

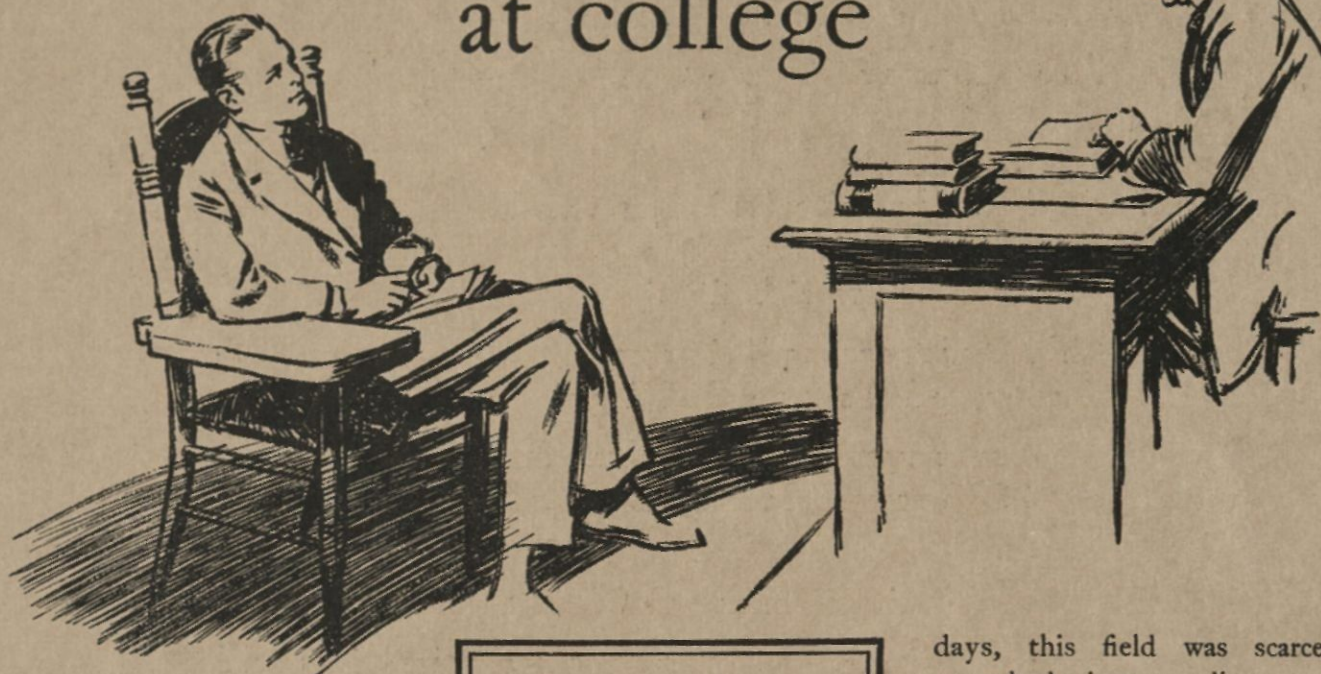
The COLORADO ENGINEER



MEMBER OF ENGINEERING
COLLEGE MAGAZINES ASSOCIATED

UNIVERSITY OF
COLORADO
JANUARY
1927

What he didn't learn at college



LAWRENCE DAY
HOWELL

In his class work, Lawrence Day Howell, Princeton, Litt. B. '13, E. E. '19, never heard of marine applications for electrical equipment. In fact, they were practically unknown. Yet he now is in charge of the Marine Section, Transportation Division, of the Westinghouse Sales Department, located at New York.

When Howell came from college to the Westinghouse Graduate Students' Course, he had twelve months of thoroughgoing work in the shops at East Pittsburgh. Then he decided he wanted to enter the field which seemed most undeveloped

“What's the future with a large organization?” That is what college men want to know, first of all. The question is best answered by the accomplishments of others with similar training and like opportunities. This is one of a series of advertisements portraying the progress at Westinghouse of college graduates, off the campus some five—eight—ten years.

and perhaps most promising of broad expansion. This was marine engineering.

Not five per cent of the present opportunities on the water have been opened for electrification. Yet there is more horsepower, in prime movers, on the ocean than there is on the land.

In Howell's undergraduate

days, this field was scarcely scratched—just as radio was not known to many young engineers when they were in college. A college man's opportunities are not limited to the electrical developments now in existence.

In marine applications an order may assume large proportions. A single installation, negotiated by Howell recently, of the newly-developed Diesel-electric drive for a yacht, totaled \$175,000. Such sales are not made overnight. They result from understanding fully a customer's needs.

To men with the knack of taking the other fellow's point of view, a career as Sales Engineer at Westinghouse brings returns in personal satisfaction as well as in worldly reward.

Westinghouse



COLORADO ENGINEERS! SUPPORT THESE ADVERTISERS.



Flexible—it wraps around the large wheel easily—around the small wheel more easily than a belt.

Positive—the teeth in the chain form practically a flexible gear.

Combining the best qualities of the belt (without the slip) and the gear (without the shock), the result is 98.2% (actual test) efficiency, which makes it the ideal drive for machines and lineshafts.

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An Amazing Growth

SO far as growth in size is indicative of worth, the University of Colorado occupies a position in which its students may take a justifiable pride.

The student body this year is the largest in the history of the University, numbering 2,767 for the fall quarter.

With the additional students who always come in the winter and spring quarters, the total for last year of 2,841 will be greatly exceeded this year.

There are nearly 1,000 freshmen in the University.

The University has grown in the size of its student body almost 133 per cent during the past ten years.

Not counting the former soldiers, attendance at the University for the past nine years has been:

1917-1918	1,278
1918-1919	1,540
1919-1920	2,021
1920-1921	2,085
1921-1922	2,292
1922-1923	2,475
1923-1924	2,525
1924-1925	2,683
1925-1926	2,811

Great size is, of course, not the only basis for pride in an educational institution but it is one of the logical and legitimate bases. In these figures students of the University find ample justification for a very natural pride that comes from the realization that they belong to a "going" concern.

UNIVERSITY OF COLORADO
BOULDER, COLORADO

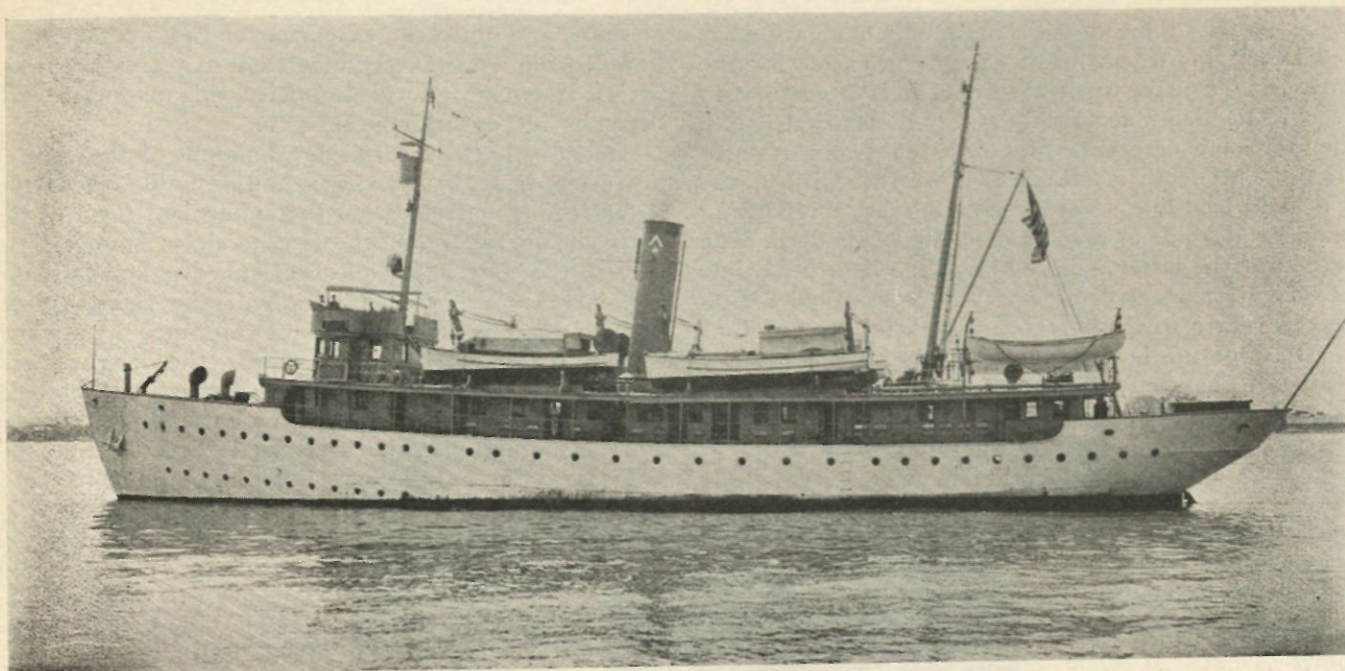
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TREE AT TIMBERLINE

—Photo by Ed. Tangen.



United States Coast and Geodetic Survey Ship "Surveyor." She won her chevrons and star in the World War by sinking the submarine which torpedoed the "Lusitania."

THE WORK OF THE UNITED STATES COAST *and* GEODETIC SURVEY

CHARLES J. CLIFFORD, '24

WITHIN the shadow of the Nation's Capitol is housed one of the oldest bureaus in the Government. Its activities are far-flung, reaching almost literally "from Greenland's icy mountains to India's coral strand," though for Greenland, we must substitute Alaska, and for India, the Philippine Islands. Few government bureaus do so much important work and are content with so little publicity as the United States Coast and Geodetic Survey.

A full and complete knowledge of the coast, the reefs near it, the character of the sea bottom in its vicinity, the rise and fall of the tide, the direction and force of the currents, and the character and amount of magnetic variation is of the greatest importance to any nation which touches the sea or has any interest in commerce. To supply this knowledge, most maritime nations have made very accurate surveys of their coasts.

A conception of the importance of such work to the United States may be formed when it is realized that the general trend of the coast line of the United States and Alaska exceeds 11,500 statute miles in length. The measurement of the actual shore line, including all the islands, bays, sounds, and rivers in the tidal belt would increase these figures to 91,000 miles. To the foregoing must be added the shore line of Porto Rico, Guam, Tutuila, Wake, the Hawaiian, the Midway, and the Philippine Islands, and the Virgin Islands of the United States. The general shore line of these islands is more than 5,400 miles, while their detailed coast is in excess of 12,000 miles.

It was in 1807, during the administration of Thomas Jefferson, that Congress authorized the establishment of a Coast Survey, and adopted the plan for its organization submitted by Ferdinand R. Hassler, a young Swiss scientist who was appointed its first superintendent. Because of the unsettled condition of the foreign affairs of the country, and later, because of the War of 1812, actual operations of the new bureau were delayed until the close of 1815. Work was suspended in 1818 and was not resumed until 1832, since which time operations have been continuous. In 1871, the scope of the bureau was greatly enlarged, and in 1878, its designation was changed to Coast and Geodetic Survey.

The principal function of the Coast and Geodetic Survey is the charting of the coasts of the United States. To form a chart which shows the proper relation between land and water, it is necessary to combine topography and hydrography. The principal method of locating topography used by the Coast and Geodetic Survey is that of the plane table and stadia. The plane table is an instrument peculiarly fitted for locating coast topography, such as outlying ledges and islands, inaccessible bluffs, and marshes and swamps of large extent. By this method a map is produced in the field from the country as a model, and the topographer is enabled to determine his position at an unknown point by the solution of a three-point problem.

Hydrographic surveys determine the depth of the water, outline the channels, banks, and shoals, and

locate the positions of all dangers to navigation, as well as all aids which make navigation easier for the mariner. To make such a survey, it is necessary to measure the depth accurately and to locate that depth. The location is determined by topography and triangulation. The depth is measured near shore by means of a hand lead-line. For greater depths, a recording sounding machine or a sonic depth-finder is used. The method of the latter is based upon the length of time necessary for a sound to reach the bottom and for its echo to return to the surface. The lead-line develops the slope of the bottom, but it does not necessarily locate all obstructions to navigation, such as rocks, isolated reefs, and ledges. In order to detect the presence of such dangers, the water area is swept over with a wire drag, which is a wire-cable slung between two vessels and maintained at a given depth by buoys.

In order to establish a mean datum plane to which the soundings may be referred, a study of the tides is necessary. The tides have been studied for centuries, but even yet our knowledge is far from complete, and it is unsafe to place too great a reliance in theory. In a text-book once used by the famous French "École des Ponts et Chaussées," there is a paragraph which illustrates this statement and at the same time is unconsciously humorous. After stating the theory of laws governing tidal and wave action, it says that a celebrated mathematician once studied out a formula from which, with the proper entry of known terms, the status of the movements of the ocean could be determined for any epoch since the creation of the world; but it adds that unfortunately the formula could not be integrated, and that even, if it could have been, the results would probably have proved wrong by reason of unknown factors.

Prior to 1885 the prediction of tides was accomplished by means of empirical tables and graphs. Beginning with that year there was used a machine devised by William Ferrell of the Coast and Geodetic Survey, and built in the shops of the bureau. This machine was used until 1912, when it was superseded by another better adapted for the prediction of tides in all parts of the world.

The demands of the mariner and the surveyor resulted in the earlier magnetic work of the bureau. Since the compass is now used in the navigation of

airships, and since the extension of radio communication depends on greater knowledge of terrestrial magnetism and atmospheric electricity, this magnetic work becomes increasingly necessary.

