

The
COLORADO
ENGINEER

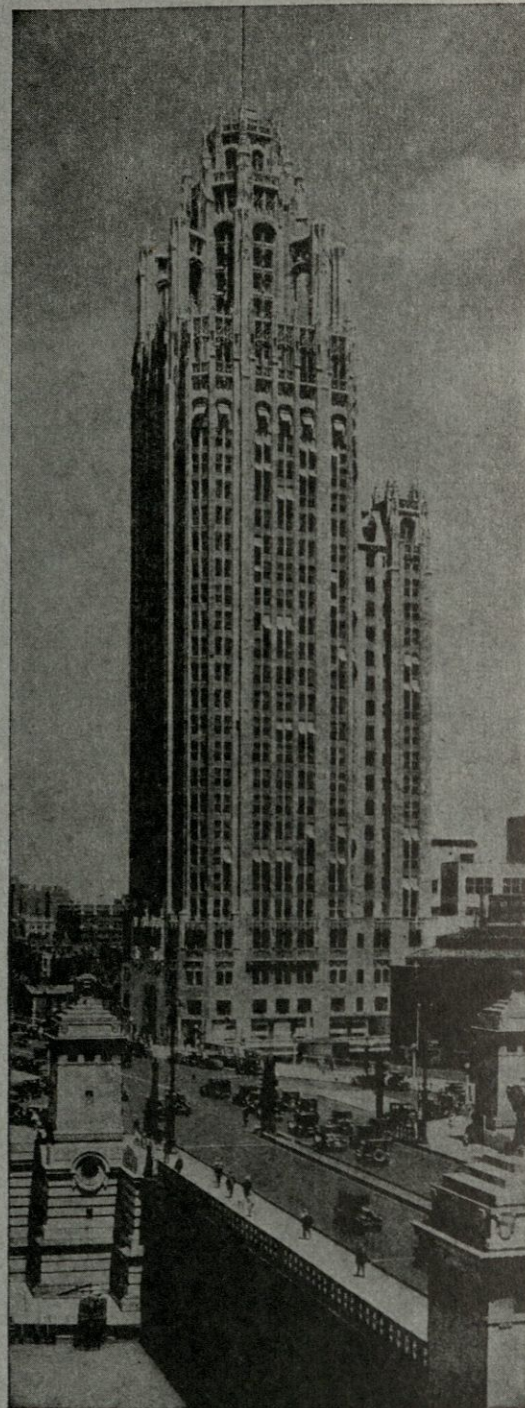


MEMBER OF THE ENGINEERING COLLEGE MAGAZINES ASSOCIATED

A Lesson in Psychology

AN OLD CHIEF of the Pueblo Indians, on his first visit to Chicago, was taken to the top of the new Tribune Tower Building. On leaving the elevator, he turned to his guide and asked, "When are we going up?" When he was told that he was already on the top floor, the old man declared flatly that he did not believe it, because he had climbed no ladders;—nor could he be persuaded until he looked over the city spread out beneath him.

It's all a matter of association. The Chief had always associated the idea of "going up" with the ladders of a Pueblo. In a similar fashion, to people in modern cities the world over, the idea of ascent is inextricably bound up with the name of Otis.

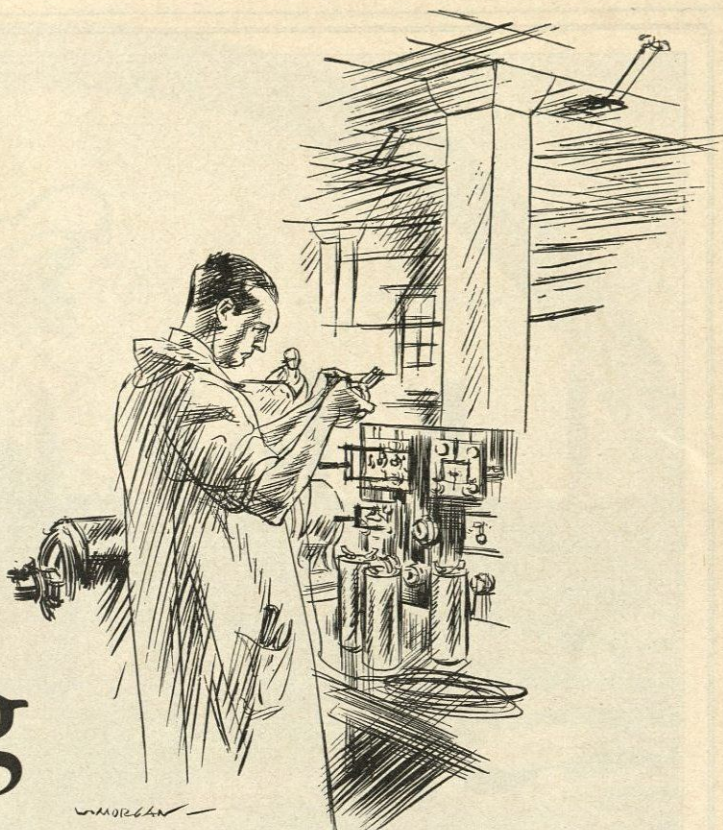


THE CHICAGO TRIBUNE BUILDING is equipped with nine (9) Otis Elevators, traveling at a speed of 800 F. P. M., and operating with signal control, which is entirely automatic in operation and independent of the operator. This is the newest and most improved operation for intensive elevator service in high buildings.

O T I S E L E V A T O R C O M P A N Y

Offices in all Principal Cities of the World

Lab Lightning



Douglas F. Miner

SOME of the men at Clark University mentioned it first. "Doug surely lives in the Lab," they remarked. Later, too, at Worcester Polytechnic Institute, instructors made the same comment. And Douglas F. Miner, himself, agrees that he did—and does. That makes it unanimous.

"Big league lab work" was his aim as he turned to Westinghouse after graduation in 1917. But not until his return from overseas service two years later could he settle down to the lab. Now—at thirty-three—he's in charge of experiments at our Engineering, High Power, and High Voltage Laboratories, with a staff of twenty-five to direct.

He can unleash artificial lightning of 5,000,000 horsepower in 5/1000 of a

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He has demonstrated the greatest artificial arc on record—fifty-five feet in length. To further his experiments a single generating plant, capable of producing on short circuit a million horsepower, has been erected.

There is a practical reason for these super-tests—for this equipment in advance of what the world uses now in its daily work. This, for instance, is frequently the attitude of a Central Station customer: "Of course your apparatus meets our needs today—takes every test to which we can put it now. But what of 1950? Will this insulation stand the load we will

The question is sometimes asked: Where do young men get when they enter a large industrial organization? Have they opportunity to exercise creative talents, or are they forced into narrow grooves?

This series of advertisements throws light on these questions. Each advertisement takes up the record of a college man who came with the Westinghouse Company, within the past ten years, after graduation.

use then? And how many volts will these arresters bear?"

They come to Miner for the answer. He gets it from the laboratories. He produces under a roof the same conditions which nature, or time, may be holding in store for Westinghouse equipment.

Such is the pioneering of Westinghouse Laboratory Engineers. They are "experimenting in the tomorrow"—the step between research and application. They are finding growth, reward, congenial work, while following a bent for trying things out.

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Steam Power Plant of American Gas and Electric Company, Windsor, W. Va.

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BUILDERS OF SUPERSTRUCTURES AS WELL AS SUBSTRUCTURES



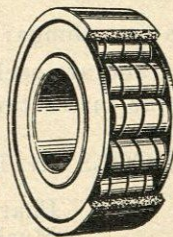
Columbus was a man of vision

BUT not even he could have foreseen the great industrial development of this country which would come about through improved methods of manufacture and transportation, and the important part that would be played by Hyatt roller bearings.

Modern industry requires and far sighted engineers demand that rotating parts be mounted on bearings that will roll instead of rub.

Raw silk, wool and cotton are transformed into the fruit of the loom; deeply hidden coal and metal ores are brought to

the light; ribs of steel are fabricated for the backbone of modern construction. In fact every phase of industry is speeded up and assured uninterrupted output by the use of Hyatt roller bearings which, with their rugged durability and unfailing dependability are serving the needs of the nation faithfully and well.



When designing or purchasing mechanical equipment, remember that the combined experience of the Hyatt Roller Bearing Company's engineers and specialists is always at your disposal to help you solve your bearing problems.

HYATT

Roller Bearings

An actual Hyatt bearing, nickel plated for use as a paper weight or pocket piece, is yours for the asking. This bearing, the smallest we manufacture, clearly demonstrates the anti-friction principle which has made Hyatt bearings leaders in the commercial world.

HYATT ROLLER BEARING COMPANY, NEWARK, N. J.



A Large Family

The University has a large family. In this picture, made one morning in front of Macky Building just after the weekly assembly of students, there are nearly three thousand students. This is equal to the population of a good-sized town.

This large University family indicates two things:

That the youth of Colorado desire and are seeking higher education.

That the University is supplying the instruction these young men and women demand.

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Medicine
Law
Summer Quarter

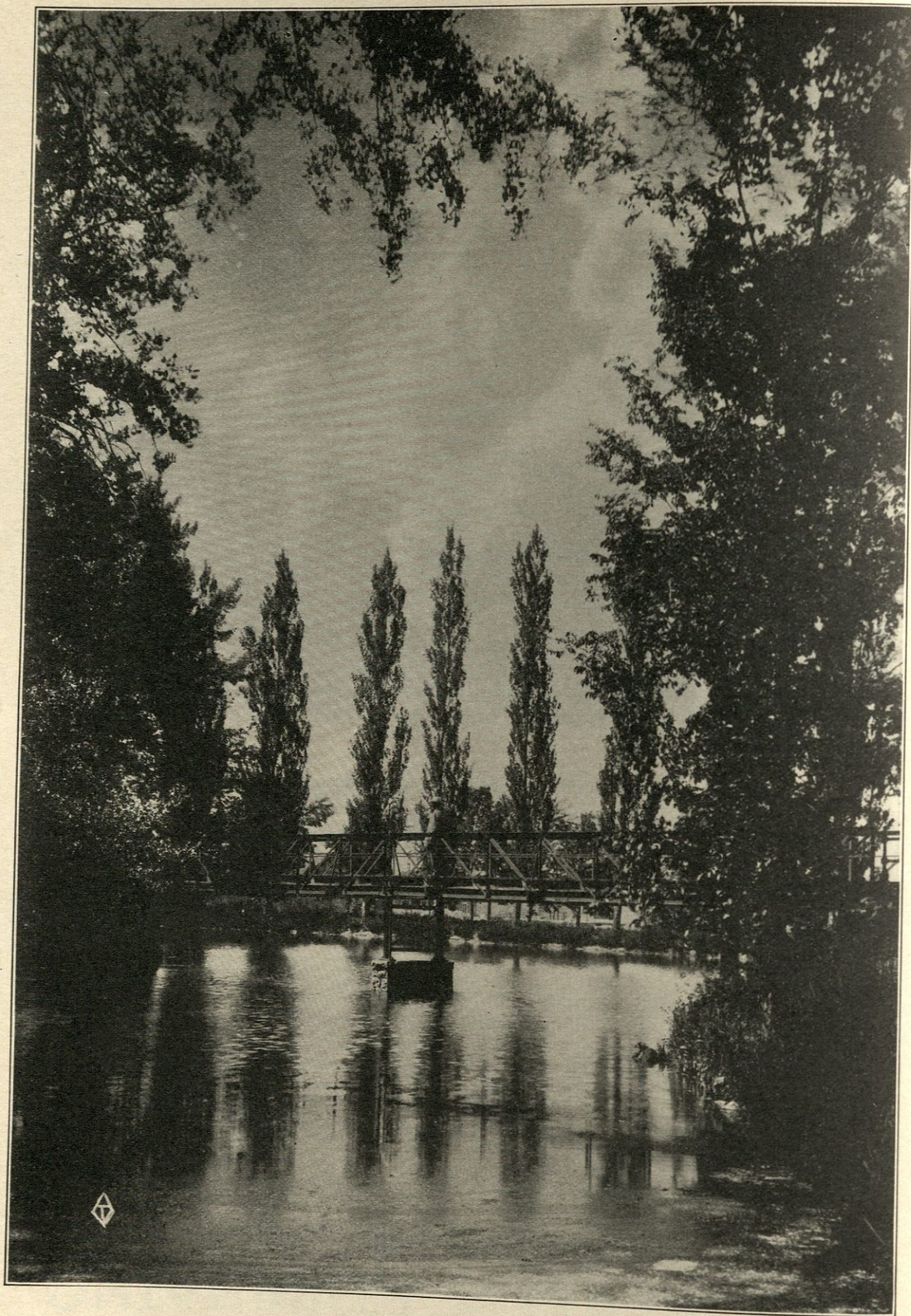
Pharmacy
Music
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Graduate
Extension Division

For Information, Write to The Registrar

UNIVERSITY of COLORADO
BOULDER, COLORADO

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THE POPLARS STILL KEEP WATCH OVER VARSITY LAKE

—Photo by Ed. Tangen.

ALUMNI TELL ABOUT THEMSELVES

Answers to Inquiry Give Salary Statistics and Personal Opinions About Engineering Education

GALEN G. CARTWRIGHT, E.E., '26
Editor of THE COLORADO ENGINEER in 1924-1925

"I CONSIDER that the field of the greatest service of the university is in *vocational guidance* based on a thorough and scientific knowledge of vocational psychology. To me, the greatest of all tragedies is 'the square peg in the round hole.' I know, for I have been one. The greatest work that a college of engineering can do, in my estimation, is to study the man, his *inclinations* and native abilities and then start him right, whether his field of real usefulness is engineering, sales work, or scenario writing. A right start is a fortune in itself."

This is the thought of a graduate of one of the engineering schools of the country as he answers one of the queries of a questionnaire conceived by a committee of the Society for the Promotion of Engineering Education and sent out to graduates of most of the larger colleges of engineering throughout the nation by co-operative committees of the faculties of the institutions. The thought of this graduate sounds a keynote of the general attitude of engineers as to the possible improvements in engineering education, and the tone of the results of the whole survey has a rich quality of human interest as the data from one of the most extensive investigations of engineering education are made public.

