various modifications of the standard construction due to the high rotating speeds and the large number of poles necessary to produce the high frequencies. Frequencies below one hundred cycles do not, in general, require a great amount of special design. The stators of high frequency machines embody several special features including the rigid construction made necessary on account of the small air gaps and high peripheral speeds, the special stator core proportions, and the large number of relatively narrow stator coils required. A high quality iron, finely laminated, and operated at reduced densities is necessary to limit core losses to a reasonable value. Nonmagnetic features are not uncommon.

The inductor type of machine

has no rotating windings of any kind. The stator and rotor have slots, smaller in proportion to the frequency, which, when the machine rotates, cause rapid pulsations in the magnetic reluctance at any given point between the stator and rotor. The machine is excited by a stationary direct current coil or coils placed in the stator frame and the flux pulsations are picked up in the form of an output voltage by a winding placed in the stator slots. The inherent regulation of this type of machine is high, especially at lagging power factors, and the weight per kw. of output is larger than for pole excited machines.

The reaction type of machines has little practical use because of its inherently poor regulation, efficiency, and use of materials. The machine is similar in design to the inductor type except that the exciting winding acts as both the field winding and stator winding. At the present time the most economical means of obtaining frequencies in the upper range of this machine is by use of a vacuum tube.

At the present time the largest high frequency machines in operation are a 3000 kv.-a. 420 cycle machine used for transformer testing and two 1250 Kv-a 1000 cycle machines used for coreless induction furnaces. These machines have all been built by the General Electric Co. within the last two years.

New Filteration Plant

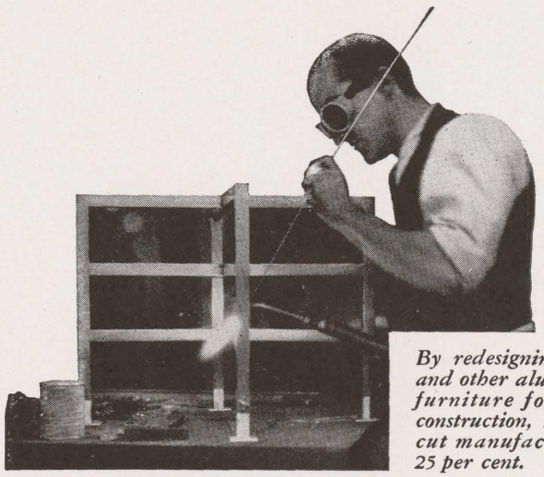
(Continued from Page 7)

200 gallons capacity. Eight minutes are required for this washing process.

The filtered water is pumped directly into the supply mains and distributed to the consumers. The capacity of the plant is about 1500 gallons per minute.

From an operating standpoint the Grants Pass filter plant is of finer design than the average small town plant. The laboratory and office are on a mezzanine floor overlooking all parts of the plant. All the pumps can be started and primed from the laboratory, while just a few steps distant are the chemical and filter controls. A measuring device indicates the level of the water in the reservoirs at the other end of the city.

Design for OXWELDING

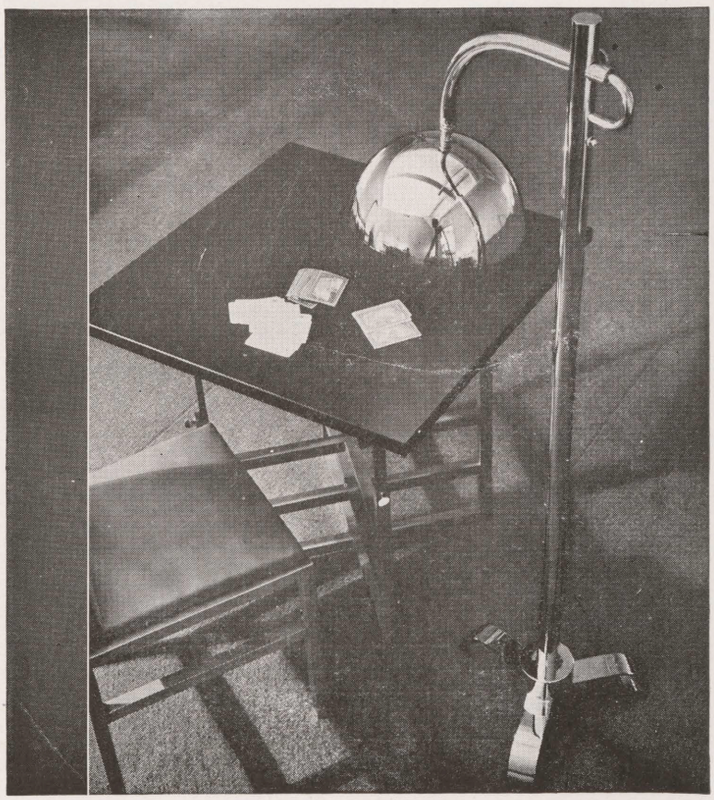


By redesigning this table and other aluminum alloy furniture for oxwelded construction, the producer cut manufacturing costs 25 per cent.

and lower production costs

OXY-ACETYLENE welding lowers production costs because it provides a method of fabricating metal without slow and expensive mechanical jointing . . . By making joints stronger than the metal itself, it permits the use of lighter material or the substitution of shape-cut fabricated parts for castings . . . And by making a smooth, invisible joint, it makes painting, lacquering, enameling, or polishing easier and quicker.