Geodesy is the natural development of the simpler operation of land surveying; though, unlike the latter, it takes into consideration the spheroidal form of the earth. The main object of a geodetic survey is to furnish the control for all other surveys, and this control includes the determination of the relative positions of some principal points of reference upon which to base the work. In other words, the distances and directions between certain points must be obtained.

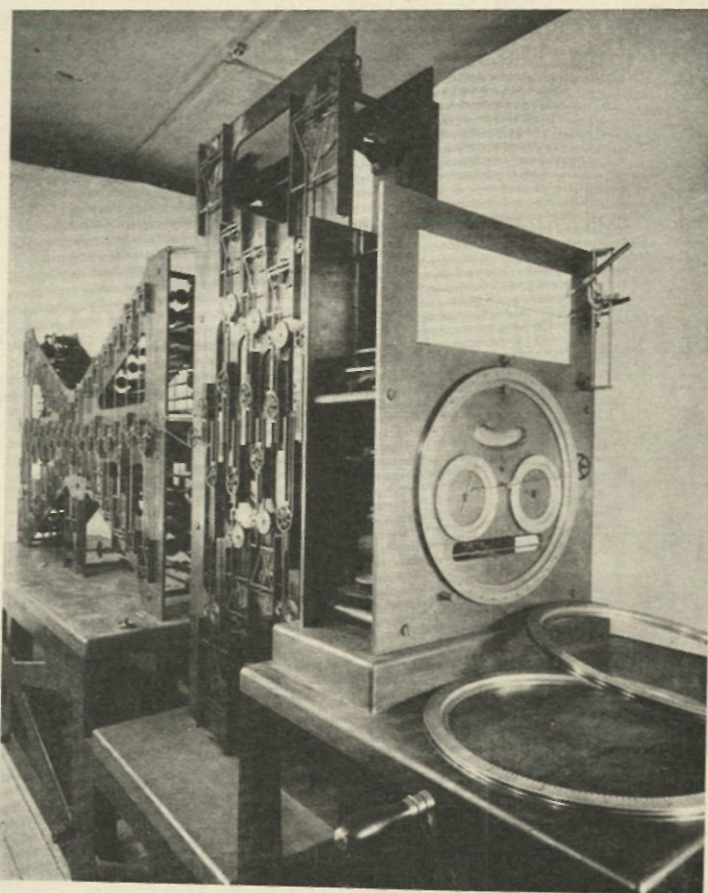
When only a small area is involved, these distances and directions may be measured directly, but this

method would be too costly and laborious to be employed when a whole continent is considered. Besides this, natural obstacles, such as rivers, lakes, and mountain ranges would render it impractical. To overcome this difficulty, triangulation is used, since direct measurement is necessary only in the base line. In flat or in densely wooded country where it would be too expensive to erect observing towers, a system of traverse may be used.

It has been found that the accuracy obtained by traverse is as great as that obtained by triangulation; that is, the error will not be greater than one one-hundred-thousandth of the distance. In other words, if the distance is 100 miles, the error will probably not exceed 5 feet.

There are few surveying operations in which leveling does not occur. While for many purposes the relative elevation of the points involved is sufficient, it is often necessary to refer the elevations to some datum plane. In the network of leveling which covers the country, mean sea level is the datum and is taken to be the same for both the Atlantic and the Pacific. There are now more than 27,000 miles of first-order leveling in this country and it is proposed to extend the network until no point is more than 50 miles from a first-order bench mark.

Certain astronomic observations must be made by geodetic survey field parties, in order that the triangulation or traverse may be more accurately adjusted, or may be determining the curvature of the earth's surface. These field astronomic observations are for the purpose of determining the astronomical latitude or



Tide Predicting Machine.

longitude of a point or the astronomical azimuth of a line.

Of these operations, that of determining longitude is the most difficult, since it is necessary to compare the local time of the point with that of some point of which the longitude is known, the difference in time being the difference in longitude. Formerly, signals were exchanged over the commercial telegraph lines with a similar observatory whose longitude was known, but recently the radio time signals sent out from Annapolis have been used.

Gravity observations are an essential and important part of a geodetic survey. Before triangulation surveys can be made and computed, the shape and size of the earth must be known. Astronomic observations are used in obtaining the size of the earth, but its shape can best be determined by gravity results.

The difference between the computed and the observed values of gravity gives an indication of the density of the rock formation underlying a gravity station. If several stations are located within a few miles of each other, some idea may be obtained of the location and extent of the rock and other material of abnormal density concealed in the earth. There is a possibility that gravity observations may have some



No comfort or honor in this. These field men are packing their instruments up this difficult ascent for a desired set-up.

influence in the search for mineral or oil deposits. This may be by indicating where mineral and oil are probably absent rather than where they may be found.

When Newton, by means of his discovery of the law of gravitation, proved that the earth as a revolving and not wholly rigid body, subject to its own attraction, must take the form of a slightly

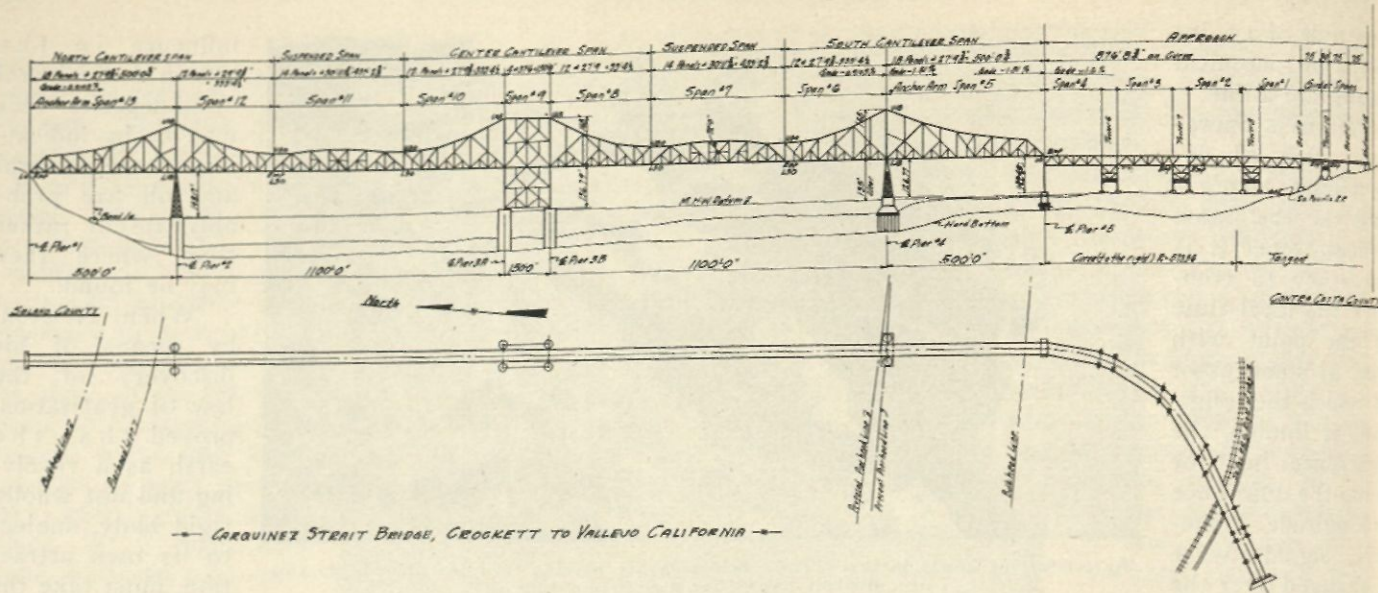
flattened sphere, he laid the foundation of modern geodesy. The form thus indicated was apparently contradicted by measurements made in France, which seemed to show that the shape was that of an elongated sphere. To settle the question two expeditions were sent out, one to the equatorial regions in what was then Peru, and another to the Arctic region in Lapland. Their results supported Newton's theory of a flattened sphere; that is, they showed that a degree at or near the pole was longer than at the equator.

The form of the earth as given by modern precise measurements is found to be such that, with considerable exactness, any section of it parallel with the equator is a circle, and any section passing through both poles is an ellipse. The most notable computations of the ellipsoid are those made by Bessel in 1841,

(Continued on Page 68)



Preparing the Wire Drag.



CANTILEVER HIGHWAY BRIDGE ACROSS CARQUINEZ STRAIT

JACK N. WITHERS, '23

THE longest highway bridge is now being constructed across Carquinez Strait in California at a point near to the Mare Navy Yard. The crossing is at the west end of Carquinez Strait from Valona, Contra Costa County, on the south, to Morrow Cove, Salona County, on the north of the waterway, about forty miles northeast of San Francisco. The bridge proper is 3,350 feet in length, to which is joined the viaduct and highway approach at the south, which is about 1,400 ft. long. The bridge is approximately the same length as the Brooklyn and Queensboro bridges in New York.

The total estimated cost is \$5,500,000, the steel part costing about \$2,800,000 erected. The estimated cost of the steel is \$1,600,000, and the erection of the steel about \$1,200,000.

The income from the bridge will be derived from tolls from passengers and vehicles. The location is such that it receives the travel between the San Francisco Bay region and the northwest and central parts of the state. The ferries at this point carry about 1,200,000 passengers and 465,000 vehicles yearly, most of which traffic will be attracted to the Carquinez Bridge. Estimates indi-

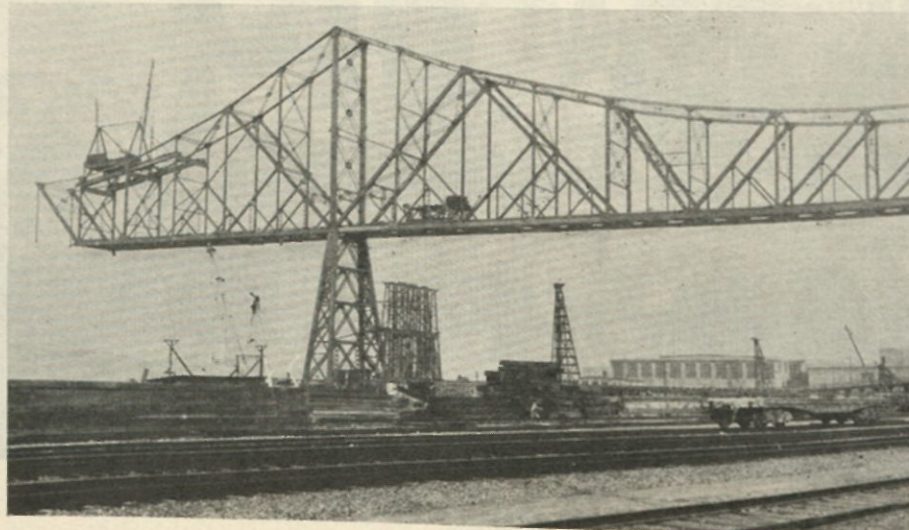
cate that at the expiration of the franchise in 1948 the income from tolls will be very substantial.

The bridge proper consists of two anchor arms, each 500 ft. long, two 1,100-ft. spans, and a 150-ft. tower span at the center. Each 1,100-ft. span consists of two 333-ft. cantilever arms and a 434-ft. suspended span. The trusses are spaced 42-ft. centers, providing a roadway 36 ft. wide, two sidewalks 4 ft. 3 in. wide, and a trolley track in the center of the roadway.

Some idea can be gained as to the size of the trusses by considering their height. The center member is 168 ft. center to center of pin-holes and weighs 60 tons. The bottom chord is 135 ft. above the mean high water.

The material used is carbon steel for bracing, floor system, and light members. Members carrying large stresses are made of silicon steel because it will sustain a unit stress

about forty per cent more than the carbon steel. The silicon steel used is about thirty per cent of the total weight of the bridge proper. The decrease in dead load by using the silicon steel more than balanced the increase in cost of fabrication. Silicon steel is unusually hard, thus



incurring more difficult punching and finishing in the shops.

An unusual feature was included in the design of the bridge. A condition for earthquake shock at the expansion joints requires that the spans be tied together during the sudden force. Therefore at one end of each suspended span and at the end of the anchor arm connecting with the approach, a hydraulic buffer was placed in each chord-member, and was made strong enough to take a 250,000-lb. force. Under ordinary expansion, which was figured at 11 in. for the long spans, the liquid in the buffer would flow from one chamber to another, but under a sudden shock, the valve would lock and would not allow any movement until the shock had subsided.

This bridge was very difficult to erect. During all the layout and design of the bridge, erection problems had to be considered very closely.

The south anchor arm was erected on falsework. The north anchor arm was erected on falsework for eight panels, and one part of the center tower was placed at this point as a bent, known as Pier No. 1a, and the remainder was erected as a cantilever.