With every medium of publicity fairly choked with data and reports from investigating committees that are gathering statistics on almost no limit of subjects, technical and otherwise, we find ourselves looking through report after report and booklet after booklet with increasing distaste and disgust, and each additional collection of figures and cold-fact information sends our minds into a chaotic state of confusion. Now and then, however, when a bit of data seems to apply to ourselves more or less directly and to throw a ray of light into the mysterious depths of our own futures, we displace the castle of lofty dreams with the more rugged and obvious dwelling place of hopes—that of the law of averages—and we conjecture with

SUBJECTS IN WHICH STUDENTS HAD MOST DIFFICULTY

	Per Cent
Mathematics	21.4
Chemistry	16.3
Modern languages.....	12.6
Descriptive Geometry and Drawing..	12.2
Physics	10.6
Mechanics	9.3
English	7.8
Laboratory courses.....	4.1
Engineering subjects.....	3.2
Shop courses.....	2.1
Others	0.4
	100.0

ourselves as to our own position in life relative to the mythical average person.

The local committee of the faculty of the College of Engineering, acting in conjunction with the program of the country-wide survey of the S.P.E.E. on engineering graduates, has obtained data listed under the heading of "A Study of Engineering Graduates and Former Students." The writer has not consulted replies from former students but will limit this article to a consideration of the graduates only. Classes of 1924, 1923, 1922, 1919, 1914, 1909, 1904, 1899,

1894, 1889, and 1884 have been canvassed and two distinct groups of graduates have been formed; namely, recent graduates and older graduates.

Among the more important subjects considered in the questionnaire studies are the distribution of engineering graduates as to general fields and special type of work, earnings and progress of the graduates, the placement process or, in other words, the placement of the men in their respective line of work, and, lastly, the opinions of the graduates on engineering education and their general attitude toward their preparatory training and chosen profession. Nearly 64 per cent. of the younger alumni returned the questionnaires which were sent out, while 45 per cent. of the older alumni replied.

Perhaps one of the most interesting items in the results of the survey is the matter concerning the various types of positions in which the graduates are now working. It is found that more than 50 per cent. of the engineers are employed in some form of industrial engineering, while about a third of the men are classed as professional engineers. Such a grouping of the engineers is not surprising, but the actual percentage is often a matter of question. Commercial and governmental engineering take only a small percentage of the technically trained men, as is to be expected. More specifically, however, we find from the compiled figures that testing, drafting work, and

design, in order of their percentage, head the list of occupations of recent graduates, and construction, operation and maintenance, estimating, administrative or executive work, research, and sales work also rank high in the list. Comparatively few graduates are engaged in teaching engineering and other subjects and but a scant number are employed in consulting engineering work. But those fields already mentioned do not claim every engineer, for a wide range of activity is evidenced by miscellaneous occupations in many branches of the profession. For example, men reported that they were employed in inspection work, investigation, engineering development, results and production engineering, rating, combustion engineering, and cost production work.

Closely allied to the various types of positions is the matter of the earnings and progress of the graduates. Secondary though it may seem, the wage earning capacity of the average engineer is a matter of primary concern, and, unfortunately perhaps, it is this wage-earning power by which success is largely measured. In 1894, neophyte engineers gained an average yearly income of \$810. As a contrast to this, in 1924, the computed median of the yearly incomes of the recent graduates was \$1,260. The figures show that the yearly increase in pay for the first three years out of college has varied between the rough limits of \$150 and \$480. After the three-year period the increase is shown in smaller average increments. It is a noteworthy fact that in the twentieth year for the classes of 1894 and 1899 the yearly salary increased to \$13,000, and the most unique case of an unusual individual salary reported is that of a graduate who is now working in his thirtieth year after graduation and is receiving \$30,000 as an annual income.

Of even more initial importance than the salary is the problem of securing a position once the graduate has stepped out from the realms of preparatory training. According to the information sent back to the committee, placement in a position may have been the result of solicitation by an employer, which, by the way, has given over 30 per cent. of our recent graduates a job. Nearly 20 per cent. of the men have been placed in their first position through the efforts of the college or one of the faculty members. Personal endeavor of the young engineers has been the determining factor in nearly 17 per cent. of the cases, and a few men have been aided in their quest for employment by a friend or member of the family. Of course, in some instances, more than one of the agencies mentioned

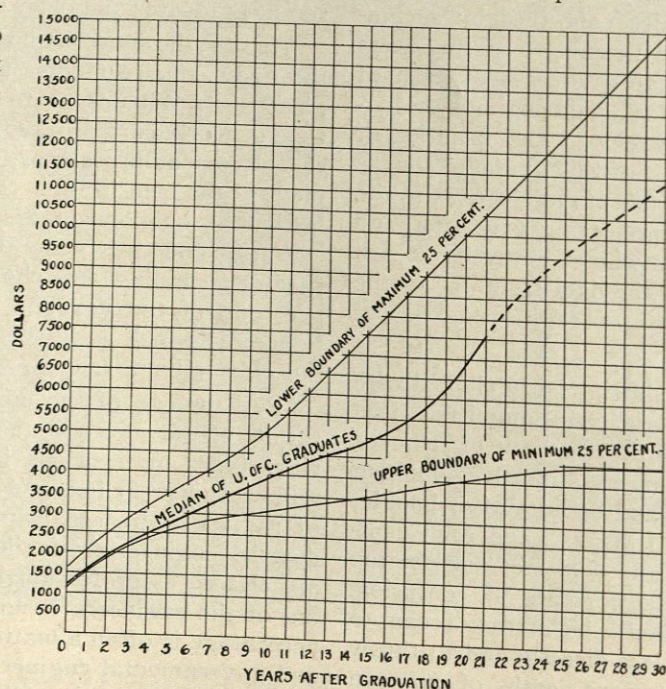
has played an important part in the ultimate placement process, and in such cases the more potent factor was considered. The comparatively large number of graduate engineers chosen by solicitation on the part of the employer gives a good indication that there is an excellent demand for men trained in our own College of Engineering.

From the standpoint of the graduate we find a set of reactions which bear out indirectly the conclusions to be drawn from the attitude of the employer. Relative to the reactions of the recent graduates in regard to their present positions, 85 per cent. of the men state that they are satisfied with their work, thus leaving 15 per cent. of the replies in the dissatisfaction column. Ninety per cent. are satisfied with their prospects, 95 per cent. express a liking for engineering work, and 98 per cent. are "Glad I studied engineering."

In line with the general satisfaction with their profession, the majority of graduates reported that, in their opinion, the college course was good and, in as many cases, excellent as a proper scientific and technical foundation for the professional work. The opinion, as noted, is a cross section of the attitude of the older graduates on the matter of a proper foundation in the scholastic training for engineers and, for this reason, it more nearly approaches an unbiased belief. The importance assigned to the various general divisions of the engineering curricula has a special significance, in that the scientific group of subjects scored more heavily than did the engineering group; and the cultural group was placed far above the economic group as an important part in an engineer's fundamental education.

Although it is generally conceded that scientific training is indispensable, a broad education for the majority, justly considering the general needs of industry, and a specific training in the anticipation of

the needs of specialized industry for those who desire it are jointly advocated as the solution of some of the problems of present-day engineering education. Engineers of today have found that cultural and economic studies would be of some benefit to the majority, but these subjects are wisely held in the background, with technical subjects occupying the immediate foreground in the academic landscape. The practicing engineer realizes that even though he needs a general cultural education to take his place properly in society, it is the scientific and technical part of his education that prepares him for the engineering profession.



Curves showing earnings of engineering graduates. Upper and lower curves have been plotted from general data, while the median curve has been plotted from the average income of graduates of the University of Colorado.



©Chicago Aerial Survey Co.

Aeroplane View of South Side Terminal District, Chicago, Showing Where New Channel of Chicago River Will Be Cut.

STRAIGHTENING THE CHICAGO RIVER

H. G. ALTVATER, B.S. (C.E.), '22

ASSOC. MEM. A.S.C.E.

Formerly Assistant Engineer of the Chicago Railway Terminal Committee

DIVERSE and conflicting interests make the plan for changing the channel of the Chicago River a far-reaching and many-sided engineering problem. The municipal, sanitary district, state, and federal governments, and fourteen railroad corporations are directly interested. New questions of riparian and property rights have arisen upon which no precedents have been established in the courts—particularly as to the bed of the present channel which will become dry land. Portions may belong either to the adjoining land owners, or to the United States, to the state, to the city, to the sanitary district, to the owners of the riparian rights, or to the owners of the piers of bridges. Dock frontage will be destroyed for some and created for others, and a readjustment of railroad trackage is necessary. The possible legal

costs and delays are so uninviting and the values so large, that the city can not undertake ordinary methods of condemnation. A voluntary agreement is the most practicable way to provide for its accomplishment.

To many, the principal object of the improvement is to permit three or four additional streets to be cut through from the south part of the city to the central business district (known as "the Loop" because it is encircled by the elevated lines). As shown in Fig. 1, the Chicago River, which once flowed northeasterly to its outlet at the municipal pier, has been connected with the Des Plaines and Mississippi River basins by the Illinois & Michigan and by the Sanitary canal. These navigable waterways, which require expensive movable bridges at all crossings, have limited the

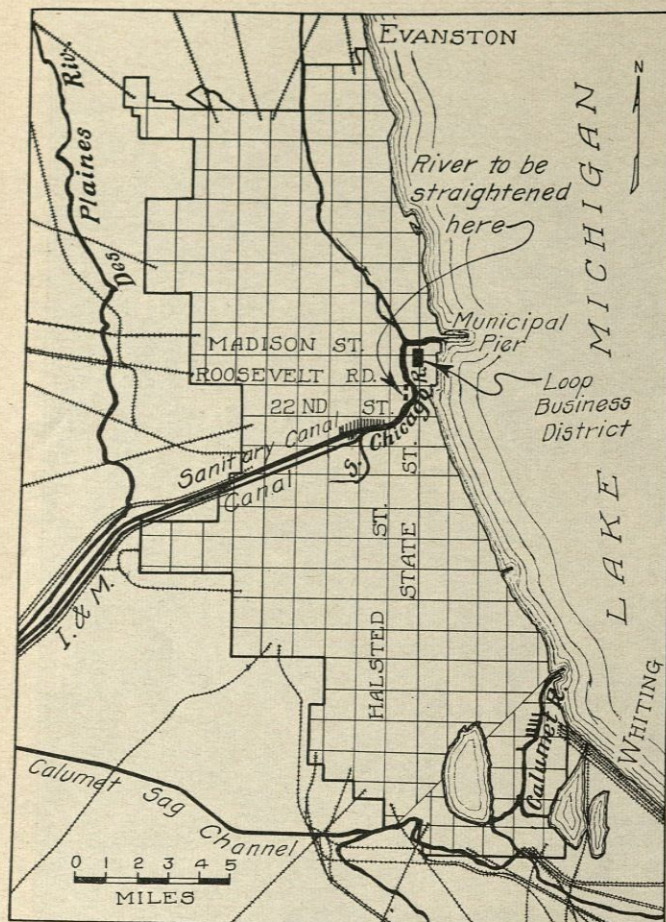


Fig. I—Map of Chicago, Showing Section-line Streets, Railroad Lines Entering the City Limits, and Waterways.

number of streets running through from north to south. As a result, practically all traffic originating in or north of the loop district must force its way through the bottle-neck between the river and the lake at Roosevelt Road. Conversely, the traffic originating in the south half of the city is squeezed together, and through this area, as it proceeds northward. The four streets crossing Roosevelt Road east of the Chicago River are insufficient during the rush hours: Michigan Boulevard alone accommodates 35,000 vehicles per day; one of the alleys is occupied by the elevated lines; the railroad tracks in the intervening blocks carry 1,280 passenger train movements per day and switching for sixteen team yards and thirty-one freight depots. The railroad lines which enter the city from all directions, as shown in Fig. I, converge into the shaded areas of Fig. II, producing a heavy volume of slow-moving truck and horse-drawn traffic surrounding the loop business district.

As a consequence, the very center of the congested district is becoming relatively inaccessible, when time is considered, owing to delay in traveling from the edges to the center. Retail stores have shown a tendency to move outward to locations near which automobiles can be parked; property at the center is becoming stagnant; time is lost by both customers and employees of business houses; and even fire apparatus is blocked by traffic jams. To remedy this condition, improvements are being made on all sides. The outer drive (11), Fig. II, has recently been opened; the

roadways shown in Grant Park are being created by filling the lake; the connection (10) to the lake shore drive on the north is being contracted for; on Wacker Drive (9), along the south bank of the river, a double-deck street is being constructed; Michigan Boulevard has been widened and a two-level bridge constructed; Canal Street has been widened; and numerous additional bridges have recently been provided for. To increase the avenues of traffic leading south the straightening of the river will permit additional streets to be extended through on viaducts.

However, to the best informed, the desirability of river straightening to relieve congestion is exceeded in importance by its necessity as a step in the solution of the railway terminal problem—an integral part of municipal development in its larger aspects. When considering its present growth, the primary reason for the existence of a city at this geographical location must not be overlooked. In penetrating the interior of this country, the early explorers found the southwest shore of Lake Michigan to be the farthest inland point accessible by water routes, and the best landing point in the vicinity was a short way up the Chicago River. So the neighborhood of (9), Fig. II, became the nucleus of the settlement. When the railroads built westward, this trading post of four thousand people became their objective. They approached as close as possible and occupied the then swamps south of stations (3), (4), and (5), paying little attention to streets. Other western lines started

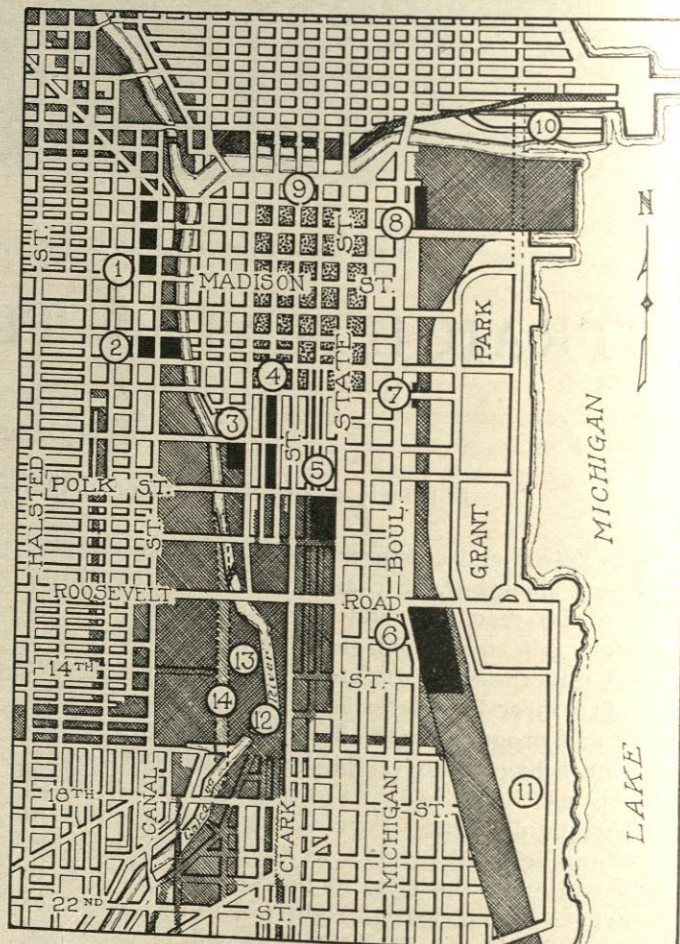


Fig. II—Central Section of Chicago, Showing Loop District Dotted; Areas Occupied by Railroads Cross-hatched; Steam Railway Passenger Stations Black.