Tomorrow's engineers will be expected to know how to apply the oxy-acetylene process of welding and cutting metals. For their assistance, we have prepared several interesting technical booklets explaining how this modern metal-working process is used in the design, construction, and fabrication of metal parts and structures. These books contain newer and more practical material than most texts and will form a helpful addition to your personal library. Write to us and we will send them to you without charge.



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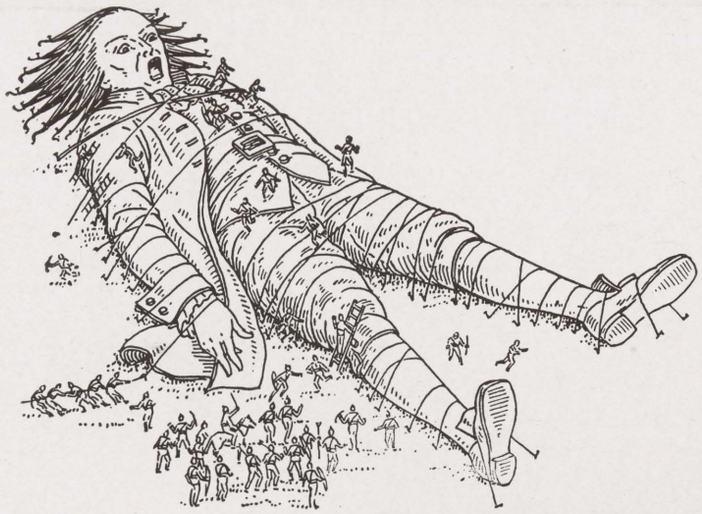
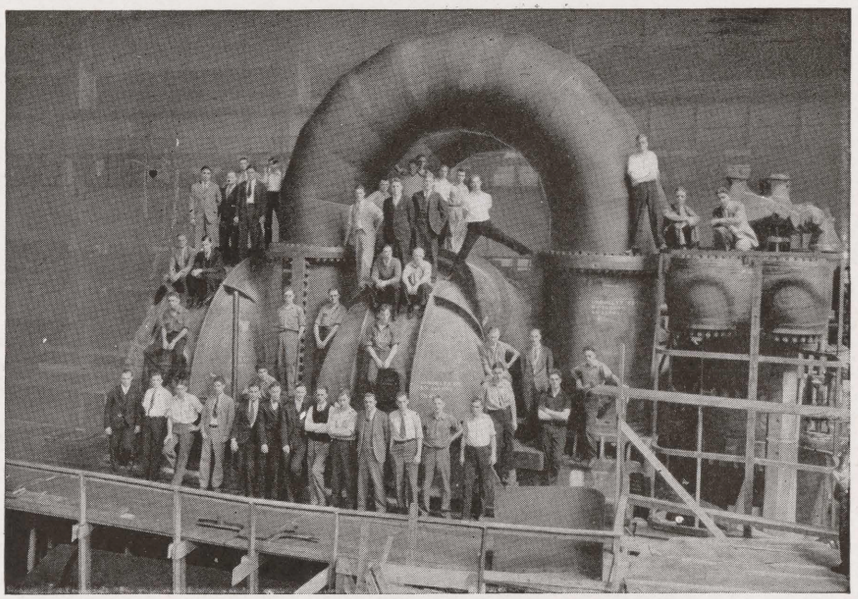
LINDE OXYGEN · PREST-O-LITE ACETYLENE · OXWELD APPARATUS AND SUPPLIES · UNION CARBIDE



An Electrical GULLIVER AMONG LILLIPUTIANS?



160,000-kw. G-E tandem-compound turbine-generator set on test.

No—but the immense size of this 160,000-kilowatt turbine-generator dwarfs the 44 test men who test such apparatus. This turbine-generator for the Brooklyn Edison Company—the largest single-shaft unit yet developed—is capable of furnishing muscle power equal to all the inhabitants of New York City. Its 214,400 horsepower operates both day and night, lifting heavy burdens from human shoulders, and supplying electric energy to countless devices in homes, in offices, and in factories.

The 44 test men shown above represent 31 colleges and universities from New Mexico to New Hampshire, including the University of Porto Rico. Each year many college-trained men join the General Electric Testing Department, which trains them for future responsible positions and electrical leadership on land, on sea, and in the air.

95-895DH

GENERAL ELECTRIC