Because of temperature changes, the exact length of the span, when it was erected to the north bent at Pier No. 2, could not be definitely determined. The truss had to be connected to the bent at this point by pins, and the exact length had to be obtained in order that the pins might be driven. To do this, special jacking arrangement had to be made at Pier No. 1. An arrangement of rollers was placed on top of the bent at Pier No. 1a so that the main truss would roll or rock at this point. Jacks were installed at Pier

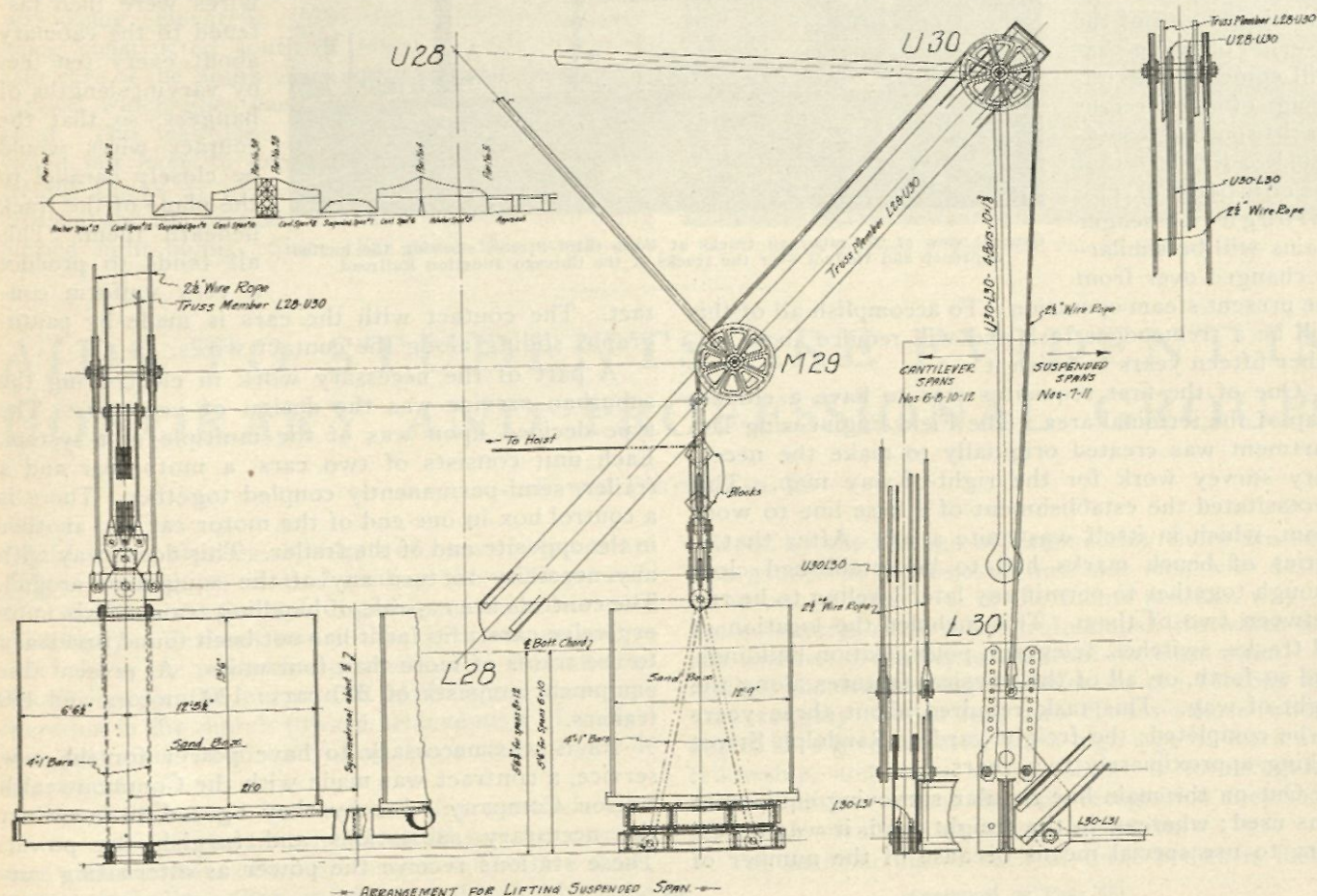
No. 1 so that the end of the span could be raised or lowered, moved forward or backward as the condition required when the span was landed at Pier No. 2. When the span was completed out to Pier No. 2, the end at Pier No. 1 was jacked up, and the bent at Pier No. 1a was released. Original plans were to have the remainder of the center tower erected, hanging from the trusses while Bent No. 1a was in use and floated into place by barges. The services of a Navy Yard crane, with a very long derrick boom, was secured, and all the towers were erected by it instead of from the trusses.

The anchor arms were the only parts of the bridge which could be erected on falsework because of navigation and of the height of the trusses above the water. The remainder of the portion out to the suspended spans was erected by cantilever action. The falsework under the south anchor arm required 1,500,000 ft. of lumber. The difference between buying price and salvage price of the lumber was about \$6 per 1,000 ft.

The trusses could not all be erected from the floor because of their great height. The first eight panels were erected from the floor, and the traveler was then placed on a track about sixty feet above the bottom chord, and erection was carried forward from this location.

Eight roadway stringers, made in long lengths, two pairs of four, were used to support the traveler. An extra set of eight were used with each traveler so that they could be erected ahead of the traveler onto which it could progress. The stringers were 56

(Continued on Page 70)



ELECTRIFICATION of CHICAGO TERMINAL of ILLINOIS CENTRAL

ARNOLD L. CONDRON, '25

WHEN June, 1925, brought my graduation and thrust me out on the world to earn my living, the Illinois Central Railroad offered the most likely opportunity. The organization that they placed me in was the Field Engineering Department of the Chicago Terminal Improvement Division. This division was created about six years ago when plans for revamping the Chicago Terminal began to take definite form. It takes in the area from the Chicago River on the north to a town by the name of Richton, about thirty miles south of the river. That is the area that is being developed for terminal purposes. It includes, among other things, the electrification of all parts of the service. The suburban service was the first to be changed over, and has been in operation since last August. The suburban terminal at the north end, or Randolph Street, is now in the process of construction.

The next general step will be the electrification of the freight service between Twelfth Street, or Roosevelt Road, and the Chicago River, which includes a big freight distribution yard just south of the river. Following that will come the electrifying of the freight tracks south of Roosevelt Road. When that is completed, the through passenger trains will be similarly changed over from

the present steam operation. To accomplish all of this will be a tremendous task and will require about another fifteen years to finish it.

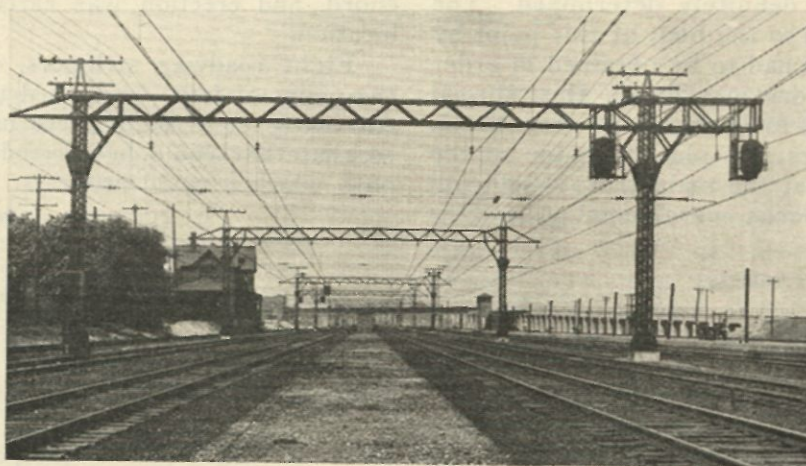
One of the first requisites was to have a correct map of the terminal area. The Field Engineering Department was created originally to make the necessary survey work for the right-of-way map. This necessitated the establishment of a base line to work from, which in itself was quite a job. After that, a series of bench marks had to be established close enough together to permit any later leveling to be run between two of them. This included the location of all tracks, switches, telegraph poles, station buildings, and so forth, or, all of the physical features along the right-of-way. This task required about three years to be completed; the freight yard at Randolph Street taking approximately two years.

Out on the main line regular surveying equipment was used; whereas, in the freight yard, it was necessary to use special means because of the number of

freight cars always standing there. Most of the transit work in that district was done with a baby tripod that put the axis of the telescope about a foot and a half above the ground as a maximum and a foot as a minimum. Such things combined to make the work very difficult.

While this station plat work was in progress the electrical equipment was being designed. As soon as sections of the map became available, the electrical department located the positions of the catenary cable supports to fit the conditions found on the ground. Uniform catenary span lengths were used as much as possible, so that the calculation of the catenary curves and cable tensions would be greatly simplified. Three hundred feet was used as the longest span between supports. The power transmission system consists of four cables: the catenary cable, the feeder cable, and

two contact wires. The catenary cable was supported every three hundred feet or less by steel structures spanning the tracks to be electrified. The contact wires were then fastened to the catenary about every ten feet by varying lengths of hangers, so that the contact wires would be closely parallel to the plane of the track beneath them. This all tends to produce a very uniform con-

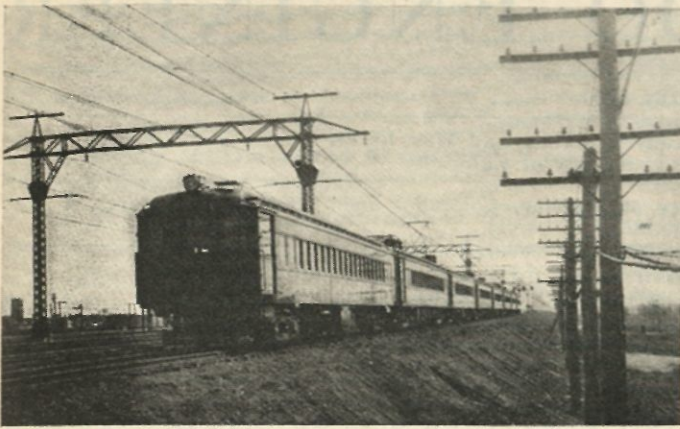


General view of the suburban tracks at Forty-third Street, showing the incline approach and viaduct over the tracks of the Chicago Junction Railroad.

tact. The contact with the cars is made by pantographs sliding along the contact wires.

A part of the necessary work in electrifying the suburban service was the design of new cars. The type decided upon was of the multiple unit system. Each unit consists of two cars, a motor car and a trailer, semi-permanently coupled together. There is a control box in one end of the motor car and another in the opposite end of the trailer. This does away with any necessity to turn any of the equipment around. The controls are capable of handling trains of six units or twelve cars. So far it has not been found necessary to use trains of more than four units. At present this equipment consists of 260 cars: 130 motors and 130 trailers.

As it was necessary to have power for the new service, a contract was made with the Commonwealth Edison Company whereby they agreed to construct the necessary substations and furnish the power. These stations receive the power as alternating cur-



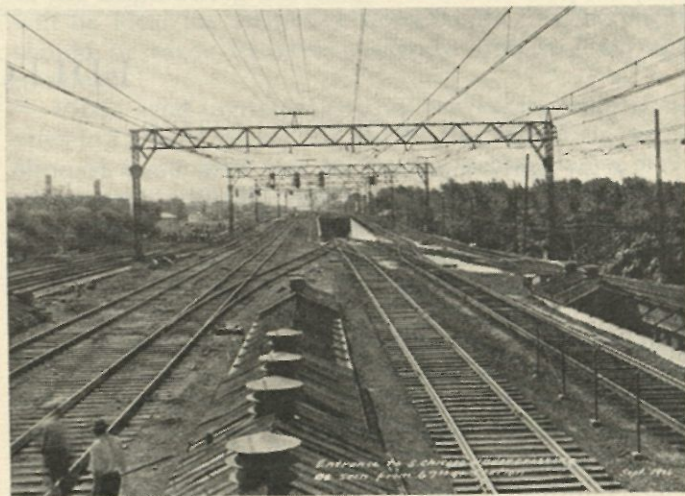
Eight-car Multiple Unit Train. It is 580 feet long and has a value of \$300,000.

rent and transform it into direct current for the train operation. Enough of the construction work had been finished by the early part of July to permit electrical service to be inaugurated to the extent of the cars that were then ready for service. The remaining necessary construction was finished in time to take care of the remainder of the cars as they were made available. The change from steam operation was made very smoothly and with little inconvenience to the patrons.

When the field engineering group finished the station plat work, the designing had progressed to the place where the foundations for the catenary supports were ready to be staked out. In the meantime, quite a stretch of track was depressed north of Forty-third Street, while a much longer section farther south on the line extending almost to Richton had been, or was being, elevated. Also an undercrossing was being constructed south of Sixty-seventh Street to take care of the South Chicago branch of the suburban service, which goes east from the main line at that point. This was done so that this suburban service would not have to cross the through passenger or freight tracks at grade. In June, 1925, the undercrossing and the catenary foundations were both being pushed right along. Since that time this work has

been completed and the suburban operation has been electrified.

What has been described in this article is only a small part of what would be necessary in order to cover the subject of even the suburban service improvements. While work is going forward on the Randolph Street Terminal rapidly, the actual design of the permanent station and track arrangement is not even definitely decided upon as yet. This work will probably require another two years to finish. Many phases of the work done and of what is to be accomplished in the future were described in a number of articles published in the "Railway Review" for March 6, 1926. Should that which has been written here arouse the interest of any one reading it, these articles will prove to be very interesting. They were all written by men in direct contact with the work and in positions to know the facts about which they wrote. It is an immense undertaking in its entirety and is also a very interesting one. There are several Colorado men working on it now, and there may be some more before the work is fully completed.



North Entrance to the South Chicago Undercrossing.

AIDS TO STUDENTS ARE EVIDENT IN HONORARY AND PROFESSIONAL GROUPS

EDWIN WHITEHEAD, '28

ALL true purposes and ideals of men of science are convergent to that of guiding the willing hands of Nature to the task of giving mankind life more abundantly. Perhaps one of the greatest privileges men have in the pursuance of this task is that of close association for the purpose of exchanging ideas, cooperation in the march toward achievement of mutual aims, and, most important of all, frequent renewals of inspiration.