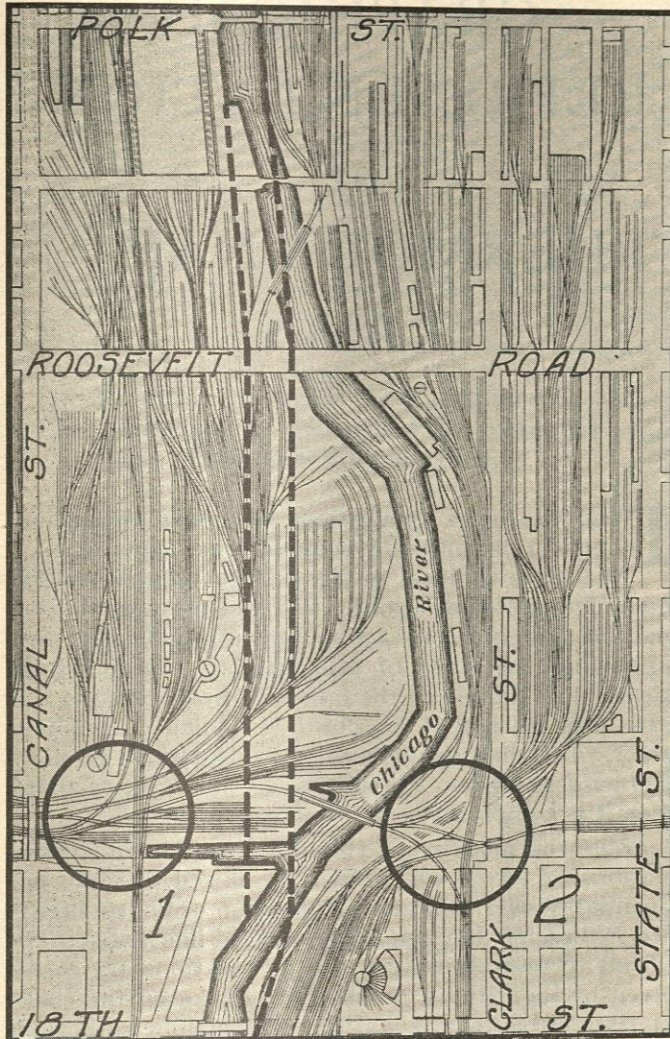


Fig. III—Track Map of South Side Terminal Area of Chicago.

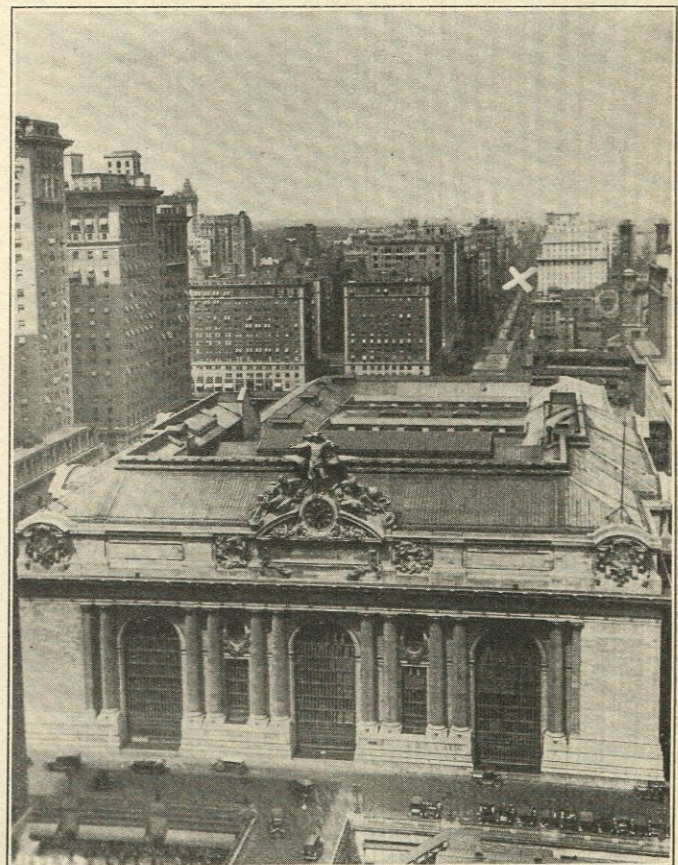
from this point. This area thus became the terminus of most of the larger systems, and Chicago remains today primarily a terminal, for no trains pass through the city. The business section naturally developed between the ship landings and the railroad depots. This, now the loop district, was subsequently surrounded by railroads, who acquired lands on the west and north sides of it and built on a trestle over the lake shore along the east side. The loop became the focal point of the country's transportation. Logically the national business institutions grew up at the same point. The value of land for business sites, some of which has sold at the rate of \$200 per square foot, has increased as much as 20,000 times its value at the beginning of the railroad era. Office space commonly rents for \$4 per square foot per year; so it can be seen that the rental on but a few floors falls short of paying the interest on the land investment alone. Property owners are therefore compelled to multiply the number of square feet of rental space on a given square foot of land by constructing high buildings.

The lands occupied by the railroads meanwhile have increased correspondingly—but no use is made of the space above the ground level. The railway corporations are not in the real estate business, and have made little attempt to utilize their metropolitan holdings any more intensively than necessity required.

Their accounts are organized for the transportation business, and of course do not show any losses due to inadequate utilization of high-priced real estate. Nevertheless, this neglected source of revenue constitutes an economic loss, and must be compensated by an equal amount of revenue derived from freight charges. This fact was brought forcibly to the attention of the Chicago Railway Terminal Commission during its exhaustive investigations beginning in 1914. Its 1915 report proposed to correct this by erecting multiple-story wholesale and warehouse structures over the larger portion of the yards, and by constructing office and hotel buildings on the preferred locations. The photograph of the Grand Central Terminal shows how an unsightly street in New York City was transformed by this kind of development.

Before the Chicago south side terminal area is rebuilt in this way, a disposition must be made of the passenger terminal question. A single station to accommodate as many as thirty different roads is not considered feasible on account of its necessary size; nor desirable where there is so little interchange directly between stations; nor expedient, because the Northwestern station (1), Fig. II, is only eighteen years old, and the Union Station (2) was finished in 1925. These two stations handle 423 through and 336 suburban trains per day for five railroads, and could not accommodate any more companies easily. The 1921 report of John F. Wallace recommended but one other station—at the site of the Central station (6)

(Continued on Page 64)



©Underwood and Underwood, N. Y.

Grand Central Terminal, New York. Showing Capitalization of Air Rights. As Far As Point X the Buildings Fronting On the Street Shown Have Been Constructed Above the Railway Approach Tracks.

GRAPHICAL REPRESENTATION *of* THERMODYNAMIC LAWS

S. L. SIMMERING, B.S. (M.E.), '10; M.E.; M.S.
Professor of Mechanical Engineering,
University of Colorado

THE numerous applications of simple thermodynamic relations and certain other equations of the state of ideal gases usually require considerable detailed calculations. For the most part these relations and equations can be shown graphically, thus minimizing the labor of calculation. The following discussion is limited to the method of constructing the chart, and the use of the chart in finding co-ordinate values. The chart can be used for calculating the work done by a gas when it expands, or the work required when it is compressed.

Many thermodynamic equations contain functional relations or terms which must be raised to some exponential power. When plotted on ordinary cross-sectional paper they appear as curved lines, which are difficult to plot accurately. Such equations are easily solved by logarithms, because they take on the characteristics of a linear equation. The simple isothermal relation $PV=C$ may be written as $\log P + \log V = \log C$. If one chooses $\log P$ and $\log V$ as the co-ordinates, the isothermals are lines sloping at an angle of 45° .

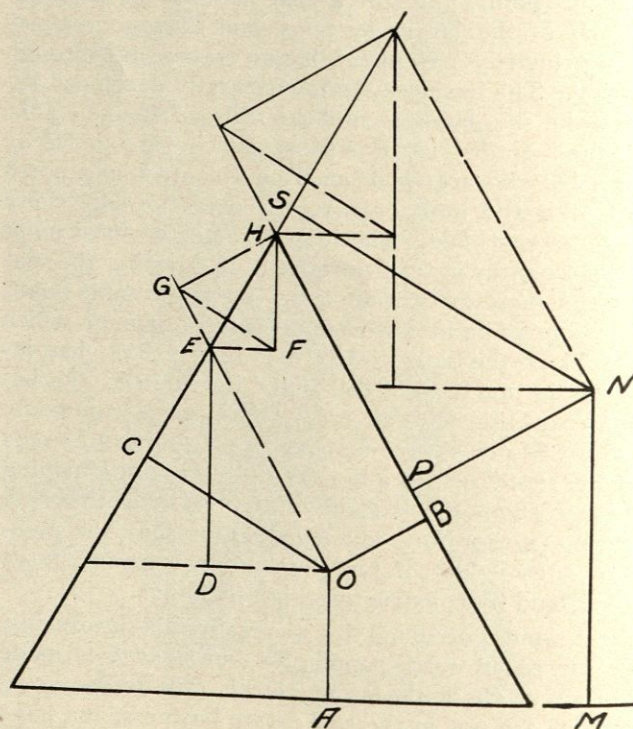
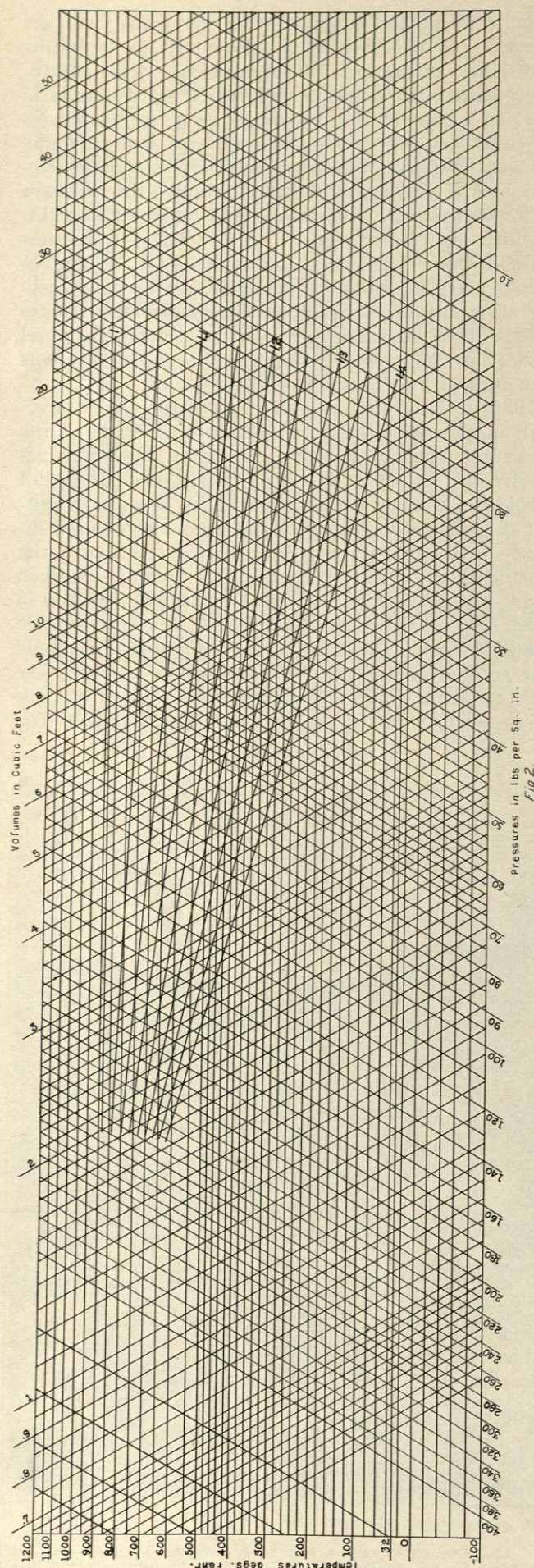


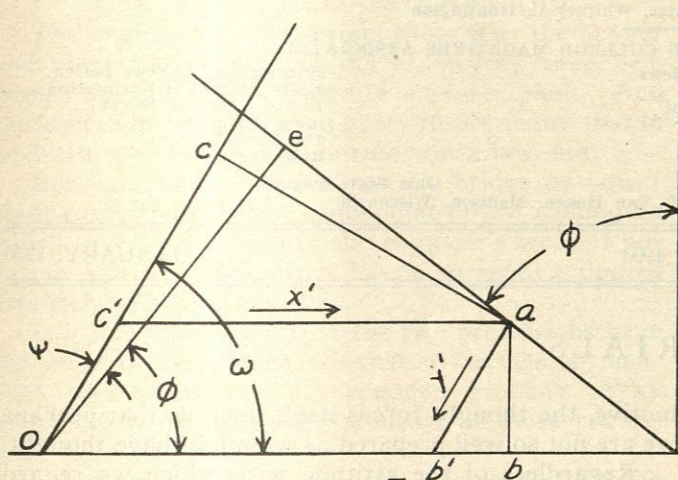
Fig 1.

The polytropic relation $PV^n=C$ may be written as $\log P+n \log V=\log C$. In this case the graphs formed will be a series of straight lines, the slope of each depending upon the value assigned to n . The values of n may vary from zero to infinity.

Consider again the characteristic equation of the ideal gas $PV=BT$, which is best represented by a surface whose three co-ordinates are P , V , and T . An isothermal, then, is represented by a plane that is perpendicular to the T axis; and the line of inter-section thus forms an hyperbola. By means of logarithms, this space diagram can be replaced by a linear diagram by writing the equation as

$$\log P + \log V - \log T = \log B \quad - \quad - \quad - \quad - \quad - \quad 1$$

In order to show this equation on a single plane, use is made of the well-known property of an equi-



lateral triangle; namely, that the perpendiculars from a point within the triangle upon the three sides must be equal to the height of the triangle. In figure 1 the line $CO=ED$; and the line $HG=HF=OB$; therefore, the lines $OA+OB+OC=OA+ED+HF$, which equals the height. In a similar manner the diagram shows that the lines $NS+NM-NP$ =the height of the triangle. When the point lies outside of the triangle as N, it is necessary to take into consideration the fact that the perpendicular NP drawn toward the inner side must be considered as negative.

The equation $\log P + \log V - \log T = \log B$ can be represented by triangular co-ordinates if $\log P$, $\log V$, and $-\log T$ are the perpendiculars of an equilateral triangle whose height is equal to $\log B$. From such a diagram one then can read values of P , V , or T , when V and T , P and T , or P and V are known.

The chart (figure 2) has been drawn for air, the characteristic gas constant of which is $B=53.34$. Since all gases have individual gas constants which differ in value from that of air, it is necessary to correct the observed values when the chart is applied to other gases. To do this the values of any two of the co-ordinates should be read directly; for example, the V and T . The corrected value of the third co-ordinate then is found by multiplying the observed value (in this case P) by the value of the gas constant under consideration and dividing the result by 53.34. Thus it becomes a simple matter to apply the chart to all known gases.

(Continued on Page 70)

KFAJ—University Radio Station Is to Be Rebuilt

Present plans for the entire reconstruction of the transmitter of the University of Colorado radio broadcasting station, KFAJ, and for the building of a new impedance-coupled speech amplifier for the studio, when carried out to completion, will place the station among the leading university stations of the United States. These plans, as well as those now being formulated for an extended broadcast program, will be put into effect in the immediate future.

The increased interest in the station and its improvements are, no doubt, stimulated by the coming of Wallace L. Cassell, B.S. (E.E.) '22, to the faculty as instructor in telephony and radio communication. Mr. Cassell, since his graduation from the University in 1922, has spent two years in radio research and design work with the General Electric Company. In 1924 he left this company to become partner in the Mutual Radio Corporation of Wellesley, Massachusetts.

It is an interesting fact to note that Mr. Cassell, who has charge of the present reconstruction, in 1920, together with Robert Owens, '23, now control operator at KOA, the General Electric Company's broadcasting station in Denver, built the small 10-watt set which was the fore-runner of KFAJ. This first set was located above the transformer laboratories in Engineering Building I and was operated as 9XAQ. Code work overshadowed telephony, the only broadcast programs being phonograph music. The range of this pioneer set was about 1,400 miles.

In 1922 the broadcasting station was licensed as KFAJ, while code was still sent under the letters of 9XAQ. Very little broadcasting was done during the school year of 1921 to 1922.

During the winter of 1922, Mr. Cassell having graduated, Robert Owens rebuilt the transmitter into one rated at 100-watts and moved the station to its present location.

The school year, 1922 to 1923, saw little done in the way of improvement, and the only broadcasting of interest was of the athletic events—football and basketball. Code work was the drawing card this year, and regular watches were maintained to relay code messages from coast to coast and from the border to the Gulf. The next year broadcasting of phonograph music and several programs from the photometry laboratory as a studio were undertaken, as well as the athletic events. Lines were run to Macky Auditorium. Monte Orsborn and John Beckley were operators this year.

The school year of 1924 to 1925 marked the beginning of a new era for KFAJ, as it did for radio broadcasting in general. A new microphone was secured, replacing a make-shift; a line was run from the stadium to the station; and a well-furnished studio in the new music building was obtained. During the winter quarter, the Extension Division of the University furnished the programs, which were well received throughout the country. —ALMON D. THOMAS.

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EDITORIALS

THE NEW YEAR

The new year, with all of the possibilities of every new year, is upon us. It is rather hard for us to realize that it is already here, for in its haste it has pushed ahead of it and out of the way the year which has just passed. Few of us are sorry that the new year is here and the old one passed. Only the old people are sorry, for they realize that time is rapidly slipping away and carrying them with it. But most of the young people are welcoming it, anxious to live it, and to have the experiences which it will bring.

The new year is the time of resolutions. It is very seldom that the well-meant resolutions are kept, but there is a good bit of value in the making of resolutions. The turning over of a new page, and the thoughts which the turning brings, serve as a balance to our fling, making possible the conception and forming of some of the more serious thoughts, thoughts which hold us all to our true selves, thoughts which bring visions.

The underclassmen welcome the new year. It means that they are approaching the time when they will cease to be exceedingly small quantities in the affairs of the University, but instead will become juniors and seniors with the privileges and honors attending their stations. On the other hand, the seniors are not so sure that they want to welcome the new year. Many are anxious to get out and into the world where big things are being done. But they all realize that they are about to change their whole lives; they are about to put to an end the only thing which they have done for all their lives. When the time actually comes which will put an end to preparation as a prime motive in life, and make accomplishment the prime

motive, the thought forces itself upon us that perhaps we are not so well prepared as we might have thought.

Regardless of the attitude with which we regard the new year, we cannot put off the fact that it is here. Someone will quote that time and tide waits for no man, and settle down into doldrums. A good number will go on advancing, improving themselves. The year is here. Are we going to fill it with joy, and work and love, and achievement?

"AGE AND YOUTH"

Those who have followed the affairs of E. C. M. A., and those who are concerned about engineering education, will be interested in the editorial which appeared in the October 29 issue of the Engineering News-Record. Speaking of the convention of E. C. M. A. at Ithaca, New York, the editor writes as follows:

"During last week an editor of the Engineering News-Record had occasion to attend two meetings. At one, a succession of practicing engineers, all at least twenty years out of college, asserted that engineering education is becoming mechanized, that the recent graduates are too technical and absorbed too greatly in the details of engineering minutiae, that they all stand in need of wider outlook and broader background. The other meeting was a group of the editors and business managers of a score of the magazines published by the undergraduates of engineering schools. Throughout a busy day's session these young men discussed the problems of their avocation. And from a long experience in attending technical meetings this editor can say that never has he heard more direct, confident, precise and clear speech than these same undergraduates used. What each had to say he said explicitly and stopped: repetition was rare, hesi-

tation was non-existent. Can as much be said of the average engineering meeting? Emphatically, no! And since the ability to think clearly and to express that thought succinctly is one of the best outward evidences of those qualities the engineers in the mature meeting found lacking in their younger brethren, the thought became inescapable that these gentlemen—who, indeed, were voicing a common enough thought among engineers—are attacking a straw man. Times are not what they used to be—and they never were. The world is going to the demnition bow-wows. If youth but knew, if age but could. The first sign of the down-slope of the years, gentlemen critics, is discontent with the rising generation. Criticize it if you want to, but don't deceive yourselves as to the real basis of your criticism."

THE SLIDE-RULE AND THE CANE

The engineer is often prone to scoff at the lawyer and point out that never did a lawyer's cane help design or construct a bridge or a power plant. And the lawyer in prolonged and gusty retort shows that in all history never did a slide-rule win a law suit.

Both are at fault. Seldom is a bridge or power plant completed without some point of law coming up which threatens to nullify the engineer's work if not wisely settled. And often has a surveyor's figures definitely settled a land suit.

Is it not plain, then, that the two professions have the same ultimate purpose—that of service to mankind—and often meet on common ground? Why should it not be so among students of those professions here at school?

Let not the friendly rivalry diminish, but let the good of the University be placed far ahead of that rivalry. Let one faction help the other in such a way as to benefit the institution as a whole.

Take cheering at Varsity games as an example. Some very clever and unique cheers could be devised to be participated in by the schools. Some contest between the two schools could be arranged to be held between halves. There are many more ways that co-operation between the two schools could keep the spirit on the campus at white heat.—A. D. T.

APPLES IS APPLES

Ellis Parker Butler, a noted writer, has verbosely informed the public that *Pigs is Pigs*; then such a notorious writer as ye scribe will certainly be granted the right to inform all persons who are interested that Apples is Apples. But when a few bushels of apples and about six hundred engineers are mixed the apples may become anything from appetite teasers to galloping dominoes.

The above mentioned apple-engineer combination was effected last Tuesday evening at the annual Apple Fest and apples certainly assumed roles that would have given Adam and Eve new worlds to conquer.

After the party had broken up and ye scribe had returned to his room it was decided by those in the room to take a vote upon what an apple should be called. After the balloting had been done and the votes counted, it was discovered that the result stood one to nothing that apples is apples.

—FRED P. GIBBS.

ABOUT CONTRIBUTIONS

The staff welcomes nothing quite so much as contributions from students and alumni that show intelligent effort toward interest and improvement of the magazine. It appreciates that nothing will make the magazine as interesting to the readers as articles written by people with whom the readers are personally acquainted. However, it cannot accept articles that are sent through the mails or slipped under the door of the office, and which do not bear the name of the author. In the first place, the authenticity of the article is not insured, since even the author does not care to guarantee it. Then, too, the articles of anonymous nature too often contain ideas which have not been clearly thought out, and which are of a highly radical nature.

Contributors may be sure that their identity will be revealed to the readers of THE COLORADO ENGINEER only by their initials if they, through modesty or some other instinct, do not care to have their identity generally known. The staff will not violate a confidence; but it would rather not have any confidences of that nature.

THE NEXT ISSUE

Following the custom that has long existed as part of the policy of the magazine, THE COLORADO ENGINEER is going to make the next issue the Alumni Directory. In the present issue, the Engineer is running a page or two of alumni notes. Many items of interest will be found therein concerning old friends and classmates. The next issue will concern the alumni almost entirely, and the last issue will also contain a page or two of interesting notes.

Of course it stands to reason that it will be impossible for the staff to obtain these news items without the co-operation of the alumni. In fact, it must be more than mere co-operation; it must rest almost entirely with the alumni themselves. After the several items have been collected, the staff will see that they are published.

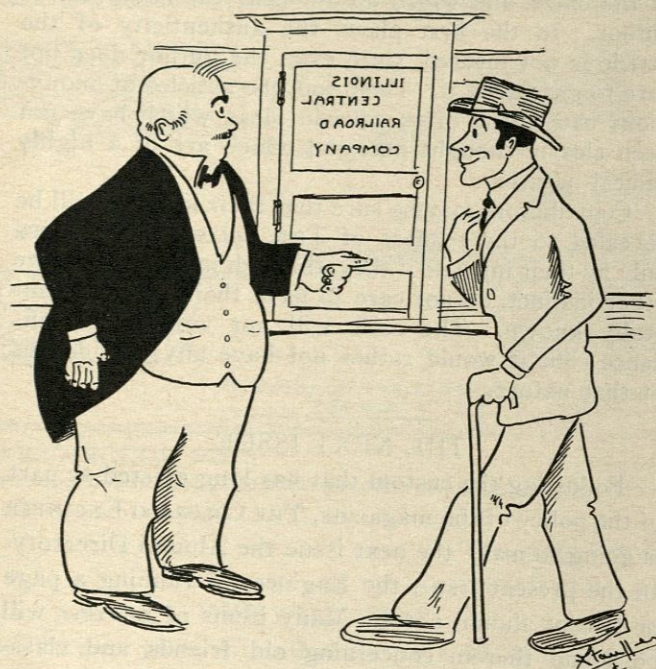
In fulfilling the purpose which it has set for itself, THE COLORADO ENGINEER has given itself a big job. It is a pretty hard matter to find and to publish articles and news that is interesting to all of the subscribers, ranging as they do from the awkward freshman who does not know what it is all about, to the man who is thirty years an alumni, does know what it is all about, and does not want to hear any more about it. To please all of the readers all of the time is, of course, an impossibility. For that reason, the staff does not attempt to publish articles all of which are interesting to everyone. If they can have the majority of the articles wholly interesting, they will feel that a great deal has been accomplished. Those of us who are here in school yet can usually supply the news which is interesting to the under-grads. But the responsibility of deciding what is interesting to the alumni, and that of obtaining it, rests with the alumni themselves.

JOYS AND SORROWS OF THE JOB

Experiences of the First Two Years Out of College

HAROLD W. RICHARDSON, B.S. (C.E.), '23

Illustrated by Ted C. Stauffer



"I can't let you hang around this town without a job."

THE first two years out of college! To the undergraduate those years are in the hazy future, vaguely connected with the first job and the practical application of knowledge. To the recent graduate, the first two years are a dizzy whirl, amid a desperate attempt to find out what it's all about. To the older grads, those early days lie in smiling recollections of mastering seemingly unsurmountable problems which later faded into insignificance.

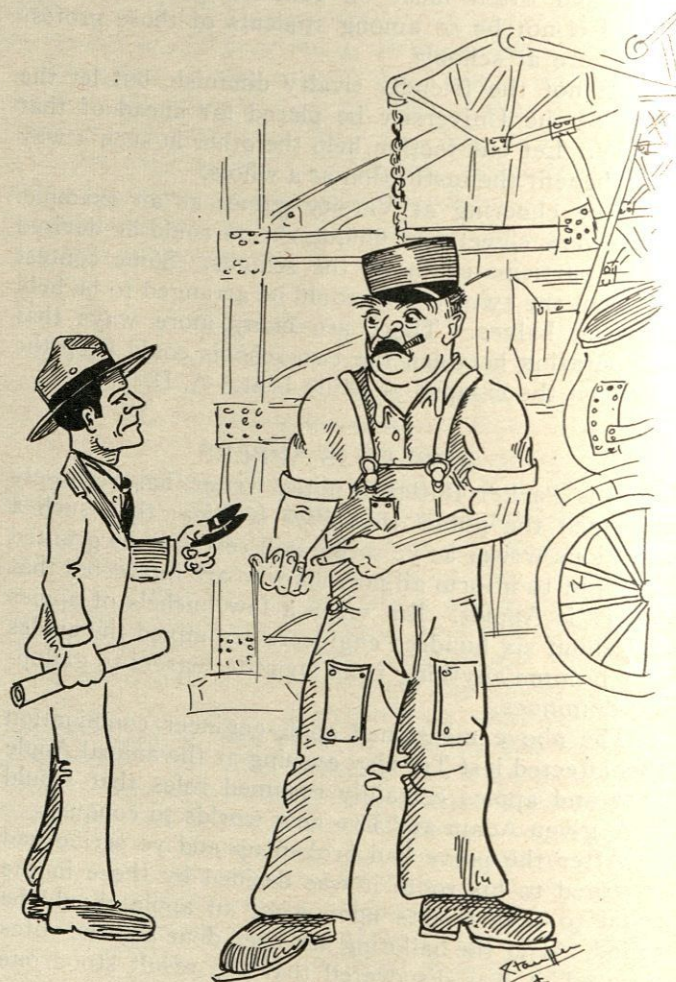
The editor asked for a few ups and downs of those first two years in my experience, just now passed. Therefore these remarks will be more or less personal, and, by their very nature, confined to construction work.