We shall always be students, for otherwise we can never be engineers; therefore all our future contacts with members of our profession will be, in a sense, student activities. For, in every professional course

offered by the College of Engineering there are certain groups of enthusiastic and able men who desire to advance themselves, in the fullest possible way, in those features of broader professional life which are not, and never can be, taken from the class room. In reality, the engineering societies on the campus are very roughly divided into two classes—those whose object is to give incentive for a high type of work and fellowship, and those whose object is to recognize these qualities, so that through recognition they may give their members an added inspiration.

The membership of each of these bodies is made

(Continued on Page 65)

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Armour Engineer	Technograph	Sibley Journal of Engineering	
Cornell Civil Engineer	Nebraska Blue Print	Pennsylvania Triangle	
Kansas State Engineer	Wisconsin Engineer	Iowa Engineer	
Minnesota Techno-Log	Michigan Technic	The Translt	
Penn State Engineer	Kansas Engineer	Rose Technic	
	University of Virginia Journal of Engineering	Ohio State Engineer	
	Chairman, E. C. M. A.; Professor L. F. Van Hagan, Madison, Wisconsin.		

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EDITORIALS

NEW YEAR OPPORTUNITIES

As the early moments of the New Year crept in upon the world to assume their rightful places on the calendar, many apparent and not insignificant opportunities for the advancement and betterment of the College of Engineering as a whole and more particularly of the Colorado Engineers broke through the crust of lethargy which is prone to take existence with the student body between the beginning and the finish of a year. These opportunities have not been non-existent heretofore, but they have been nullified by the indifference of the student body. They are opportunities not for only a few but for every student in the college.

First, Engineers' Day, the truly big and representative event sponsored by the Colorado Engineers, now presents difficulties surmountable only through the concerted efforts and co-operation of all engineers in the college. In recent years, interest in this event has waned, whereas it should have increased to such a point that it might be said that Engineers' Day at Colorado rivals any in the country. Let it so be said in the future!

Second, inter-department sports should be initiated in the College of Engineering to bring about support of and interest in each student's respective department—civil, electrical, or mechanical. Baseball, basketball, soccer, etc., lend themselves very well to such competition and are of such a nature that rivalry between the supporters can be as keen as that of the men on the teams.

Third, every engineer should be an active member of his respective engineering society on the campus, or being a member, he should be influential in making other men members. Each of these societies has much to offer to the student-engineer.

Fourth, in order that the Colorado Engineers may function as a truly democratic organization, it is necessary that all members attempt to be at every meeting and at every election.

Fifth, other activities of the Colorado Engineers—the Apple Fest, the Engineers' Ball, etc.—should receive the support of every engineer.

ENGINEERS AND RHODES SCHOLARS

A not insignificant fact in the recent history of the College of Engineering is the somewhat unique honor of having two of its students awarded Rhodes scholarships in four successive selections for that distinction. The attainment of the honor of being selected as a Rhodes scholar requires that the applicant be versed in a number of widely varied interests, and the fact that two recent recipients of the scholarship from Colorado have been engineers tends to undermine the still prevalent misconception that the engineer is an uncouth, uncultured man of machines, enveloped in self or in science.

The unique honor enjoyed by the two men and by the College of Engineering reflects back upon the administration and upon the personnel of the college. Also it has a tendency to demonstrate that the curriculum recently set forth in the preliminary report of educational investigation conducted by the Society for the Promotion of Engineering Education (this report is treated of elsewhere in this issue) develops a well-educated graduate, since the curriculum at Colorado very nearly corresponds to the somewhat flexible ideal recommended in the report.

It is often advanced by those who think that the liberal arts graduate is the ultimate as an educational product that the engineer, having no course in the appreciation of art or of literature, is immune to the

enjoyment of any masterpiece of art or of any work of literature. However, it is our opinion that, through the present curriculum in use here, the imagination of the average engineer is developed to such an extent that he appreciates a work of art or of literature with a spontaneity seldom found in his contemporary, the average liberal arts graduate.

Let us not forget, though, that in spite of the fact that the selection of one of its students for the award is a credit to any institution, it is also a highly honorable achievement for the successful applicant. Congratulations are due our past and future representatives at Oxford!

WHAT IS LACKING IN OUR ENGINEERS' DAY CELEBRATION?

Engineers' Day, as it is celebrated at the University of Colorado, always seems to have something lacking. No matter how long before Engineers' Day the outlines and plans of the day are formulated, when the day arrives there is something missing that might be added to make the celebration an example of the best that could be put out by the engineering school.

This missing part of Engineers' Day can not be due to the lack of equipment and apparatus with which to stage a successful demonstration; nor can it be blamed upon the men who speak before the school. What, then, can be the cause of this seeming lack of interest? When finally reduced to bare facts, I think that this missing part is due to the attitude of the students. All of the classes in the afternoon are dismissed so that the students may attend the lecture given by some man of national, or even international prominence. This lecture would be well worth while for any one; not only engineers, but also students from the other schools of the University. Too many students, however, take this dismissal from classes for the afternoon as a holiday, and spend the time as they please, instead of going to an address which, undoubtedly, would do them some good.

Engineers' Day will never be a success until each student of the engineering school puts the very best that he has into the celebration. After all, Engineers' Day is really a display of the best work that each man is capable of doing. So, can we afford to let Engineers' Day in the future be similar to those in the past, when a little more effort on the part of each man might make it a decided success?

H. R.

HOW TO MAKE ENGINEERS' DAY A SUCCESS

Last year very little interest was shown on what should be the biggest event of the whole school year. Why? Because it takes a different kind of an inducement than, "Mr. Blank will address the engineers in Macky Auditorium." There are several reasons why the students do not care to go to Macky to listen to someone talk, even though the subject and speaker are interesting. Three good reasons are as follows:

First, an auditorium with a few straggling bunches of spectators squatted here and there produces very little inducement.

Second, very few students attend voluntary chapel.

This shows that for some unknown reason the majority of students are not very interested in lectures given in Macky.

Third, the speaker must have an exceptionally clear voice in order to make himself understood in Macky.

Well, then, what shall we do?

First, do away with the afternoon speech, and have it in the evening.

Second, have each student and instructor in the engineering college give a small sum, say fifty cents, for the purpose of financing a real entertainment. The enrollment, this year, should be ample to donate a sum of approximately three hundred dollars.

Third, serve a lunch with hot coffee. This can be served from several tables placed in Engineering I Building; or still better, serve a picnic lunch on the lawn, if weather conditions will permit. The Public Service Company of Colorado frequently entertain business clubs in this manner, and find this method very successful.

Fourth, decorations, such as colored lamps and banners will arouse more interest. For one example, decorate the street lamps leading from Twelfth Street to the Engineering Buildings. The new campus lights will be ideal for attractive decorations. Every effort should be made to have a snappy orchestra for the evening.

Fifth, send invitations to all the engineering societies in Denver, requesting them to inform their members of the event, and to let the school know how many will probably attend, so that every engineer may have a ticket for himself and family, or for any guest he may care to bring. These are to entitle the engineer to lunch and to the best seats for the lecture. All engineering students should be provided with tickets the same as the outside professional men. Any outsider who is not an engineer should be welcome to the lecture, but must buy a ticket ahead of time if he wants to attend the lunch. The cost of the tickets is to be determined at the arranging of the lunch and decorations.

Sixth, at a convenient time, the party should be conducted to Macky, or any other suitable place, where the speaker can deliver his address.

F. M. I.

THE ALUMNI DIRECTORY

In accordance with the custom of the magazine for a number of years, the next issue of the Colorado Engineer will be the annual Alumni Directory. It is desired to make the Alumnews section the largest of the year with every class from 1897 to 1926 well represented, and it is hoped that the Directory will be complete.

However, the success of these features depends upon the co-operation which the alumni give us. It is, therefore, the wish of the staff that every alumnus reply to the letter soon to be sent to all Colorado engineering graduates and that all replies reach this office as soon as possible so that the compilation of the directory may be accomplished without undue haste.

Further, may we receive all the possible support and available news from each of the alumni?

ALUMNEWS

'98

Franklin P. Wood, e, 507 Tramway Building Denver, reports a successful year for the firm of Wood and Weber. They now have a number of new plants working successfully.

'99

S. E. Holland, c, Division Engineer of the Pennsylvania Railroad at Wheeling, West Virginia, spent Thanksgiving day in Boulder.



'09

Alfred H. Allen, ch, who has been Factory Superintendent of the Fajardo Sugar Company of Fajardo, Porto Rico, for the past fifteen years, is now taking an extended vacation. He is living in Boulder at the present time.

'11

J. W. Wightman, e, writes that he has the same old job as District Mining Specialist in Cincinnati, Ohio. His address is 3755 Ault Park Road, Cincinnati.

'13

E. J. Glem, e, reports a change in address. His residence is now at 502 Jeannette Street, Wilkesburg, Pennsylvania. He writes that he would like to announce a move to Colorado.

'15

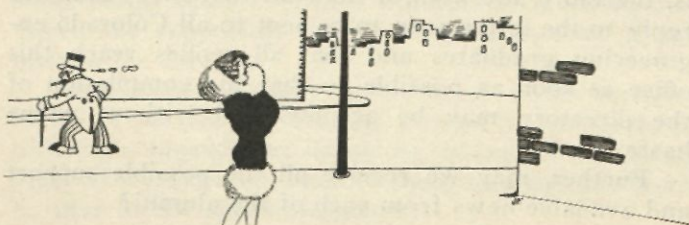
A wedding of interest took place recently when John S. Means, c, and Miss Mary Holliday were married in Denver. Mrs. Means was a student in the Denver Conservatory of Music, and came to Denver from Nashville, Tennessee. The couple will make their home in Detroit, Michigan, where Mr. Means is employed as salesman by the Celite Products Company, 762 Book Building.

'18

G. B. Rollosen, e, is at the York Hotel in Denver.

'20

One of our popular coeds, Elsie Eaves, c, is now with the McGraw-Hill Book Company in New York City. She writes that the fun of New York is the surprise that lurks around every corner. A letter will reach her at 268 West 73rd Street.



'22

Clarence V. Kiefer, c, who is Assistant Resident Engineer of the California Highway Commission, announces his marriage to Clara M. Jarde, of Long Beach, California.

J. F. Price, m, has been promoted to the position of Factory Superintendent of the Fajardo Sugar Company, at Fajardo, Porto Rico. In October he was given a nine-weeks vacation, and he and Mrs. Price have been spending it enjoyable in the States. During his short visit in Boulder in December, he gave a highly interesting talk on the sugar industry in Porto Rico at a joint meeting of the A. I. E. E. and the A. S. M. E.

'23

Paul W. Kirkpatrick, e, 1052 Gas and Electric Building, Denver, writes, "Nothing new or startling, just living well and enjoying life 100 per cent."

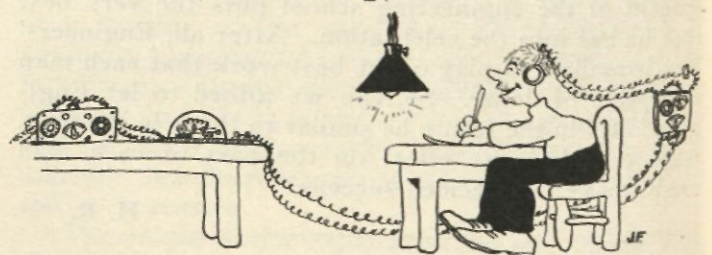
Mrs. A. S. Merrill, better known on the campus as Lou Alta Melton, is enjoying a visit to Scotland, where her husband is attending the University of Edinburgh. Later they expect to make an extended tour of England and France. Mr. Merrill is Professor of Engineering at the University of Montana.

L. H. McKenna, m, is now stationed at the Terminal Substation of the Utah Power and Light Company at Salt Lake City.

Charles Ware, m, and Paul Blanchard, m, are also with the Utah Power and Light Company, and are stationed at the Jordan Steam Station.

H. W. Richardson, c, who is with the Bates and Rogers Construction Company, has been transferred to Clarksdale, Mississippi.

'21



Lou Connelly, e, is no longer with the General Electric Plant at South Schenectady, but has accepted a position at the main plant as assistant engineer in charge of transmitting. Connelly was elected President of the Schenectady Alumni Chapter of Eta Kappa Nu for the coming year.

C. A. Callow spent Thanksgiving in Boulder with his parents. His several weeks vacation here was spent in convalescing from an operation for appendicitis. He is now with the Utah Power and Light Company, at Grace, Idaho.

John W. Howard, c, writes that he is now working on steel bridge design for the Colorado State Highway

Department. He states that the resumé by N. D. Morgan on the Sapinero arch, published in the *COLORADO ENGINEER* of November, 1925, was a valuable guide in recent bridge construction by the State Highway Department. Mr. Howard gets his mail at 466 St. Paul Street, Denver, Colorado.

'25

Arnold L. Condon, c, is engaged with the Chicago Terminal Improvement Division of the Illinois Central Railroad. He reports that he was married to Miss Anna Barbara Waugh, who formerly attended the College of Engineering at the University. He announces also that Barbara Jane arrived on September 15.

Milton Kalischer, e, who is with the Westinghouse Company, reports a change in address. He now resides at 519 Coal Street, Wilkesburg, Pennsylvania.