My first and present job was landed after a heart-breaking, ten-day search in the city of Chicago during torrid June days. I soon found that a newly graduated engineer was in no danger of being smothered with offers of jobs. But from the moment my present boss hired me because "I can't let you hang around this town without a job," to this very afternoon when I escaped from the wrath of two trainmasters for blocking the yards with sand and gravel, there has never been a dull moment.

The first blow a fellow gets after leaving the sheltering protection of the campus is the staggering realization of how little he really knows, and how much there is yet to learn. From then on the blows come

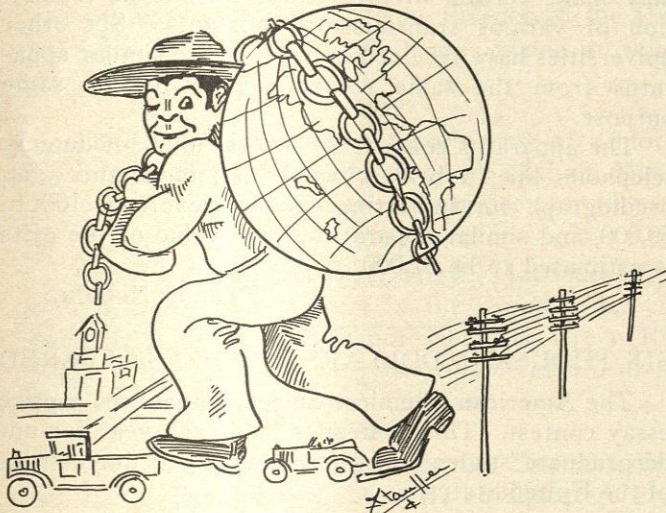
thick and fast; some mere biffs, others near-knock-outs. Once in a while a soft brick and even a rare bouquet falls in the showers of granite blocks.

My very first day on the job was spent delving into a dizzy array of costs, quantities, material records, and more costs. I'll admit that I didn't know much about what I was trying to do. I was assigned to a field office at Homewood, Ill., on a large job involving about twenty-five subways, bridges, and railroad grade separations on the Illinois Central Railroad, strung out for fifteen miles along the right-of-way. This was part of the I. C.'s tremendous program of elevating and electrifying the Chicago terminal district, and the construction of the world's largest and most modern freight yards. Part of my job was to get materials to every subway and bridge, unload it, and get the cars released. My predecessor, sorry to say, had badly bungled up the job, till the trainmen were wild from switching and reswitching cars. One



The soothing action of a handful of cigars—

car of steel was sent up and down the line several times, and when I came on the job it was still far away from where it was needed. So I trotted out innocently to the yardmaster's office with a request for another switch on the car. Now yardmasters are a pretty good bunch of fellows, I have since learned, but when they have an engine "on the ground, all eight wheels," the whole yard blocked, a few manifest trains trying to get through—that is a mighty poor



"If I wanted the world moved without disturbing traffic, I would get an engineer to do it."

time to ask one of them to move a car back to a spot where he had already placed twice and moved. Wow! I'm still looking in Webster's for several of the terms one "Highball" Davis used on that occasion. Professor Birk might well install a course on "Courtesy to and from Yardmasters."

However, the soothing action of a handful of cigars made a friend out of Highball; and since then, occasional applications of cigars have help move many, many cars of material. Of course, as we must work under traffic at all times, we are always in the way and always a bother; yet we manage to get along with the operating department and get our work done. The Illinois Central runs about eighty passenger trains, including suburbans, and innumerable freights over this end of the terminal every twenty-four hours.

Several times this material job has been turned over to some one else, but through resignations and transfers, the job has always come back to me. Handling materials sounds innocent enough, but much is the grief that arises therefrom. The materials for half a dozen spasmodic mixers must be kept rolling all the time. The roar that arises from a job shut down for lack of material is rivalled only by that coming from the yards cluttered up with a string of badly needed coal cars loaded with sand and gravel.

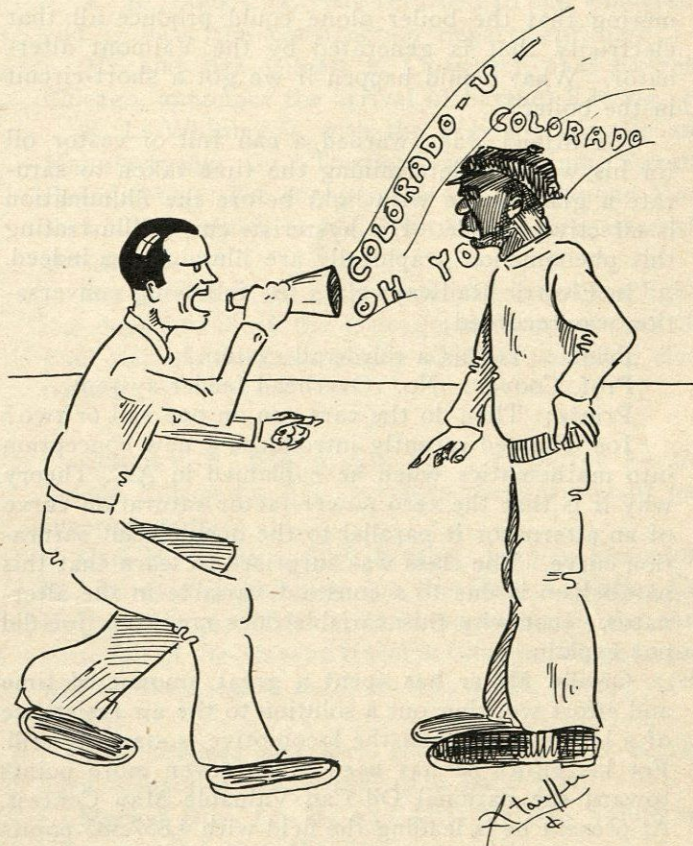
One of the solar plexus blows I have received came about in this manner: We were working on an abandoned track next to a "hot" passenger track on the I. C. temporary bridge over the Grand Trunk tracks. The mixer was set on a platform built between the two tracks, with the string of material cars directly behind the mixer on this abandoned track. I gave the

night switch crew instructions to pull out a car several hundred feet beyond the bridge as they set in fresh cars of sand and gravel for the next day's run. The switch list went in at 3:00 p. m. About 5:00 p. m. the foreman got the idea he could arrange his chutes to better advantage by placing the mixer, a 7S gas portable, directly on the old track. So I phoned the switch crew to place the setting a car length back of the usual spot, and then I forgot about it. The concrete crew was on the job bright and early the next morning—only to find the neatest lot of junk piled up in the cofferdam that you ever saw. A thousand dollars worth of mixer was reduced to a few cents worth of scrap. I had forgotten all about the car ordered pulled beyond the bridge, and the crew had backed down the track with a string of cars, with no one on the rear end, expecting a clear track. I hope I'm in Russia or Timbuctoo when final settlement is made on the damage done.

Another one of my pet worries is the reinforcing. Every piece is ordered cut to length, and bent where needed. But invariably the reinforcing gang gets the sizes and lengths mixed when they come to place the steel. If they can't find 10-foot bars they will use 10½-foot bars. That's a good idea until they need some of the longer bars. The inspectors never say a word if the bars are too long and can still be used, but try to use a bunch of short bars—. Then the "boes" use those nice new rods for crowbars, carrying hooks, boiler irons, etc., in spite of my threats of murder or worse.

The engineer who has had no experience in construction work cannot comprehend the amount of

(Continued on Page 72)



Shouting for one's college—is mighty poor policy on the job.

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 Society of Oil Cans has been very successful in the past two months in acquiring a new and original-thinking membership.

Tuttle was anointed with used cylinder oil for his recent work in surveying. While classes were dismissing in adjacent buildings, Tuttle was heard to bellow across the campus commanding Webber to get his pants back of the rod so that it might be better seen. The extreme visibility of pants of various kinds is, of course, well known, but Tuttle was the first to make practical use of the fact. Why not try purple ones, Tuttle?

The classes in yelling and surveying have been so productive of oil can material that we can mention only a few. Perhaps the most noteworthy are Bole and Brannon who were running a dumpy level. They hit upon the bright idea of turning the level rod upside down to avoid the necessity of having to stand on their heads to take the rod reading through the dumpy. It is such simple little ideas as this that yield their originators fortune and fame.

W. D. Stapp, a junior mechanical, ought to be well oiled up for his recent attempts to convince Prof. Simmering that the boiler alone could produce all that electricity that is generated by the Valmont alternator. What would happen if we got a short-circuit in the boiler?

Joe Minici was awarded a can full of castor oil for his work in determining the time taken to saturate a glass shade with light before the illumination is effective outside. His hysteresis curves illustrating this phenomenon graphically are illuminating indeed.

In Electric Railways class the following conversation was recorded:

Printz: Is this a third-rail system?

Prof. Coover: No. Overhead feeder system.

Printz: Then do the cars run on one rail or two?

Joe Olmsted recently introduced a new conception into mathematics when he explained in A.C. Theory why it is that the zero power-factor saturation curve of an alternator is parallel to the open circuit saturation curve. The class was surprised to learn that this parallelism is due to a constant variable in the alternator. Just why this variable does not vary, Joe did not explain.

Orville Miller has spent a great amount of time and effort working out a solution to the air resistance of a locomotive when the locomotive is standing still. For his effort he has been given seven more points toward the national Oil Can Valuable Man Contest. At present he is leading the field with 4,857,385 points to his nearest opponent's 21.

THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY DONATES A COMPLETE TELEPHONE EXCHANGE TO THE UNIVERSITY OF COLORADO

A complete telephone exchange has been donated to the electrical department of the University of Colorado by the American Telephone and Telegraph Company. The apparatus was received November 19, 1925.

The reason for the donation is that the University may make certain investigations for the determination of various transmission constants. Six other universities have received or will receive similar apparatus from the same company and for the same purpose.

The apparatus consists of several miles of dummy telephone line, a bridge, amplifiers, inductances, an oscillograph for indicating frequencies from 100 to 50,000, and similar apparatus. The value of the gifts is estimated to be \$7,000.

—PAUL E. NELSON.

SIX THOUSAND DOLLARS IN PRIZES OFFERED

The American Chemical Society announces a prize essay contest. This contest is held each year for undergraduate students of the colleges and universities of the United States.

These prizes are made possible by the generosity of Mr. and Mrs. Francis P. Gowan. Six prizes will be awarded for the best essays on one of the following subjects: The Relation of Chemistry to the Enrichment of Life; The Relation of Chemistry to National Defense; The Relation of Chemistry to the Home; or The Relation of Chemistry to the Development of an Industry or a Resource of the United States.

Essays must be the original work of the contestants, and only persons who have satisfied college entrance requirements, who are enrolled in such an institution, and who are continuing work of a collegiate grade are eligible to enter this contest.

Rules governing the contest are as follows:

1. A contestant may submit only one essay.
2. Essays must not exceed 5,000 words. Any exceeding 5,000 words will not be considered by the judges of the contest.

—CARL BORGMANN.

A. S. M. E.

The Colorado Agricultural College A. S. M. E. has challenged the University of Colorado A. S. M. E. to a debate. That the Agricultural A. S. M. E. is not the only active branch was shown when our local chapter accepted this debate. It is to be held in Denver before the Colorado A. S. M. E. next spring. The subject is "Should the A. S. M. E. Boiler Code Be Made a State Law?" The Boulder A. S. M. E. will probably give a preliminary debate at one of the regular branch meetings next quarter.

The A. S. M. E. is very much alive this year. It has held four meetings with outside speakers and one with student speakers. There has been a good representative number in attendance at meetings and at the picture taken for the *Coloradoan* at the Snow studio.

—LUCILE KAUFMAN.

ALUMNEWS

'99

S. E. Holland, C. E., recently visited his family which is living in Boulder. Mr. Holland is now division engineer with the Wheeling division of the Pennsylvania Railroad. His offices are located at Wheeling, West Virginia.

'05

The light and power department of Colorado Springs is now under the direction of Earl Mosley. He was formerly assistant city engineer for that city.

'08

Because of the fact that Harry J. Jacobucci, C. E., owned controlling interest in the Green River company, it is interesting to note that the Green River Light and Power Company has completed a deal with the Utah Light and Power Company.

'09

The second vice-president of the Simmons-Wiles Motor Co. is John D. Lobb. His headquarters are in Kansas City, Missouri.

'10

George L. Sullivan, M. E., is president of the Chamber of Commerce of Santa Ana, Calif.

'11

A. A. Kelly, M. E., planning engineer of the Western Electric Company, has been transferred from Western Springs, Illinois, to the plant at Kearney, New Jersey.

We were grieved to hear of the death in Florida this summer of C. C. Mathis. He was buried in Council Bluffs, Iowa.

'13

The Peerless Radio Corporation of Wellesley, Mass., has W. E. Watrous, E.E., for production manager and treasurer.

Claud Arnett Armor, E. E., is at present Railway Service Engineer for the Western Electric Manufacturing Company.

'15

Frank H. Prouty, C. E., formerly assistant superintendent of steam power for the Cambria Steel Company of Johnstown, Pa., is now a partner in the firm of Prouty Brothers Engineering Co., in Denver, Colorado.

'16

The radio store of James A. Hedges, E. E., in Jackson, Michigan, is very much a growing institution.

Roy Roberts, C. E., has just returned to Shanghai, China, where he is employed as assistant engineer for the Shanghai Municipal Court. His visit here has been a very pleasant one, and we hope to see him again soon.



During the summer, Samuel J. Blythe, E. E., visited Boulder and renewed old acquaintances. He is now living in Atchison, Kansas.

'17

The Florida Public Service Co., of Orlando, announces that Norman H. Coit, E. E., is now general manager of the company.



'18

Joe Elzi and wife announce the birth of a baby girl. Mr. Elzi was formerly instructor at the University.

'19

M. F. Skinker, E. E., who received a Rhodes scholarship to Oxford University from 1921 to 1924, has been appointed assistant research engineer for the Brooklyn Edison Co.

L. B. Johnson, E. E., and Mrs. Johnson, formerly Marguerite Lang, announce the birth of a baby daughter, Marguerite Ann, who was born May 20. Mr. Johnson is now working for the General Electric Company and is located at Salt Lake City.

'20

R. W. Lind, C. E., has returned to the University and is with the construction department here.

Mr. and Mrs. Gilbert E. Carpenter, 5523 Everett, Chicago, announce the arrival of Samuel Edwing, Jr.

R. L. Whitney is with the Western Electric and Manufacturing Co., Thirtieth and Walnut Streets, Philadelphia. The engagement of Miss Pauline Martin of Philadelphia to Mr. Whitney has been recently announced.

Lee J. Murry, E. E., is employed in the car lighting department of the Chicago, Milwaukee and St. Paul Railway in the capacity of chief traveling electrician.

'21

Clarence A. Bahret, Ch. E., is employed by the Toledo Edison Co. He occupies the position of gas superintendent.

Carl H. Johnson, 1810 Wesley Avenue, Evanston, Ill., is revision engineer for the Geo. A. Fuller Co. He has charge of all revisions made during the construction of the Stevens Hotel in Chicago. The Stevens will be the largest hotel in the world, having 3,000 rooms.

Tom Mellors and Mrs. Mellors, nee Nan Blackburn, announce the arrival of a baby girl.

Marion Dice, Ch. E., and Miss Bernita Vanderlas were married recently.

'23

Jack Withers is working harder than ever for the American Bridge Company at Gary. The reason is known as Harriet Elizabeth and arrived July 26.

Robert H. Owen is now employed by the General Electric Co. at K. O. A. in Denver.

Charles W. Keller, E. E., employed by the General Electric Co., has been transferred from the Schenectady plant to the Denver office.

Harold Richardson was married this summer in Boulder to Miss Marguerite Forrest of Eckert, Colo. The two left immediately for Harvey, Ill., where Harold is employed by the Bates-Rogers Construction Company.

Paul Kirkpatrick, E. E., and Miss Helena Beeson, formerly of Pittsburgh, were married this summer. Their place of residence is Wilksburg, Pennsylvania.

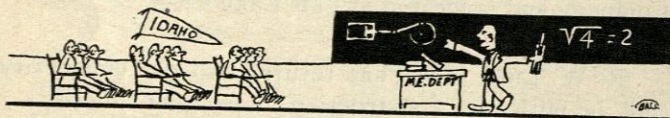
Russel C. Putnam, E. E., who was formerly employed at the Schenectady plant of the General Electric Company, is now teaching in the Department of Electrical Engineering at Case School of Applied Science, Cleveland, Ohio.

Otto Arnold, Glen Dewey, and J. I. Kaspery were recent visitors to the campus.

In the motoring world we hear of Raymond Eddy who is now employed by the Chrysler Motor Company of Detroit, Michigan.

'24

Neal Bailey is teaching in the M. E. Department of the University of Idaho, Moscow, Idaho.



Alva H. Meyer, M. E., and his wife, Helen Bush Meyer, visited recently with Professor DuVall.

'25

Earl Loser, C. E., is studying in the Doherty Training School, which is connected with the Public Service Co. of Colorado.

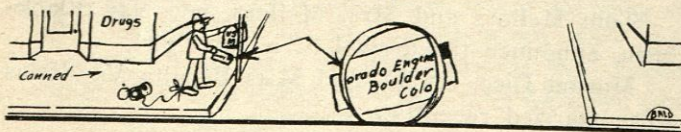
George Blackstone, M. E., and Eunice Millington were married early last summer. Mr. Blackstone is now working for the Public Service Company at Denver.

Lucius H. Shattuck, C. E., formerly with the Mutual Oil Company at Glen Rock, Wyoming, may now be reached at Artesian, New Mexico.

Ted Tingling, C. E., is connected with the Illinois Central R. R. with headquarters at Chicago.

The New Mexico Military Institute informs us that Phineas Ingalls, M. E., is on their staff. He is instructor of physics for this school.

Many of the recent graduates change positions often. It is difficult to keep in touch with them. Miss Black of the Engineering Library is anxious to hear of any change of address or position.



This is the way the scoreboard at the new stadium looked on Homecoming Day at the end of the game with Colorado college. All those figures looked good to the old grads who were back. Incidentally, they liked the scoreboard. You will, too; especially when it's decorated with the kind of figures that we expect to have there next year.

A huge wood structure ten feet high and twenty feet long, this scoreboard stands at the north end of the field where it is visible to every one in the stadium. On it are places for the score of each team, the time left in the quarter, the number of the quarter, the team that has the ball, the down, the number of yards to go, and the penalty.

Three men are required for its operation. One handles the scores and the time; another watches and records the downs; and a third takes care of the yards to go and of the penalty. The information is relayed to these men from the sidelines by means of large cardboard placards.

The slot system is used in the operation of the board, the operator simply pushing the number or letter into the proper opening. The letter openings are fifteen inches square, and the clock is three feet in diameter.

Early in July Professor and Mrs. M. S. Coover entertained a group of recent alumni at their home in Schenectady, where they spent the summer while Professor Coover, of our Electrical Engineering department, was employed by the General Electric Company.

The guest list included Charles V. Schelke, '24; George R. Best, '25; Mr. and Mrs. Lyman E. Holt, '25; Henry M. Richardson, '25; Mrs. Henry M. Richardson, (Mary Larrick) '24; George Lenning, '24; Mrs. George Lenning, (Mildred Wade) ex-'25; Donald L. Porter, '24; Mrs. Donald L. Porter, (Alicia Farrow) ex-'27; Mr. and Mrs. Ralph P. Paden, '24; Neil P. Bailey, '24; Mrs. Neil P. Bailey, (Margaret Hunsicker) '23; Mr. and Mrs. B. O. Buckland, '23; Mr. and Mrs. G. H. Dewey, '23; J. L. Tooker, '23; O. B. Arnold, '23; C. W. Keller, '23; Marcellus S. Merrill, '23; L. F. Kielsmeier, '25; L. A. Connelly, '24; Mrs. L. A. Connelly, (Mary Casey) '23; and Professor W. O. Birk.



Officers and Delegates Attending the Fifth Annual Convention of Engineering College Magazines Associated at Cornell University, October 23 and 24, 1925.

E.C.M.A. HOLDS CONVENTION AT CORNELL

Late in October at Ithaca, New York, the Cornell Civil Engineer and the Sibley Journal of Engineering were joint hosts to the largest convention in the short history of Engineering College Magazines, Associated. Every member-magazine in the organization was represented by at least one delegate, while some of them were represented by their entire staffs. Throughout the sessions the various ideas of the magazines in widely different sections of the country were brought together and co-ordinated with the view toward making all of the magazines masterpieces of artistic technical journalism.

E.C.M.A. is composed of twenty-one magazines in the leading technical schools of the country. The main purpose for the organization of these engineering college magazines into the association is for the assurance of national advertising. Incidentally, definite standards of style and makeup are set by the organization.

National advertising is obtained through the medium of Roy Barnhill, Inc., a national advertising agency. This company sells to the advertisers an advertising policy, covering a period of time, rather than advertising covering one or two issues. This insures both the advertisers and the magazine,—the one that his copy will be presented according to contract for a long period ahead, and the other that national advertising will be secured for him consistently, thereby making possible the financing of the publication.

At the convention such matters were discussed as Staff Problems, National and Local Advertising, Style and Illustration of Magazines. Many other subjects of importance to the delegates were discussed. The various ideas of the delegates were brought forward and attempts made to co-ordinate them for the good of the magazines.

A style book of the organization has recently been revised and published. This book sets forth the standards of practice, the advertising regulations, history of the association, a section regarding new magazines, the principles of technical make-up, advertising standards, and group statistics for the preceding year. All of the member-magazines are required to follow closely the rules as set forth in the handbook.

Professor Leslie Van Hagan, of the University of Wisconsin, is Chairman of the Association; Willard V. Merrihue, of the Publicity Department of the General Electric Company, is Eastern Vice-Chairman; and Professor W. Otto Birk, faculty adviser of THE COLORADO ENGINEER, is the Western Vice-Chairman.

The following is the program of the two days of convention:

FRIDAY MORNING

- 8:00—Registration—Convention Headquarters.
- 9:00—Call to order and roll call—Chairman Van Hagan.

- 9:10—Chairman's Report—Professor L. H. Van Hagan.
 9:30—Report of Roy Barnhill, Inc.—W. B. Littell.
 10:00—Advertising Problems—Discussion led by Knox B. Howe, Business Manager of The Michigan Technic.
 Mr. Merrihue Presiding
 11:00—Circulation Problems—Discussion led by Bert B. Kern, Business Manager of the Penn State Engineer.
 12:00—Recess for convention photograph and luncheon.

FRIDAY AFTERNOON

Mr. Merrihue Presiding

- 1:30—Call to order—Announcement of committees.
 1:40—Staff Problems—Discussion led by Charles M. Nelson, Editor of The Armour Engineer.
 2:40—How to Get Material—Discussion led by Norman E. Sanders, Managing Editor of The Cornell Civil Engineer.
 Professor Birk Presiding
 3:40—Illustrating a Magazine—Discussion led by The Kansas Engineer.
 The Fundamentals of Magazine Illustration—Professor Bristow Adams, Editor of Publications in the College of Agriculture, Cornell University.
 5:00—Recess.

FRIDAY EVENING

- 6:45—Convention Banquet—Prudence Risley Hall. Delegates will be the guests of The Cornell Civil Engineer and the Sibley Journal of Engineering.
 Mr. Frank C. Wight, Editor of The Engineering News-Record, will give the principal address of the evening.

SATURDAY MORNING

Professor Birk Presiding

- 8:30—Call to order.
 Style for Magazines—Discussion led by Wilbur O. Richards, Editor of THE COLORADO ENGINEER.
 9:30—Policy for Magazines—Discussion led by Paul B. Nelson, Managing Editor of the Minnesota Techno-Log.
 Professor Van Hagan Presiding
 10:30—Reports of committees.
 11:00—Business Session.
 12:00—Adjournment.

Frank Stubbs is now with the I. C. R. R. in Chicago and may be reached at 1473 E. 20 Street.

F. X. Rettenmeyer, E. E., is now employed by the F. A. D. Andrea Corporation, manufacturers of radio and radio equipment.

Albert Barth, E. E., and Miss Thelma Wedding were married last summer. Mr. and Mrs. Barth are also living in Wilksburg.

STRAIGHTENING THE CHICAGO RIVER

(Continued from Page 53)

—for all the remaining railroads. The present old station there takes care of 115 through and 406 suburban trains per day for four railroads—the same suburban trains stopping at the Van Buren station (7) and the Randolph station (8). The Grand Central station (3), the La Salle station (4), and the Dearborn station (5), together handle 273 through and 154 suburban trains for fourteen railroads. A new station will be built during the next two years at the site of the Central station (6) for as many railroads as will use it. However, the plans do not provide for a loop terminal, which has been found in other cities to have many operating advantages and 25 per cent more capacity than the stub type. Then, too, the La Salle station (4) is only 22 years old and in good condition for numerous more years of use—but it could be converted into a purely suburban station. At any rate, whatever their reasons, the owners of the La Salle station are reluctant to enter the Central station, and contemplate building one of their own. The Grand Central station (3), which is 35 years old, and the Dearborn station (5), which is 40 years old, are both obsolete, owing to inadequate track capacities and insufficient conveniences for patrons, which are likely to injure business. Many of the railroads using these two last-mentioned stations are tenants, and will probably move to where the most favorable terms can be secured.

Should a large new station be built some time in the future at the La Salle site (4), the river would have to be straightened in order to provide sufficient space for first-class station approach tracks west of Clark Street. In the alternative case, if the users of stations (3), (4), and (5), go into the Central station (6) and use the areas west of State street for freight purposes, it is not likely the holders of their securities will permit the continued non-use of the valuable air rights. In constructing buildings over the tracks, the excessive costs of skew girders and poor locations of column footings can only be avoided by realigning the tracks onto true north and south positions. This adjustment of tracks and the best design of buildings will also require straightening the river at the point (12), Fig. II.

The erection of buildings over the tracks confronts the rail executives with the subject of electrification, regarding which there is much bitter feeling. Generally, it is not economically justifiable to electrify a steam railway line until the quantity of traffic exceeds the capacity of the existing number of tracks. Railway traffic normally increases three to four per cent per year, so that by the time multiple-story buildings are under way, this question may have solved itself. To the railroads outside the Central station this problem does not appear very pressing, and they have been inclined to a policy of watchful waiting. The city is anxious to relieve its street traffic congestion, but the powers of any municipality are very limited in directly forcing a construction program upon a carrier. Largely due to the advisory services of the consulting railway engineers for the city, considerable progress has been made.

The Union Station ordinance of 1914—a contract

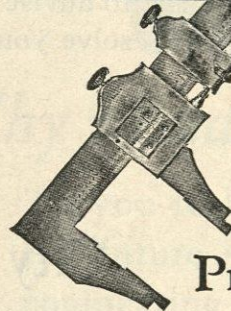
ordinance, such as are used almost invariably hereabouts—which was accepted by the Pennsylvania, the Burlington, and the Milwaukee lines, contains a provision agreeing to river straightening and arbitration; the 1915 ordinance for a yard of the B. & O. contains a similar provision; the Lake Front ordinance of 1919, accepted by the Illinois Central lines, cleared up further obstacles; the permit for the St. Charles Air Line Railway bridge provided for moving that structure without costs to the city; an act has been passed by the state legislature relinquishing its rights in the old channel in return for similar rights in the new one.

During the past six months a committee of prominent and very able citizens, assisted by the engineers of the City Plan Commission, the Railway Terminal Committee, and the railroads, has reconciled the different estimates of cost and provided a basis of agreement. A careful valuation developed that the land required for the new channel will cost \$3,450,000, whereas the land recovered from the old channel will be worth \$6,341,000; and the parcel transferred from the west side to the east side of the river will appreciate in value \$1,560,300. So, purely as a real estate deal, without considering the enormous benefits to nearby property, the owners could contribute the difference of \$4,451,000 toward river straightening.

In addition to the main items, totaling \$5,400,000, the railroad engineers contend that \$1,097,470 should be included for separation of grades at point 1, Fig. III. The reduction in distance from this crossing to the bridge introduces an unacceptable grade in the eastbound track. At point 2 as well, the intricate crossings must be eliminated sometimes; because it is now possible for a long freight train, traveling westward, in case of derailment while on both crossings, to block the approaches to stations 2, 3, 4, and 6. After the river is moved, the shapes of the lands are too chopped up for track designs; so a number of land trades must also be effected. The allocation made by the citizens committee is generally acceptable to all concerned. Negotiations are now being conducted to adopt officially the agreements outlined and to proceed along the course suggested by this committee.