Henry Martin Richardson, e, who has been employed in the Testing Department as a student engineer of the General Electric Company, has accepted a position in the Engineering General Department of that company.

'26

We have received some interesting news from the members of last year's class who are with the General Electric Company. Elbert Messer, for instance, has written an interesting letter concerning the work at Schenectady. He writes, "I can tell you one thing, they know back here that Colorado turns out some good men."

O. V. Miller, e, has been transferred from the testing department at Schenectady to that at Erie, Pennsylvania. He is engaged in locomotive test. He says the work is interesting, but he doesn't like the weather.

Lloyd Swedlund, e, is doing graduate work through a fellowship at the California Institute of Technology at Pasadena.

A. N. Tuttle, e, and Harlan Webber, e, are both engaged in the testing section of the Radio Department.

We have received news from Myril Reed, e, who is with the Utah Power and Light Company, concerning two noted events in his life. One is that he has been transferred from Grace, Idaho, to the Soda Point Station at Alexander, Idaho; the other is that he was married September 15, to Georgia Beck, '26, of Boulder.

Richard Hull, ch, is now living at 1901 K Street, Washington, D. C. He is working as a metallurgical engineer at the Bureau of Standards, and is also doing research work toward a master's degree at George Washington University.

Wilbur Richards, e, last year's editor of the *COLORADO ENGINEER*, is engaged in commercial testing of large steam turbines.

Ed Paullin, e, is doing excellent work in the radio department of the General Electric Company. He is at present at the head of the engineering test on the Radiola 28.

Charles Printz, e, has entered the Test Department of the General Electric Company. He has the responsible position of assistant head of the Induction Motor Department.

F. M. Orsborne, e, is also in the Testing Department at Schenectady, where he is at present engaged in tests on motor generators.

Ted Stauffer, c, is at present with the Roxana Petroleum Corporation, Bay City, Texas.

J. D. Ball, m, has recently completed a two-weeks salesmanship course in the Commercial School conducted by the Westinghouse Company. Mr. Ball has segregated for Works Management, and is at present located at East Pittsburgh.

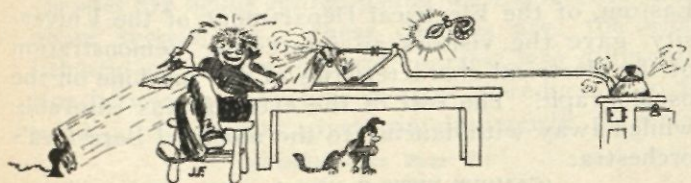
R. L. DOWNING, '14 JOINS FACULTY

We have with us this year another who, while not a stranger to the school, is—perhaps we should now say was—a stranger to most of the students. Mr. R. L. Downing, a Colorado graduate, has come to us this year to take the position left vacant by the departure of Professor Marcellus.

Mr. Downing graduated from the University of Colorado in 1914. While a member of the student body, he was well known and active on the campus. He started off his college career with a rush by making the frosh football team. In his junior and senior years he was a member of the varsity team. He also achieved prominence in his junior year as secretary of the Society of Civil Engineers, the following year being elected president of this organization. In addition, Mr. Downing was a member of the San Souci Club, which, after his graduation, petitioned to Alpha Sigma Phi. He is, also, an associate member of the American Society of Civil Engineers.

Since his graduation, Mr. Downing has held numerous positions which are qualified to fit him for his new work. Immediately after graduation, he accepted a position with the Santa Fe railroad in the Chief Engineer's office. After two years here, he took a similar position with the Oregon Short Line railroad, where he remained one year. In 1917 he entered the employ of the government, in the U. S. Bureau of Public Roads. He spent six years there, working on the location, design, and construction of public roads. In 1923, Mr. Downing left this position to enter private practice in the Arkansas Valley and in northern Colorado. Last year he was engaged in the beet sugar industry in Minnesota.

Mr. Downing comes to the Colorado faculty well equipped to fill the position which he now holds. He is not only well versed in engineering, both theoretical and practical, but he brings with him a fund of charm and personality which is bound to win for him a place in the hearts of all the students with whom he comes into contact.



CAMPUS NEWS

DEAN EVANS ATTENDS CONFERENCE

Dean Evans recently represented the University of Colorado at the special convention of the Society for the Promotion of Engineering Education in Washington, D. C. Over a hundred deans and administrative officers representing eighty per cent of the American engineering institutions were present at this conference. The Dean states that the convention was entirely successful.

In addition to attending the interesting convention, which is described elsewhere in this issue, Dean Evans enjoyed a number of attractive side-trips. He visited the Bureau of Standards, the engineers' paradise, and was enthusiastic over the engineering work which was being conducted there. On his return trip, he stopped several days in Chicago where he studied in some detail the work of remodeling the factories of the International Harvester Company. The inspection was rather unusual, inasmuch as it was possible to view the work under the old and new methods at the same time.

CHEMICAL ENGINEERS FORM NEW SOCIETY

The chemical engineers of the University have formed a new society to correspond to the other societies in the engineering college. It is called the Society of Chemical Engineers, and at present is local. The society plans to communicate with similar organizations in other schools for the purpose of forming a national organization. Up to the present, all of the meetings have been strictly business, but according to Russel Heckman, president of the organization, talks and entertainments are planned. The first speaker was booked for the first Wednesday in January. The meetings are held the second and fourth Wednesday of every month, and, according to the faculty advisers, any chemical engineer is eligible for membership.

A. S. M. E.

The members of the student branch of the American Society of Mechanical Engineers have shown a great deal of interest in the Society lately, and several good talks by students have been given. On December 8, a combined meeting of A. S. M. E. and A. I. E. E. was held in Engineering III. Mr. Price, a recent graduate and instructor of the University, who has been in Porto Rico for the past three years, gave a talk on the "Sugar Industry in Porto Rico."

Another thing of interest to the student engineer is that the Colorado Section of A. S. M. E. has accepted a challenge of the student branch, for a debate to be held next month on the question, "The Bonus Plan of Paying Laborers." Two debates will first be held in the branch for the purpose of selecting a team to represent the University Branch at this debate.

A. S. C. E.

The University Branch of the American Society of Civil Engineers has developed a live bunch of fellows this year. Several fine meetings have been held, and a large percentage of the members has been present. At the first one, Mr. Robert Follansbee of Denver spoke on "Rainfall in Colorado." The programs for the others have been furnished by students in the society. Tatlow and Eager gave talks on "Highway Development in Colorado." Interest in these talks has been stimulated because credit is now given in Civil Engineering Seminar at the University for papers and reports given before the society. The society plans some very good meetings in the future, and desires that all Civils be present.

A. I. E. E.

The University of Colorado Branch of the A. I. E. E. has enjoyed an instructive season during the past few months. Interest in the branch has been keen, and a large number of men have been turning out to all the meetings, the attendance as a whole being better than in previous years.

Speakers at the recent meetings have been Dean Lester of the Graduate School, Mr. Lester Simpson, a graduate of 1925, and Mr. Ketterman, Manager of the Boulder telephone exchange. Motion pictures depicting various phases of telephone operations were also well received by every one.

For the beginning of this year, plans have been made for each of the respective electric and manufacturing companies to put on a program for the benefit of the juniors and seniors. These programs are always looked forward to, and are enjoyed by all.

A. I. E. E. MEETS AT VALMONT

The members of the University Branch of the A. I. E. E., together with the Denver Section, were guests of the Public Service Company, at a joint meeting which was held at the Valmont plant on November 18, 1926.

The meeting was in celebration of the completion of the new 25,000-kw. turbo-generator which the General Electric Company had just installed for the Public Service Company. This machine, a few days before, successfully passed a rigid test under the supervision of Mr. Warren of the General Electric Company. The members were treated to a banquet which was later followed by an inspection trip through the entire plant, and a demonstration of this new unit, one of the largest in this part of the country. Mr. Easton, of the Electrical Department of the University, gave the visitors an interesting demonstration of the electrical characteristics of the machine on the oscillograph. The rest of the evening was enjoyably whiled away with dancing to the music of Beresford's orchestra.

(CAMPUS NEWS Continued on Page 72)

VALUABLE CONCLUSIONS DRAWN FROM S. P. E. E. INVESTIGATION OF ENGINEERING EDUCATION

VALUABLE suggestions that will light the way in teaching engineering students are set forth by the Board of Investigation and Co-ordination of the Society for the Promotion of Engineering Education in a preliminary report that was presented to the deans and administrative officers of the colleges of engineering in America at a special meeting in Washington, D. C., on November 18 and 19.

Dean H. S. Evans represented the College of Engineering of the University of Colorado.

At the annual meeting of the society three years ago last June, the Board on Investigation and Co-ordination was chosen for the purpose of collecting facts and data from which recommendations for the improvement of engineering colleges might be obtained. During three years of intensive investigation, through the agency of engineering colleges, the engineering industries, and the engineering societies, the board, under the direction of Mr. William E. Wickenden, has obtained some accurate and illuminating information. This information has been admirably compiled in the form of a report, which offers valuable suggestions and recommendations concerning the scope and character of engineering colleges. At the recent meeting in Washington, the report was carefully discussed and finally adopted.

A short discussion of a few of the more important points of the report will be of special interest to every one concerned with engineering. Considerable emphasis was placed on the structure of undergraduate curricula. Although a five-year course has been strongly advocated in the past, it was definitely decided that a four-year course was sufficient. In connection with this, it was pointed out that a degree should not require in excess of 136 semester hours or the equivalent in quarter hours. Six distinct subjects to be carried simultaneously were suggested as a maximum limit consistent with efficiency of effort, and fewer than six subjects were recommended. Another point of interest concerned the differentiation between the various phases of engineering,—that is, mechanical, civil, electrical, and chemical. Investigation has shown that the various courses should not be too strongly differentiated from each other. The first year should be identical for all courses, and the other years should gradually tend toward work of a more specialized nature. However, it was pointed out that extremely specialized work had no place in the undergraduate curriculum and was to be avoided.

It is interesting to note that the curriculum of our own engineering college conforms rather closely to the recommendations cited above. A few minor changes are being contemplated with reference to the above suggestions. These changes are: the establishment of certain cultural courses, less differentiation between the various courses, a reduction in the number of subjects given simultaneously in certain

(Continued on Page 66)

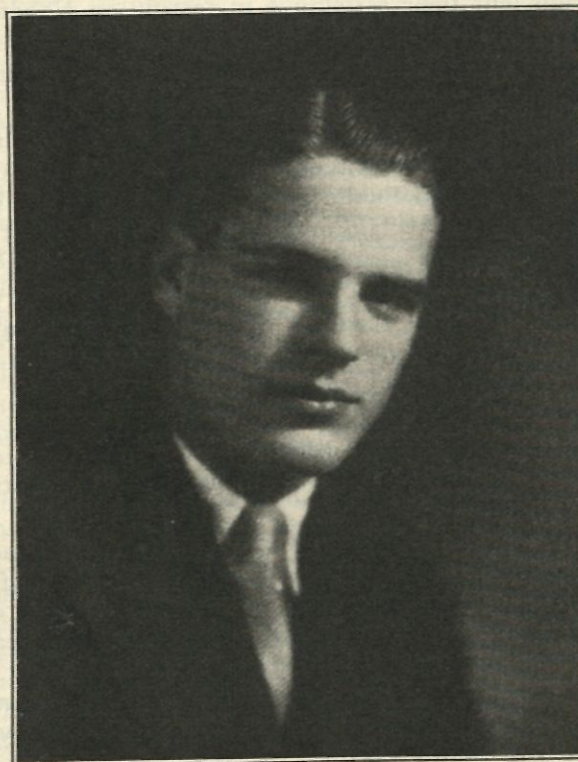
SENIOR ENGINEER WINS RHODES SCHOLARSHIP

Hudson Moore, Jr., a senior in the electrical engineering school, has the distinction of being the second Rhodes scholar to be selected from the College of Engineering in five years, Murray Skinner, e, '19, having been selected in 1921. This scholarship permits one to pursue advanced studies at Oxford University, and carries a stipend of two thousand dollars a year for three years.

Candidates are drawn from the colleges and universities in the state, each institution being allowed a number of applicants proportional to the student enrollment. In the recent examination, held December 11, the apportionment was as follows: Colorado College, three men; Denver University, three men; Colorado University, five men. Yale and Notre Dame were each represented by one candidate.

The committee, of which Dean Hellemis of the College of Arts and Sciences is chairman, conducted a preliminary examination which consisted of reviewing the credentials, averages, references, and undergraduate autobiography of the applicant. The oral examination was arranged in such a way that all but five men were eliminated after a short period of time. It was of a general nature, and was designed to test the mental versatility, poise, and personality of the applicant.

Moore's undergraduate record, both as a scholar and as an "activity man" is difficult to parallel. He is a member of Chi Psi, Tau Beta Pi, Eta Kappa Nu, and Sigma Tau. While at Oxford he will specialize in physical research.



Hudson Moore, Jr.



Employees of the Public Service Company of Colorado and students of the University of Colorado who tested the new 25,000-kw. turbo-generator at Valmont.

SENIOR ENGINEERS AID IN VALMONT TEST

Thirty engineering students from the electrical and mechanical departments of the College of Engineering lent their assistance in testing on November 16, 17, and 18, the new power unit which was recently installed at the Valmont plant of the Public Service Company.

In order to insure the best co-operation and mutual benefit from this joint test, engineers of both the General Electric and Public Service companies met with the students to explain in detail the methods used and the procedure to be followed in conducting the work. The students' duties consisted principally of observing and recording the readings of the various measuring instruments used to indicate the operation of the unit under different load conditions.