There is no nearby storage space, and to avoid blocking the river, the dirt removed will be wasted in the lake to create new land. Material secured southwest of the city will be deposited in the old channel by bottom-dump barges to a height of -10 and rehandled by suction dredges to the desired height. A considerable portion of the cost could be saved by temporarily closing the river. There has been some bitter expression of opinion regarding the value to the community of waterway shipping. Other than iron ore for the steel mills on the lake, the total tonnage carried into the Chicago district by ships is very small compared with the 1,500 trainloads of railroad freight that enter daily. The peak load, in 1888, of water traffic between the Great Lakes and the Mississippi River, could have been handled by three freight trains daily. Nevertheless, waterway shipping appeals to the

(Continued on Page 67)



Re-making the World with Precision Tools

IT is difficult to comprehend the tremendous changes made possible in the world by the introduction of practical precision tools. The astounding mechanical progress of the past 50 years, which has completely changed man's environment, would have been impossible without them. They place within reach of all the standards without which working methods in the metal trades would be primitive.

The vernier as a mechanical principle of indicating very small dimensions was invented by Pierre Vernier in 1631. The first practical application of the principle to a measuring tool for metalworkers was not made, however, until 1851, when Jos. R. Brown invented the Vernier Caliper.

The manufacture of this highly useful tool by the Brown & Sharpe Mfg. Co., dated from that year. Today, hundreds of styles and sizes of tools embodying the vernier, and measuring to one thousandth of an inch, are made by this company and distributed all over the world.



The first and original Vernier Caliper, so far as is known, invented in 1851 by Jos. R. Brown, the founder of the Brown & Sharpe Mfg. Co.

BROWN & SHARPE MFG. CO.
PROVIDENCE, R. I., U. S. A.

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For Comfort

Open the hot water faucet and out comes plenty of hot water, the kind that's hot. You should have your house or shop equipped to always give hot water. In order to assure you of this comfort we have specialists to advise and design for you. Call on us to help you solve your hot water or heating problem.

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YOU ARE WELCOME HERE
Special Orchestral Music

BRING YOUR FRIENDS
Always a Good Show

STRAIGHTENING THE CHICAGO RIVER

(Continued from Page 65)

popular imagination and has considerable potential value. Its faults lie in lack of proper terminals, its poverty of traffic alliances, and unwise legislation whereby its natural feeders—the railroads—are entirely divorced from it. The report of Griffenhagen and Associates recommends fixed bridges over the Chicago River to eliminate the million dollar per year cost of operating the movable ones. But some time may elapse before large ships can be thus excluded from the river. The immediate improvement of the Calumet Sag Channel (Fig. 1), as is proposed, would provide a detour whereby closing of the river to ships might be permitted during the period of construction.

A 100-foot temporary draw span will be used at the side of the St. Charles Air Line Railway bascule bridge (12) while it is being moved. The railroad bridge just north of Roosevelt road will be junked, and trains now using it will cross the river at the St. Charles Air Line Railway bridge. The number and locations of additional streets have not been determined. As in the preliminary stages of most engineering projects, the date of beginning construction is indefinite.

UNIVERSITY HOSPITAL CONNECTED WITH CENTRAL HEATING PLANT

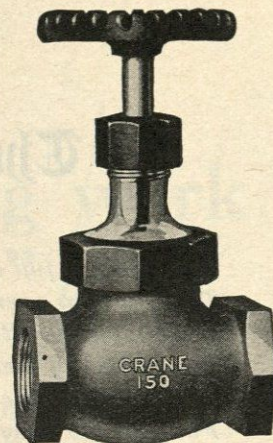
By means of a newly completed steam-pipe tunnel, the University hospital has been connected to the heating plant of the University. This tunnel runs from the hospital to the gymnasium, where it joins the previously existing tunnel which supplies heat to the gymnasium. It is built of concrete, and is tar-covered to keep out moisture. Through it runs a 3-in. steam pipe which furnishes heat to the hospital, a 2-in. condensation return pipe, and, in addition, the electric wiring for the hospital. The steam pipe is insulated with air-cell pipe covering. Putting the wiring in the tunnel does away with unsightly poles.

The tunnel, constructed at an approximate cost of seven thousand dollars, will eliminate the necessity of operating a separate heating plant for the hospital, and thereby will be a great saving to the University.

—T. P. NEWCOMB.

William LeRoy Reynolds, C. E. 1909, died April 16, 1925, at his home in Denver. He was born at McArthur Junction, Ohio, April 26, 1886, and came to Colorado with his father at the age of eleven. Mr. Reynolds for many years was employed by the state of Virginia where he supervised the construction of dams and water power projects. During the world war he was called into service at the construction of the government munitions plant at Nito, West Virginia, and later was chairman of the salvage board appointed for the selling of the plant at the close of the war. His health broke down at the time, and he was forced to return to his home in Denver. Surviving him are his wife, Luellen Reynolds, a daughter, Jane, and his father and mother, Mr. and Mrs. C. N. Reynolds.

• • CRANE VALVES • •

*Why we advertise to you*

To you technical students, the future "greats" of the engineering world, Crane Co. in this and succeeding advertisements, in a manner of speaking, presents its card. Realizing that the friendships formed at school are important and lasting, Crane is glad of the opportunity to bring before the men who will soon be engineers, the name that has guided previous graduates in their choice of dependable and durable fixtures, valves, fittings, and piping.

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CRANE LIMITED: CRANE BUILDING, 386 BEAVER HALL SQUARE, MONTREALCRANE-BENNETT, LTD., LONDON
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The College Magazine

The world is full of magazines—I tumble for them all;
 The postman opens wide the door and piles them in the hall.
 I stumble over Rustic Life when I start off at morn,
 And wipe my feet at evening on the Bolshevistic Thorn.
 I cannot read the printed stream that riots thru my door,
 For I'm too busy striving to increase my worldly store.
 I haven't time to masticate this mass of printer's ink,
 And if I tried to read it all I'd have no time to think.
 I amble gently on my way and let the flood roll by,
 But now and then a sparkling sheet attracts my eagle eye.
 I fish it out and open it and bless old Cadmus then,
 For he has made it possible to print the thoughts of men.
 And first among these choicest ones I count the magazine
 That comes to me with college news that keeps my memories green.
 The college journal that the boys so gravely labor o'er!
 They have my full *comprenez vous*,—I too have done that chore.
 I labored early, labored late and drained my thinkpot dry
 To get December's issue out e'er June exams rolled by.
 I wrestled with our students who were frozen to their pelf,
 And pleaded with alumni who were centered all in self.
 I rustled ads around the town until the merchants there
 Arose in righteous self defense and chased me off the square.
 And when I thought I had a bone hid in our treasury,
 The printer sent a billet due and took that bone from me.
 I thought my efforts would exalt my alma mater dear.
 Perhaps so, but the profs. took stock and canned me out that year.
 I think of these old college days as each fall rolls around,
 And when they ask me to subscribe I'm eager as a hound.
 I send that measly dollar bill a kiting on its way.
 I know I'll get my money's worth and make some young hearts gay.
 I waste a plenty every year, but one investment pays,—
 The coin I spend to buy a breath of dear old college days.
 The host of famous magazines lies piled up on the floor;
 I tear the wrapper from the little piebald two by four.
 I read the happenings upon the campus where I used
 To hustle up and down with pals and co-eds fair.
 From A to Z I read it through, including Eds and Ads,
 And then I heave a solemn sigh and say, "God bless them lads."
 You, too, my son, will bless them if you'll loosen up your roll
 And spend one lone simoleon for tonic for your soul.

Reprinted from The Wisconsin Engineer.

—MALT BASIN.

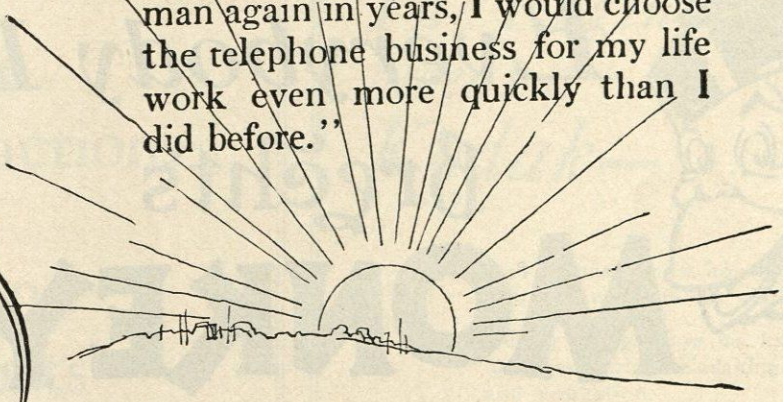
"Our pioneering work has just begun"

RECENTLY some one said to a prominent official of the Bell System:

"Your pioneering work is done. You have created a system that makes a neighborhood of the nation."

The executive replied:

"Our pioneering work has just begun. Each day brings new problems, new discoveries, new developments, all calling for broader-visioned handling on a larger scale than ever before. If I were a young man again in years, I would choose the telephone business for my life work even more quickly than I did before."



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the interest of Elec-
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an Institution that will
be helped by what-
ever helps the
Industry.

Published for the Communication Industry by

Western Electric Company

Makers of the Nation's Telephones

Number 54 of a series

THERMODYNAMIC LAWS

(Continued from Page 55)

POLYTROPIC CHANGES

Polytropic changes of state of the form $PV^n=C$ can also be drawn on such a chart as straight lines. Rewriting the equation in the logarithmic form, $\log P + n \log V = \log C$; or $\log V = (\log C - \log P) / n$.

Substituting this expression for $\log V$ in the general equation (1) gives $\log P + (\log C - \log P) / n - \log T = \log B$; or

$$(1 - 1/n) \log P - \log T = \log B - (\log C) / n \dots 2.$$

Letting $\log P = x$ and $\log T = y$, equation (2) takes the form $Ax + By = C$, which is an equation of a straight line in a system of co-ordinates whose axes are 60°. The co-ordinates, it must be remembered, are perpendicular to the axis of measuring.

In the chart (figure 2) several lines for different values of n are shown. The method of drawing these lines, or, in other words, the method of determining the angle which the line makes with the horizontal, reference is made to figure 3. Because of the difficulty of setting them in type, the necessary equations are omitted, but it can be shown that

$$\cos \Phi = 0.86603(n-1) / \sqrt{n(n-1)} \quad 1$$

The manipulation of the chart for polytropic changes is as follows: Assume the equation $PV^{1.4}=C$; initial pressure and temperature given. Place a straight edge through the intersection of the initial pressure and temperature lines, and parallel to the line marked 1.4. At any other point along this straight edge the corresponding pressure, volume, and temperature values may be read.

Indicator cards of an air compressor, when plotted on this chart, appear as an area bounded by straight lines, the value of which is easily determined.

That the Pittsburgh alumni are not sleeping is evidenced by the following letter which was sent to them just before Homecoming Day:

Dear Alumnus:

Back in old Boulder town seething, whooping crowds are now gathering in the stadium—gathering to fling their leather-lunged praises for the Silver and Gold against the nearby hills.

Right here in Pittsburgh not so large, but equally as interested a crowd is going to meet to enjoy themselves as only a bunch of mountaineers can.

We cannot have our fry on the top of a mountain, but we **are** going to have it on the top floor of the Shields building, Ross and Wood, Wilksburg at 6:45 on Tuesday, November 10.

There will be a cracker-jack of a talk by Leslie C. Paul, '15; and Clarence Wylam, '22, who has entertained thousands over KDKA, has charge of the music—can't beat 'em!

We know you're coming; so send back your O. K. on the requisition below. We must know by Saturday, November 7.

Lester C. Simpson, Secretary,
324 South Avenue,
Wilksburg, Pa.

You couldn't keep me away, and be good and sure that you reserve.....places for me at a dollar each. I'm telling every alumnus I know about it, too.



Everybody Likes
Brecht's
MONKEY Bar
5c--EVERYWHERE--5c

Made in the same famous Denver factory as Brecht's "Get-Acquainted" Package, Sextette Chocolates, Chocolate-Covered Cherries and other fine assortments of chocolates and confections.

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? *Why Worry—*

We are confident we can eliminate many of the worries and annoyances incident to the satisfactory production of your Magazine or other Book Work—that if you will take advantage of the service accorded you at the hands of a highly skilled corp of workmen, which we offer, you will appreciate the results attained, and at a minimum of worry on your part.

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Some
Real Reductions
in
Suits and
Overcoats



The Hub
REINERT CLOTHING CO.
Twelfth and Pearl

The Engineer Needs a Kodak—

And he must know how to use it to the best advantage in his work.

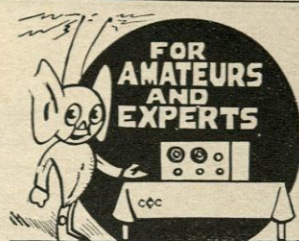
During college days his knowledge may be gained while Kodaking for pleasure and recreation.

With an AUTOGRAPHIC KODAK one can label and date each negative.

College days' pictures are kept best in an album of which we show many styles.

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We have just what they need;
A radio set of ours endures,
That's why we're in the lead.*

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Phone 108

FOR THE NEW YEAR

C. B. ROSENBERG

*Here's a resolution, man,
That is bound to help you plan
A New Year that's bound to bring
Music, news and everything.*

ALUMNI TELL ABOUT THEMSELVES

(Continued from Page 50)

Employers are wont to emphasize certain qualifications in other engineers whom they employ, and besides the broad training necessarily present, there are personal qualities of the individual to be sought when employing new men. Good character and qualities of leadership occupy the front ranks of the requisites of a technical graduate, according to the replies from practicing engineers who employ men from time to time; and personal appearance and neatness also have much to do with the final choice of the employer. The results of the survey show that, in the opinion of the graduates, scholastic record and specialized training, although of importance, should not receive as much weight as the personal characteristics of the applicant for a position. This condition is true not only in the engineering profession but in almost any line of endeavor as well.

Opinions of older graduates as to the manner and extent to which their college experiences have been valuable to them provide an interesting study. The greatest number of men think that a knowledge of the fundamental principles of science has been the most valuable acquisition to them. Nearly as many graduates considered that discipline in methods of thinking and habits of study and work has been the most tangible benefit derived from their college course. Again, nearly as many believe that the development obtained in a not easily definable way from the college life and atmosphere is the important factor in the valuation of their educational period. Next in order comes the training in engineering courses and direct preparation for engineering work and the acquirement of craftsmanship or the training in shops and laboratories. Some of the men received inspiration and guidance from members of the faculty which they consider to be of great service and value to them; and, lastly, the associations and friendships formed with fellow students has given many graduates a worth-while experience.

Though other subjects received attention in the questionnaire, the subjects hurriedly discussed in this article have been chosen as the more interesting and more applicable to an appropriate study. The entire investigation of the S.P.E.E. has not yet been completed, and, as the survey reaches its final stages, some of the present conclusions may be altered slightly.