The machine, a 25,000-kw. turbo-alternator, is a product of the General Electric Company. It is to be used in conjunction with a similar unit of Westinghouse manufacture.

Mr. Robert Throne and Mr. H. V. Burt, engineers for the Public Service Company, were in charge of the test which began November 16 and ran for three consecutive days. Officials of both companies were pleased with the results of the test which indicate that the present capacity of the plant will be adequate to meet the growing demand for electrical power for several months or even a year.

The students were divided into two groups, one

group working Tuesday and Wednesday, and the other Thursday and Friday. In the Tuesday and Wednesday division were Richard F. Bache, Carl W. Borgman, Robert E. Goure, B. B. Hammans, Carl S. Hammer, James R. Hiltner, Stanley C. Shubart, and William D. Stapp of the mechanical engineers, and George N. Miles, O. Hyde, Joe Minici, Joe Wilson, Sidney Smith, Fred Gibbs, and William Rock of the electrical engineers.

The Thursday and Friday section was composed of the following men: Claude M. Hathaway, Paul E. Nelson, William G. Edwards, Richard G. Lorraine, Hunley E. Thomas, Orval H. Polk, and Everett Jain of the electricals, and R. Higgin, Francis C. Jain, Dan Kulie, Harold A. Lindrooth, Robert O'Neil, James Potts, John E. Rice, and Claiborne Van Zandt of the mechanicals.

E. R. W.

THREE FORMER EDITORS OF THE COLORADO ENGINEER ENJOY DINNER TOGETHER

Three former editors of the COLORADO ENGINEER dined together when Mr. and Mrs. Rex E. Hieronymus entertained Mr. and Mrs. Lester C. Simpson and Mr. Galen Cartwright at dinner in their home at South Bend, Indiana, on December 12. Rex Hieronymus was editor of the COLORADO ENGINEER during the term, 1920-1921; Lester Simpson was editor 1923-1924; and Galen Cartwright was editor 1924-1925.

Hieronymus is a results engineer in the Twin Branch Plant of the Indiana and Michigan Electric Company near South Bend, Indiana. Cartwright and Simpson are with the Westinghouse Manufacturing and Electric Company in South Bend.

HONORARY AND PROFESSIONAL GROUPS ARE AIDS TO STUDENTS

(Continued from Page 57)

up of both students and members of the faculty; so the student sees a really good fellow and altogether human being in his professor; and the professor, in turn, sees the intense, hopeful young man whom he is helping along a path oft retraced but ever new.

TAU BETA PI

One of the highest honors that can come to the engineering student is his selection for membership in Tau Beta Pi, the oldest engineering fraternity. This society was founded at Lehigh University in 1885. Colorado Beta, the local chapter, was installed in 1905. Members of this honorary fraternity are those students who have shown a keen interest in their work and who have maintained high scholarship. Wearers of this key are respected for their ability by students and practicing engineers alike. The officers of Tau Beta Pi for this year are William G. Edwards, president; Almon D. Thomas, vice-president; Clyde Newell, treasurer; Hudson Moore, recording secretary; and Claude Summer, corresponding secretary. A social meeting is held once each quarter in addition to the regular meetings which are called every two weeks.

ETA KAPPA NU

Eta Kappa Nu is the fraternity of those men in the study or practice of electrical engineering who, by virtue of their demonstrated ability, interest in activities, scholarship, and personality, have been selected to work in closer union for the advancement of their profession. The charter for the local chapter was granted in 1922.

Officers for the term 1926-1927 are Sidney Smith, president; William G. Edwards, Jr., vice-president; Richard Lorraine, corresponding secretary; Fairfax Kirn, recording secretary; William Rock, treasurer; and Milton Boone, Bridge editor. Eta Kappa Nu was founded at the University of Illinois in 1904.

SIGMA TAU

The men selected for the honor of becoming members of Sigma Tau, honorary engineering fraternity, are chosen for their scholarship, personality, activities, and professional interest in their work. The Iota chapter of Sigma Tau was installed at the University of Colorado in 1914.

Leadership of the fraternity is intrusted to the following officers for the present school year: Dean Stapp, president; Harold Lindrooth, recording secretary; Robert O'Neil, corresponding secretary; and Dick Tatlow, treasurer. The plans of these officers promise much from this society in any service to the school that may come before them.

SIGMA EPSILON

Sigma Epsilon is the newest addition to the number of honorary and professional societies at the University. There has long been a real need for an organization which would provide adequate means for students and practicing members of the civil engineering profession to co-operate closely for the continued expansion of its applications and ideals. In organizing this society, the founders believe they have filled a posi-

tion unapproached by any other such group. With this in view it is probable that expansion to representative bodies of men in other schools will soon follow.

The requisites for membership in Sigma Epsilon are an active and intelligent interest in the American Society of Civil Engineers, scholarship, and a desire to promote interest in the profession, both before and after graduation.

The newly elected officers are: Richard Tatlow, president; Albert L. Cervený, secretary-treasurer; and Robert Finlayson, historian.

ALPHA CHI SIGMA

Alpha Chi Sigma is the fraternity of the foremost students and members of the chemical engineering profession, or those who are taking some phase of chemistry as a prominent part of their life work. The society was founded at the University of Wisconsin in December, 1902. Expansion of the boundary of chemical knowledge, and the furtherance of professional ideals are the chief objects of the organization. Each year the local chapter offers a scholarship cup to the freshman chemistry student who has shown the best record in his work for the year. The officers for the year are Darrell Sickman, president; Carl Borgman, vice-president; Walter Hale, treasurer; Ross Middlemiss, recorder; and Carl Gilbert, historian.

A. I. E. E.

The organization to which all junior and senior electrical engineering students should belong is correctly known as the University of Colorado Student Branch of the American Institute of Electrical Engineers. Meetings of this body are held the first and third Wednesday evenings of each month. Programs consists of student papers, talks by prominent members of the profession, and sometimes the demonstration of new equipment or interesting experiments. A very successful year is anticipated by the following officers: Almon D. Thomas, president; William G. Edwards, vice-president; Joseph A. Setter, secretary; and Randolph W. Gutshall, treasurer.

A. S. M. E.

The student and professional organization of the mechanical engineering adherents is known as the American Society of Mechanical Engineers. Speeches by practicing engineers, student papers, motion pictures, and debates provide material for interesting programs throughout the year.

The present officers are: Stanley Shubart, president; Harold Lindrooth, vice-president; and B. O. Hammons, secretary-treasurer.

A. S. C. E.

The civil engineering students are commendably active in their support of the student branch of the American Society of Civil Engineers. Student discussions, outside speakers, and occasional social entertainment, comprise the activities of the association. The A. S. C. E. meets every two weeks for regular meetings, and oftener if a special program can be arranged.

The officers are Richard Tatlow, president; George M. Williams, vice-president; Robert Finlayson, secretary; George M. Steinhauer, treasurer.

(Continued on Page 72)

Oil Can



The Honorary Society of Lubrication Engineering. Dedicated in perpetuity to the services of science, that the cause of lubricity shall lack no champion, and that friction shall not thrive unopposed.

The "Membership in Oil Can" campaign instituted in our last issue has resulted in a promising increase in the number of candidates qualifying for election into the local chapter of the society. The spirit with which the populace—particularly the juniors—has responded to the call is most gratifying and indicates that still more rivalry for this much-sought-after honor will be in evidence before the next election to be held by the society.

However, judging from the past history of the society, it is expected by the active members that few sophomores and fewer freshmen will fulfil the qualifications necessary for consideration. It was with this state of affairs in mind that the local chapter decided to offer a bounty for each qualifying remark made by either a sophomore or a freshman. Anyone so favored as to hear such a remark is kindly requested to place a note explaining the remark, the qualifying contestant, etc., in the mail box of Room 209, Engineering Building III.

Bill Rock, senior electrical, is this year's foremost contender for the position of Chief Wiper. His second remarkable revelation in as many attempts came to light recently when it was learned that the main reason for his going on test at Valmont was that he had never seen a peak-load and wanted to view one of the things while he had the chance and before the blamed thing escaped. Bill's ambition, apparently, is to qualify at every election.

Carl Borgman, senior chemical, will be honorably presented with a mercury-plated gold flask for his astounding discovery that a railroad survey is the action of running over the country with a hand level. Apparently, then, the civil department is a cross-country team.

Earl McArthur has recently been appointed to his well earned position of Chief Squirt. He has made a valiant attempt to simplify the study of lathe chucks. After long research and careful analysis, McArthur has concluded that all chucks may be divided into two classes: round chucks which are used to hold round work, and square chucks which are used to hold square work.

Our editor, Al Thomas, is at last a noted member of the society. He has recently made a brilliant discovery. He has found that a switch board makes an admirable writing desk. However, Al has found one difficulty with the new application. The terminals of a certain 220-volt switch don't seem to be able to get along at all with Al's aluminum clip board. In fact,

they even went so far as to bite a huge hole in the board when he was trying to write. Al has about decided to get a wooden board, which he has heard is much more congenial with 220-volt terminals.

VALUABLE CONCLUSIONS DRAWN FROM S. P. E. E. INVESTIGATION

(Continued from Page 63)

instances, and a probable slight lessening in the number of hours required for graduation.

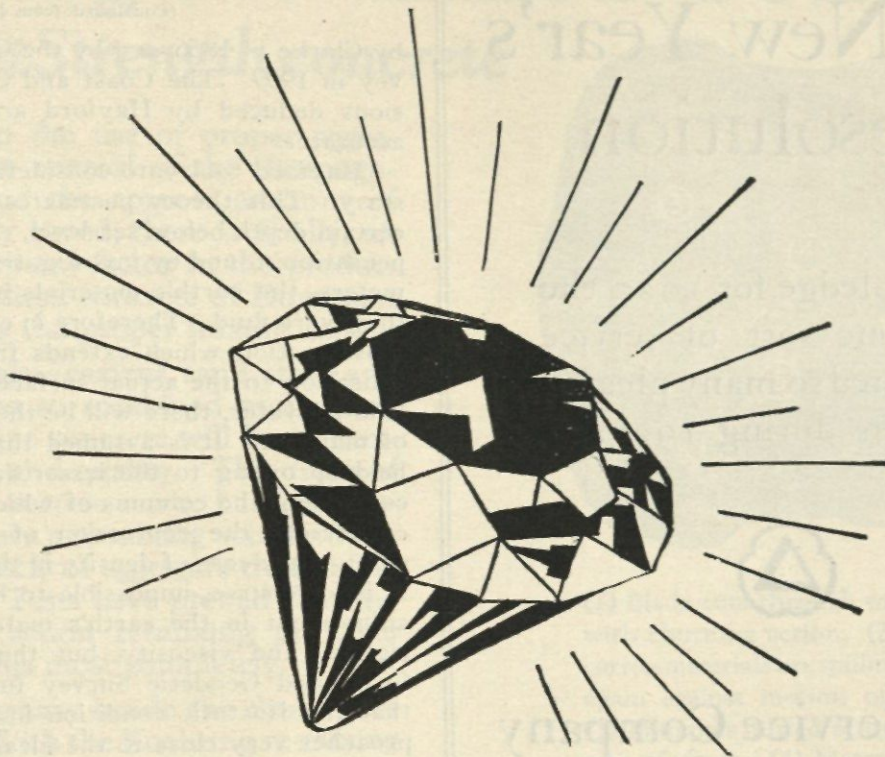
Perhaps the only apparent defect in the College of Engineering of the University of Colorado is the lack of social and economic courses. So essential was the study of general economics considered at the recent conference, that the board recommended that it be placed on a plane collateral with mathematics and the physical sciences as one of the foundation subjects of the curriculum. It was suggested that economics be included in the curriculum, even at the expense and exclusion of certain of the more technical subjects. The subject should extend throughout a complete academic year, and it should be taught by an economist of thorough competency but with proper accommodation to the interests and points of view of engineering students.

In addition to the study of general economics, certain other subjects, such as history, sociology, political economy, and even foreign language (either French or German) were highly recommended either as electives or as required subjects. The absence of social sciences and the humanities in engineering courses is prevalent in the majority of engineering schools throughout the country. One of the chief difficulties in instituting such subjects lies in the fact that a personnel which is capable of teaching them from an engineering point of view is difficult to find.

Another point discussed at the recent convention was the prevalent tendency in most American engineering colleges to place insufficient emphasis on the broader problems of society and on the social responsibilities of the engineering profession. The engineering aspect of social responsibility should be emphasized in all of the engineering courses. Moreover, the technique of engineering economy as related to costs, economy of design, and economy of selection and application should also be taught by engineers in connection with engineering subjects. A larger emphasis on these two aspects of engineering is clearly warranted.

It should be made clear that the above recommendations are merely the substance of a preliminary report which is subject to change or improvement in the future. Moreover, it should be pointed out that the investigation was not an attempt toward standardization of engineering curricula. In fact, a standard curriculum for all engineering colleges throughout the country was discouraged inasmuch as local needs and conditions would make it very undesirable. The report merely offers some general suggestions which might tend to improve engineering schools in general.

F. STARR.



A sermon in stones

CECIL RHODES, the diamond king, had a real idea which he passed on to diamonds in the rough.

"Be well-rounded men, broad in your sympathies," he said, and he made this the basis for selection of Rhodes scholars.

Surely there's a lesson for every man—graduates alike in arts, in pure science or in applied science—to balance the student in him with the athlete, the individualist with the man of sociability, the specialist with the "citizen of the world."

For Rhodes' idea was no theory. It is shared by hard-headed business men today.

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Number 64 of a Series

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Our New Year's Resolution

WE pledge for 1927 the same sort of service that earned so many pleased customers during 1926.



Public Service Company
of Colorado

THE WORK OF THE UNITED STATES COAST AND GEODETIC SURVEY

(Continued from Page 53)

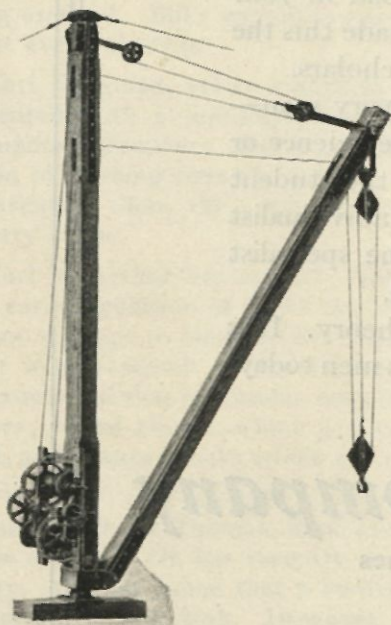
by Clarke in 1866, and by the Coast and Geodetic Survey in 1909. The Coast and Geodetic Survey dimensions deduced by Hayford are considered the most accurate.

Hayford took into consideration the theory of isostasy. This theory postulates that at and beneath a certain depth below sea level, called the depth of compensation, found by investigation to be about 122 kilometers, the earth's materials are in equilibrium as if they were fluid. Therefore in each column of the same cross section which extends from the depth of compensation to the actual surface of the earth, whether land or water, there will be the same mass or amount of material. It is assumed that elevated regions are held up owing to the lesser density of the materials composing the columns of which they form parts, and conversely the depression of the ocean bottoms is due to an excess of density in the material under them. It is, of course, impossible to have complete isostatic adjustment in the earth's materials because of some rigidity and viscosity, but the investigations of the Coast and Geodetic Survey furnish conclusive proof that the isostatic condition in the United States approaches very close to the ideal.

The work of the Coast and Geodetic Survey is not spectacular. It is not comfortable to climb a mountain peak with a pack of instruments on one's back; there

(Continued on Page 70)

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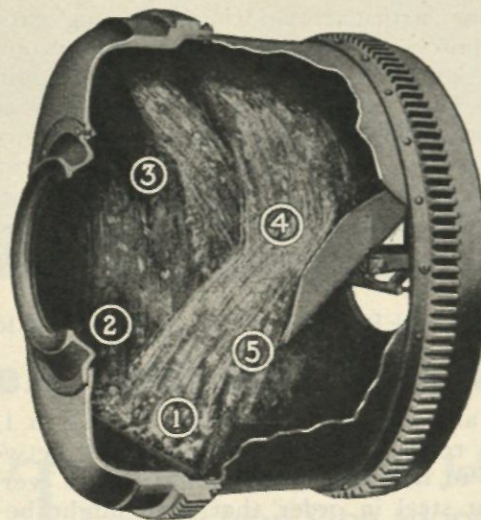
is Dominant Strength concrete

IN addition to the use of proper aggregates, positive control of the thoroughness of mix and the correct amount of water accurately timed, there is finally, an essentially important factor in the production of standardized concrete of Dominant Strength. It is the proper mixing action.

The raw materials—cement, sand, stone and water—must be so combined and mixed that the resultant concrete will be of maximum strength and quality. The drum of the Koehring concrete mixer has been designed to produce a re-mixing action which coats every particle of aggregate thoroughly with cement. Tests have proved that the Koehring five action re-mixing principle accomplishes this most completely.

Koehring supremacy inside the drum goes even further. With the Koehring re-mixing action there is no separation of aggregate according to size—it is uniform to the last shovelful of every batch.

"Concrete—Its Manufacture and Use" is a 210 page treatise on the uses of concrete, including 26 pages of tables of quantities of materials required in concrete paving work. To engineering students, faculty members and others interested we shall gladly send a copy on request.



- (1) Blade cuts through materials with churning action. (2) Blade carries materials up, spilling down again against motion of drum. (3) Materials hurled across diameter of drum. (4) Materials elevated to drum top and cascaded down to reversed discharge chute which (5) with scattering, spraying action, showers materials back to charging side for repeated trips through mixing process.

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THE WORK OF THE UNITED STATES COAST AND GEODETIC SURVEY

(Continued from Page 68)

is nothing particularly glorious, in being eaten alive by mosquitoes in Alaska, or in fighting one's way through the mangrove swamps of the Philippines; yet the field force has done its work with an accuracy that has won the approval of the scientific world. There is nothing especially inspiring in operating a calculating machine all day, in looking up logarithms, in drawing and engraving charts; and yet the office force has produced scientists of world-wide renown.

CANTILEVER HIGHWAY BRIDGE ACROSS CARQUINEZ STRAIT

(Continued from Page 55)

ft. long, and were built on an incline of 2 in 12. The stringers rested on a girder at each end between the verticals to the trusses. These stringers were made of silicon steel in order that they might be loaded during erection. The stringers, after they have served their purpose in erection, are to be cut in two and used in the suspended spans.

The traveler weighs about 120 tons and is equipped with two booms. The front boom, used in erecting all the main members in front, is capable of lifting thirty tons, which is the maximum weight of any member. The rear boom is used in erecting the bracing after the traveler has moved forward, and in removing the track stringers.

When erection is completed out to the suspended

spans, each traveler is dismantled and moved to the center, and erection will proceed out from each side toward the suspended span.

The most difficult, yet most important, part of the construction is the erection of the suspended spans. They are erected on the edge of the water and are so arranged that they can be floated to their positions by means of a barge at each end and then raised into their position. Each suspended span weighs, with all unnecessary material excluded, about 600 tons. At each end of the span, provision must be made to hoist 300 tons about 125 ft. vertically to the eye-bars which hang from the end of the span.

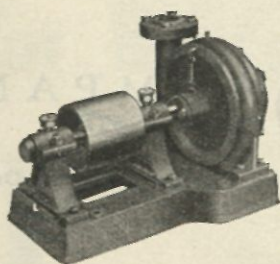
The hoisting is to be done by an arrangement of pulleys and counterweights. In the illustration will be noticed the arrangement for hoisting. At U30, on each truss directly over the end of the end of the suspended span, two two and one-half in. wire ropes are run down and connected to the end of the span. The other end of the ropes are attached to a sand box counterweight below point M29.

The counterweight is held up by an arrangement of blocks to the member L28-U30. The lead rope from the blocks is attached to a hoist on the cantilever arm. The weight of the counterweight required to lift one end of the span is 330 tons.

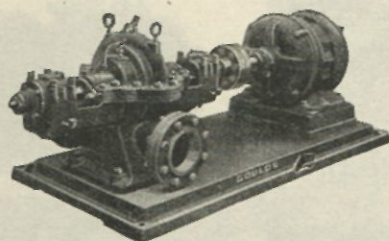
The job is so arranged that work can be carried on at several points at the same time. About two hundred men are employed on the project. The erection of the steel on the bridge is to be complete by March 1, 1927, and the bridge will be open for traffic by the middle of the year.

Goulds Pumps

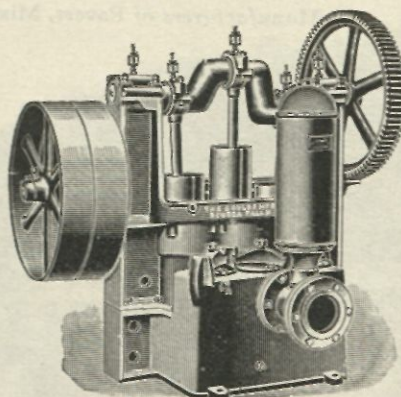
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All Conditions



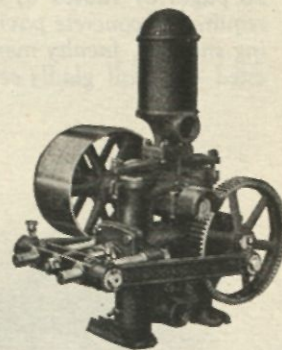
Single Stage Centrifugal Pumps



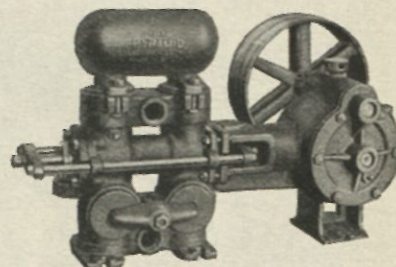
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HONORARY AND PROFESSIONAL GROUPS ARE AIDS TO STUDENTS

(Continued from Page 65)

COLORADO ENGINEERS

Every student enrolling in the College of Engineering automatically becomes a member of the Colorado Engineers. The principal activities of the organization are the publication of THE COLORADO ENGINEER, the engineering magazine of the school; the Apple Fest; the Engineer's Ball; and the Engineers' Day program. Officers are George Steinhauer, president; George M. Williams, vice-president; Oliver E. Nelson, secretary; H. A. Lindrooth, treasurer.

CAMPUS NEWS

(Continued from Page 62)

THE NEW LIGHTING SYSTEM ON THE CAMPUS

One of the latest improvements to be made on the campus of the University of Colorado is the installation of a new lighting system. Although work has been proceeding gradually during the past season, the program is unfinished. A single-conductor cable has been laid parallel to the walks, and only the majority of the twenty-eight standards to be erected are in place. The old system, therefore, is still in use.

Eventually, more than twenty-eight units will dot the campus; and, to prepare for that time, the wiring has been laid so that the number of standards may

(Continued on Page 74)

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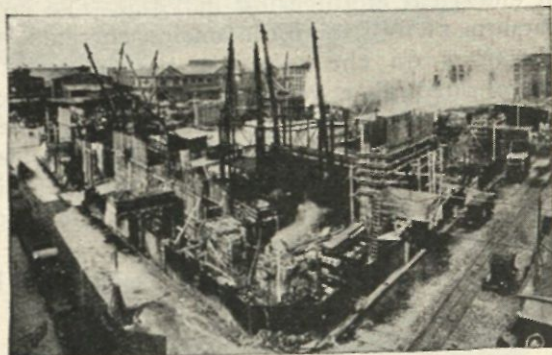
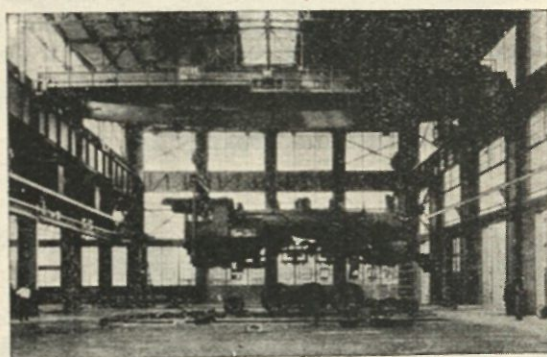
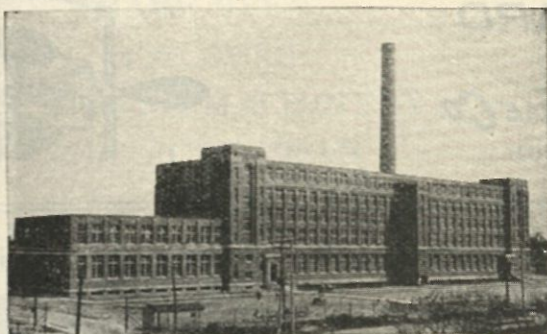
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Modern factory buildings must contain every facility to meet the demand for effective mechanical operation, and for consideration of the human operator. The mill built for Courtaulds, Limited, at Cornwall, Canada, is a model of such factory construction.

The construction of the locomotive erecting shops of the Southern Railway at Atlanta, Georgia, is a notable example of complete service rendered by engineering contractor, working in full cooperation, in both design and construction, with the engineers of the railway company.

Often considerations of location determine a site where construction of the foundations is rendered unusually difficult. The New York Telephone Building, of which Marc Eidlitz & Son, Inc. were General Contractors, was placed where the Hudson River used to flow; yet modern methods permitted The Foundation Company to construct the substructure reaching to rock five stories below surface level.

These are but a few of the types of projects constructed by this organization.

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BUILDERS OF SUPERSTRUCTURES AS WELL AS SUBSTRUCTURES

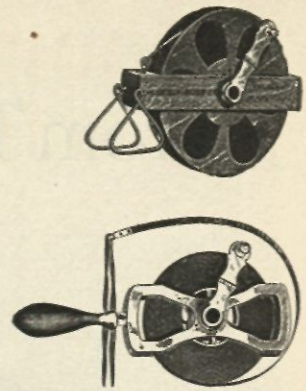
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LUFKIN STEEL TAPES

**THE RECOGNIZED
STANDARD**

THE LUFKIN RULE CO.
SAGINAW, MICH.



NEW LIGHTING SYSTEM ON THE CAMPUS

(Continued from Page 72)

readily be doubled without the need of any circuit alterations. When the system is finally completed, there will be four units situated along the front of Macky Auditorium, and one near each of the main entrances to the campus buildings. Up to the present time, however, standards have been placed at the intersections of the walks, with a few located at points along them; and two have been placed in the grass plot fronting Macky Auditorium.

This system does not embody any highly original or unusual features. It employs the series circuit that is utilized in the methods of street lighting. Electrical energy will be obtained from the power lines through a constant current transformer kept in the old powerhouse of the University. A current of 6.6 amperes, which is one of the values commonly used, will be supplied to the lamps at a potential difference of 2300 volts. Two different sizes of lamps will be used. One of these which is rated at 400 c. p., is to be put in service on the standards along Macky Auditorium, and the other, which is rated at 250 c. p., will be used in the remaining units. The size of the lamp in them, however, can easily be changed from one of 250 c. p. to one of 400 c. p.

The entire unit, when judged from the standpoint of light flux distribution and efficiency, is one of the best. In its glass bowl are two specially formed prisms which are closely fitted together. These are suspended above the lamp in the bowl, and from that

position they deflect the light which is directed upward onto the area around the standard. That part of the light was entirely wasted by the old unit. The new type, consequently, gives a more useful distribution of its light flux, which means a correspondingly higher illumination and lamp efficiency. Then, too, it is well proportioned, having a suggestion of stalwart ruggedness. In time, the University of Colorado will have a lighting system that is capable of providing a high degree of illumination, and one that is also extremely efficient and ornamental.

A. DECINO.

PROFESSOR ROYAL W. SORENSON INVENTS A NOVEL VACUUM SWITCH

The first practical device to be developed in the famous million-volt laboratory at the California Institute of Technology is the invention of Professor Royal W. Sorenson, a Colorado University graduate in electrical engineering in 1905. The invention is a vacuum switch for high tension currents. The switch functions on the principle that electricity will not travel through a vacuum. The terrific arc which results when a current of a thousand amperes is cut off in open air is totally obviated in the new device. Such a switch has great commercial value, as it will take the place of the cumbersome and expensive oil switches which are now in use.

Professor Sorenson was assisted in his experiments by the well-known physicist, Dr. Robert A. Millikan.

CLAY ROOFING TILE

CORRECT ARCHITECTURAL
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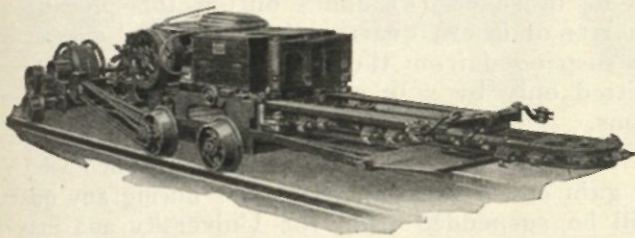
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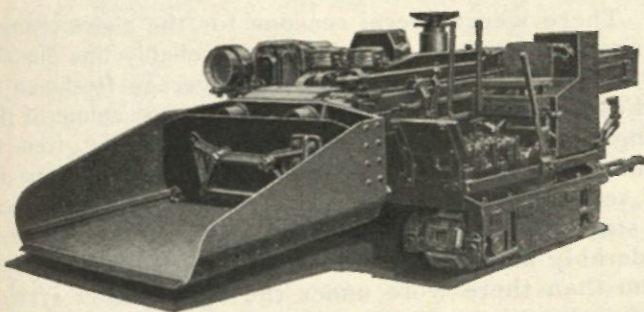
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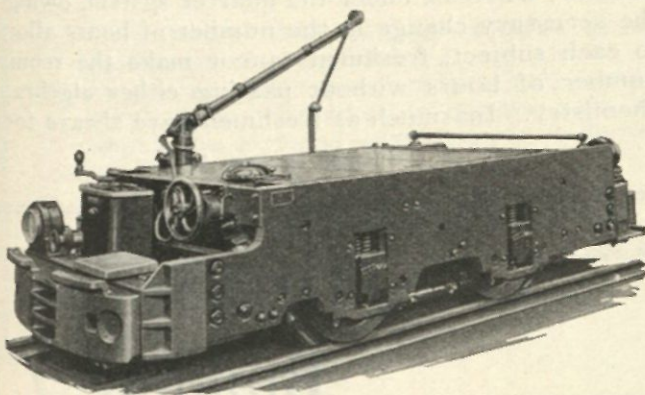
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ELECTRICALS ARE PLEDGED BY ETA KAPPA NU

Shortly before the close of the fall quarter, Eta Kappa Nu, honorary electrical engineering fraternity, pledged three seniors and eight juniors. The seniors pledged are Randolph Gutshall, Frank Tierney, and Clyde Newell, while the juniors wearing the button are James Raynor, Reginald McKinley, Paul Taylor, Thomas Eaton, George Warren, Colton Babcock, Edwin Whitehead, and Chris Bartlett. The society plans to initiate these men early in the winter quarter.

THE OLD EIGHT-HOUR RULE HAS BEEN CHANGED FOR FRESHMEN

It is of particular interest to freshmen in the College of Engineering to learn that the old eight-hour rule has been changed. After a careful consideration by the engineering faculty, an improvement on the old ruling was deemed advisable, and a committee of Professor Eckel as Chairman, Professor Simmering, and Professor Coover, was chosen to investigate and recommend an adequate change. The following proposal was made by the committee and adopted by the faculty:

"It is recommended that the present so-called 'eight-hour rule' be changed to read as follows:

"Freshmen who fail to pass seven (7) hours credit during *their* first quarter will be continued on probation, without petitioning, for one quarter, unless they are obviously unprepared for university work or show insincerity of purpose. Freshmen who fail to gain

credit in seven (7) hours during this probationary quarter or in any quarter after their first quarter will be suspended from the University and may be readmitted only by vote of the Committee on Readmissions.

"All students not classified as freshmen who fail to gain credit in eight (8) hours during any quarter will be suspended from the University and may be readmitted only by vote of the Committee on Readmissions. Each case of suspension under this rule will be considered on petition submitted by the student concerned."

There were several reasons for the above change. Primarily, it was thought that probably one quarter was too short a period for the average freshman to adjust himself to the rather intense curriculum of the Engineering College. Consequently, he is given an additional quarter in which to show what he can do. A second consideration encouraging the change was a statistical fact. Records show that there are considerably more failures under the present quarter system than there were under the old semester system. In explanation of this condition, it must be remembered that under the semester system it was possible to fail in both chemistry and algebra without suspension; whereas, under the quarter system, owing to the necessary change in the number of hours allotted to each subject, freshmen cannot make the required number of hours without passing either algebra or chemistry. Inasmuch as freshmen have always found

(Continued on Page 78)

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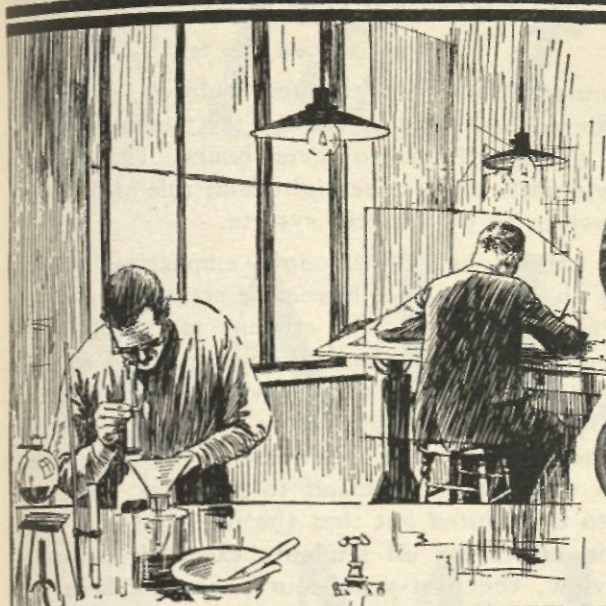
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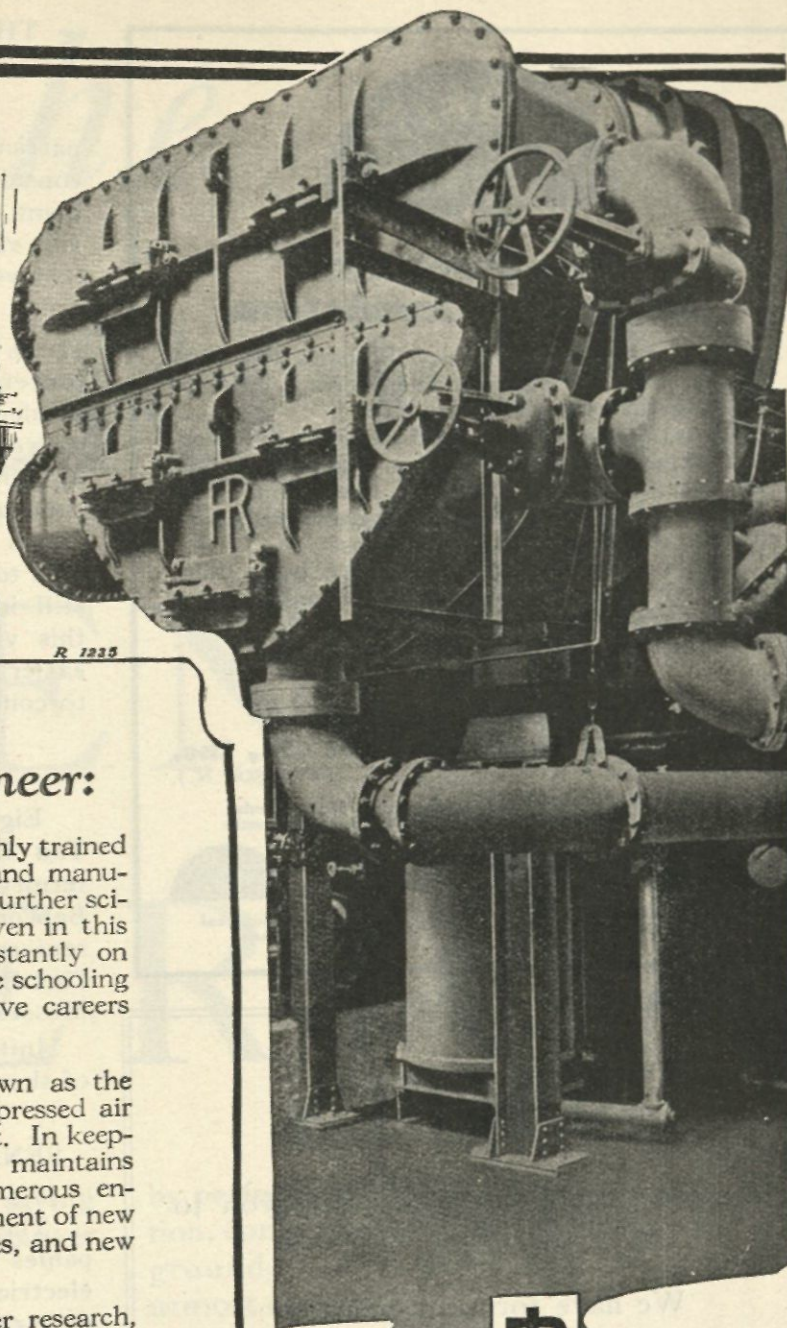
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THE OLD EIGHT-HOUR RULE HAS BEEN CHANGED FOR FRESHMEN

(Continued from Page 76)

particular difficulty with these subjects, it has been considered advisable to change the minimum requirement of eight hours to seven hours. Thus, the new rule virtually adapts the eight-hour rule of the semester system to the quarter system.

It cannot be too strongly emphasized that the above change does not lower the standards of the Engineering College. The student may still be suspended at the end of the first quarter if he is obviously unprepared for university work, or shows insincerity of purpose, as is evident from the report. The new rule merely gives the freshman a little more time in which to accustom himself to his work. Moreover, it is to be pointed out that the old eight-hour rule is still in effect for all students except freshmen. In this view, the first-year course has not been made easier; it has merely been more adequately adapted to conditions.

F. STARR.

TAU BETA PI PLEDGES ELEVEN MEN

Eight seniors and three juniors were pledged by Tau Beta Pi, honorary engineering scholastic fraternity, late in the fall quarter. The juniors are Colton Babcock, Marcy Newell, Edwin Whitehead, while the seniors pledged are Claude Hathaway, Wesley Goss, Carl Borgman, Merle Allison, Richard Tatlow, Leland Messex, Orval Polk, and Everett Jain.

Initiation of these men is to be held the first part of the winter quarter.

SENIORS SELECTED BY MANUFACTURING COMPANIES

The General Electric and Westinghouse Companies have selected their usual large quota of senior electricals and mechanicals for their respective student courses. From the seventeen Colorado men selected by the two companies the General Electric Company has given positions to the electricals: W. G. Edwards, R. W. Gutshall, R. G. Lorraine, W. P. Rock, Sid Smith, Frank Tierney, and the mechanicals: Richard Bach, R. E. Goure, and James L. Hiltner. The Westinghouse Company has chosen the electricals: C. S. Newell, J. L. Ottenheimer, O. H. Polk, Joe Minici, C. J. Wilson, and the mechanicals: Robert O'Neil, and Dean Stapp.

Glenn Thompson, who completed his under-graduate work during the fall quarter, was chosen by the General Electric to begin his student course about January 31. C. W. Coffman, junior electrical, was signed up for the summer course at Westinghouse.

The Colorado men were interviewed by M. M. Boring in charge of the General Electric Training School, and by William Trudgian of the Denver Branch Office of the Westinghouse Company. Both representatives are Colorado graduates.

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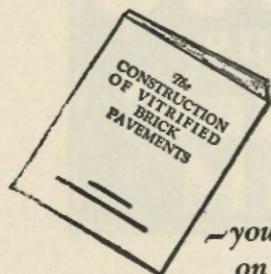
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