WILSON HARDWARE COMPANY



Twelfth and Pearl Streets

Boulder, Colorado

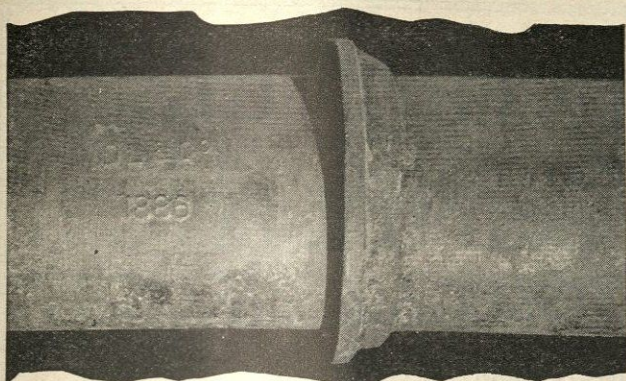
JOYS AND SORROWS OF THE JOB

(Continued from Page 59)

plant machinery and equipment required. Ordering repairs for everything from a small pump to steam shovels and locomotive cranes has been invaluable to me in becoming acquainted with the various kinds of equipment. Men who had derricks and cranes rock their cradles years ago cannot see how I can be so dumb as to not know what a gudgeon pin or a rooster top looks like.

Costs are prime importance in our work—daily costs, weekly costs, monthly costs, unit and job costs, and contract costs. Professors Crawford and Brockway used to try to hammer the value of costs into our heads—they should have used a pile hammer. Costs involve an endless array of figures, but they

(Continued on Page 74)



Bell and Spigot Joint

THE Bell and Spigot Joint for Cast Iron Pipe, adopted over one hundred years ago, is the preferred joint today.

It is tight, flexible, easily made and non-corrodible. There are no bolts to rust out. It makes changes of alignment or insertion of special fittings a simple matter. It can be taken apart and the pipe used over again, without any injury. It is not subject to damage in transit. In fact, it embodies practically all of the desirable qualities in an underground joint.

The use of this type of joint, together with the long life of Cast Iron Pipe, makes for extremely low maintenance costs.

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Send for booklet, "Cast Iron Pipe for Industrial Service," showing interesting installations to meet special problems

The Standard for Rubber Insulation



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Full details in Handbook—Send for it.

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Cuban Representatives: Victor G. Mendoza Co. Havana

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CORRECT ARCHITECTURAL
SHAPES AND COLORS

The Heinz Roofing Tile Company

1740 Champa, Denver, Colo.

JOYS AND SORROWS OF THE JOB

(Continued from Page 72)

never get tiresome. To delve into a mess of quantities and reports and come out with a series of unit costs is a satisfaction in itself. Constant comparison of unit costs and bid prices is necessary to determine the status of the work. We send in reports every week of the weekly costs and the costs to date. The time I showed form costs on one of these reports just double their actual value due to a numerical error is still a tender spot in my memory. The superintendent had been bragging about his form costs to the main office only a few days previously.

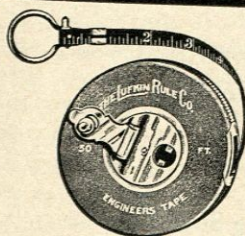
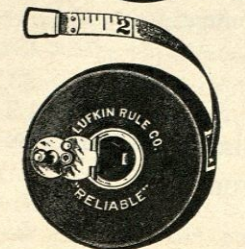
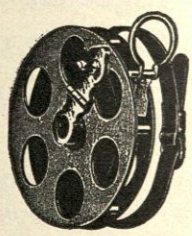
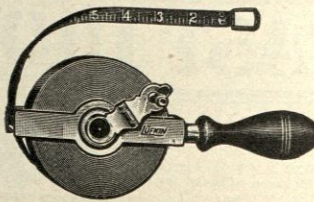
Every day there are new problems to be met and obstacles to overcome in construction work. These are usually ingeniously handled by the older and more practical men on the job, but occasionally they take suggestions from one of us younger fellows. It is a triumphant moment for us when such a suggestion is followed and the results are successful. Doing the nearly impossible is everyday work around the job. Even the famous Ring Lardner, marvelling at a huge railroad project going on under traffic on Long Island, remarked that, "If I wanted the world moved without disturbing traffic I would get an engineer to do it."

The so-called human side of engineering plays an important part in construction work. We are in contact continuously with the "boes" and negroes on the

job on up through the better classes of labor, the mechanics, foremen, to the officials of our company and those of the railroad. The engineer must get along with all of them. I have found that shouting for one's college is fine on a football field or at an alumni meeting, but is mighty poor policy around the job. By working quietly with the men around you is a much better way to gain their confidence and respect than by trying to impress upon them what you learned in school.

These first two years have been but a start into the huge field of construction work. I believe the first year was the hardest, and I hope it always remains so. Every knock has meant experience; every "bawling out" has taught me something; and knowledge comes with every mistake. I hope my superintendent's threat of "Rich, I'm going to make a superintendent of you if I have to break your blooming neck" comes true one way or the other. Really, I believe in two or three hundred years one could master the work. Any one with less experience who claims to know all about construction work is entitled to membership in the Ancient Order of Confirmed Liars.

There is a fascination all its own to heavy construction. After long months of worry, grief, and all sorts of troubles, to see a long string of varnished cars pulled by a monster locomotive, speeding safely over a bridge you have helped to build—ah, that is real satisfaction, worth all it has cost.

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If you are interested in the distribution of light through Factrolite, we will send you a copy of Laboratory Report—"Factrolited."

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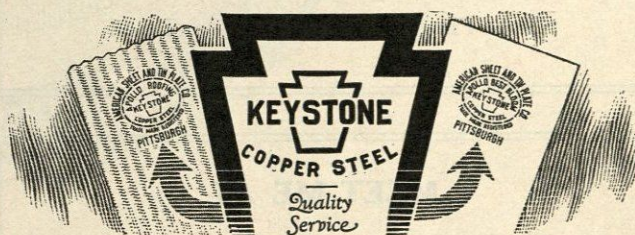


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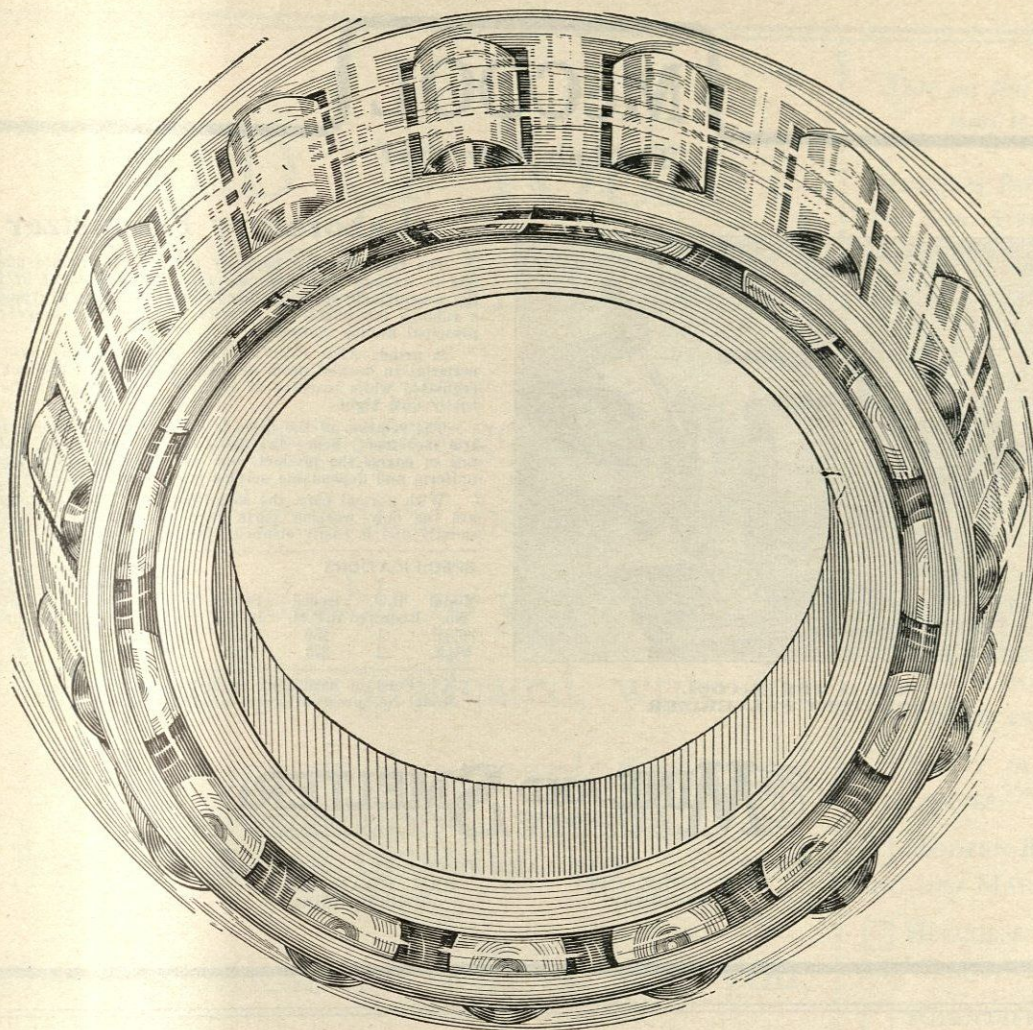
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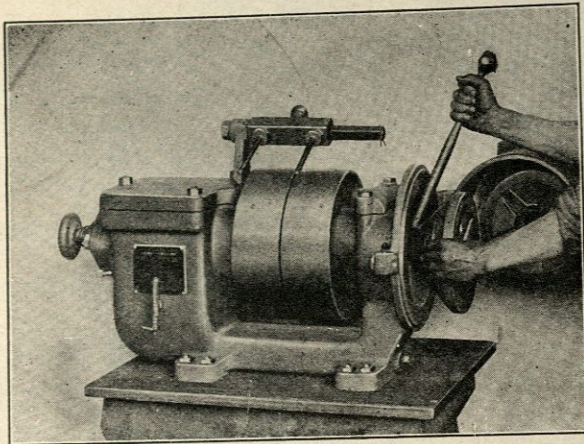
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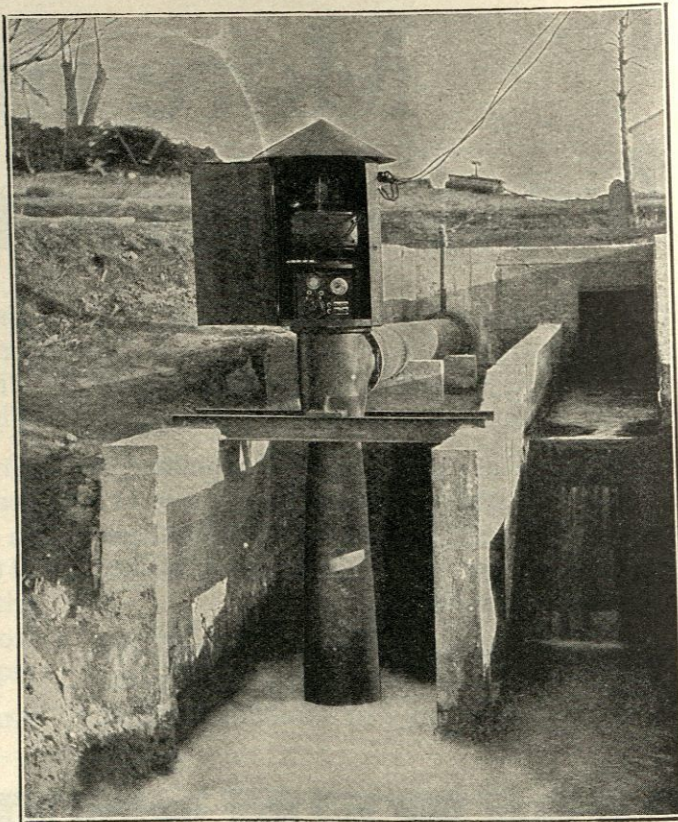
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For 1926, we anticipate and hope for a continuation of the splendid relations between customer and company, and renew a pledge that our service shall be all and more than is required of us, and that every obligation we have taken as a public utility shall be fulfilled cheerfully, speedily and efficiently.



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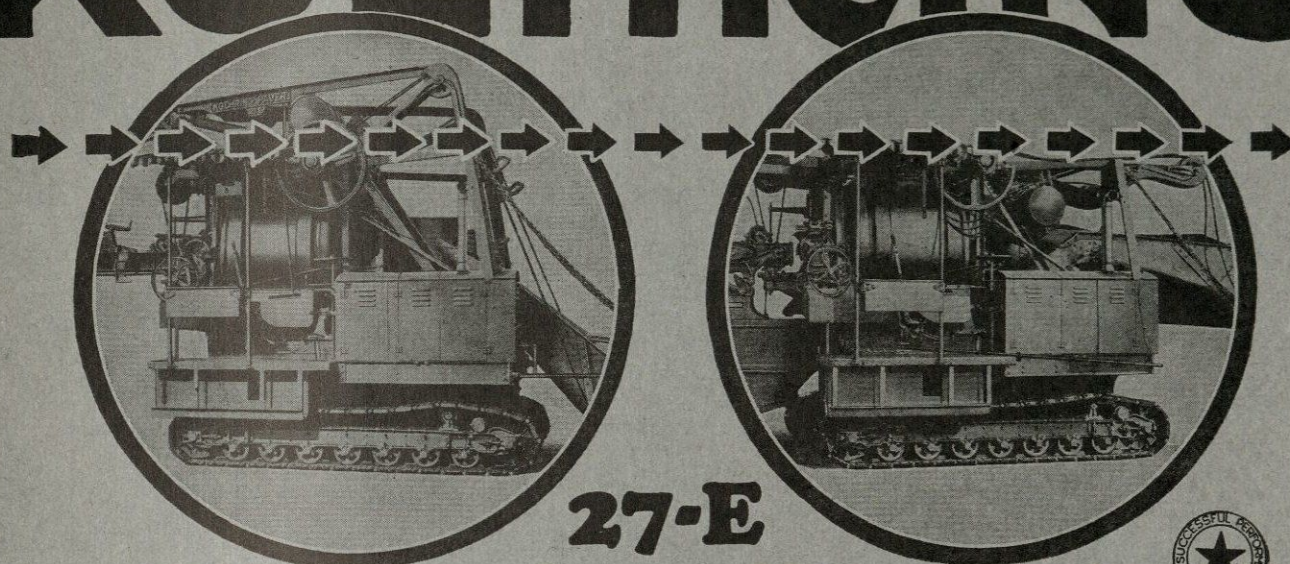
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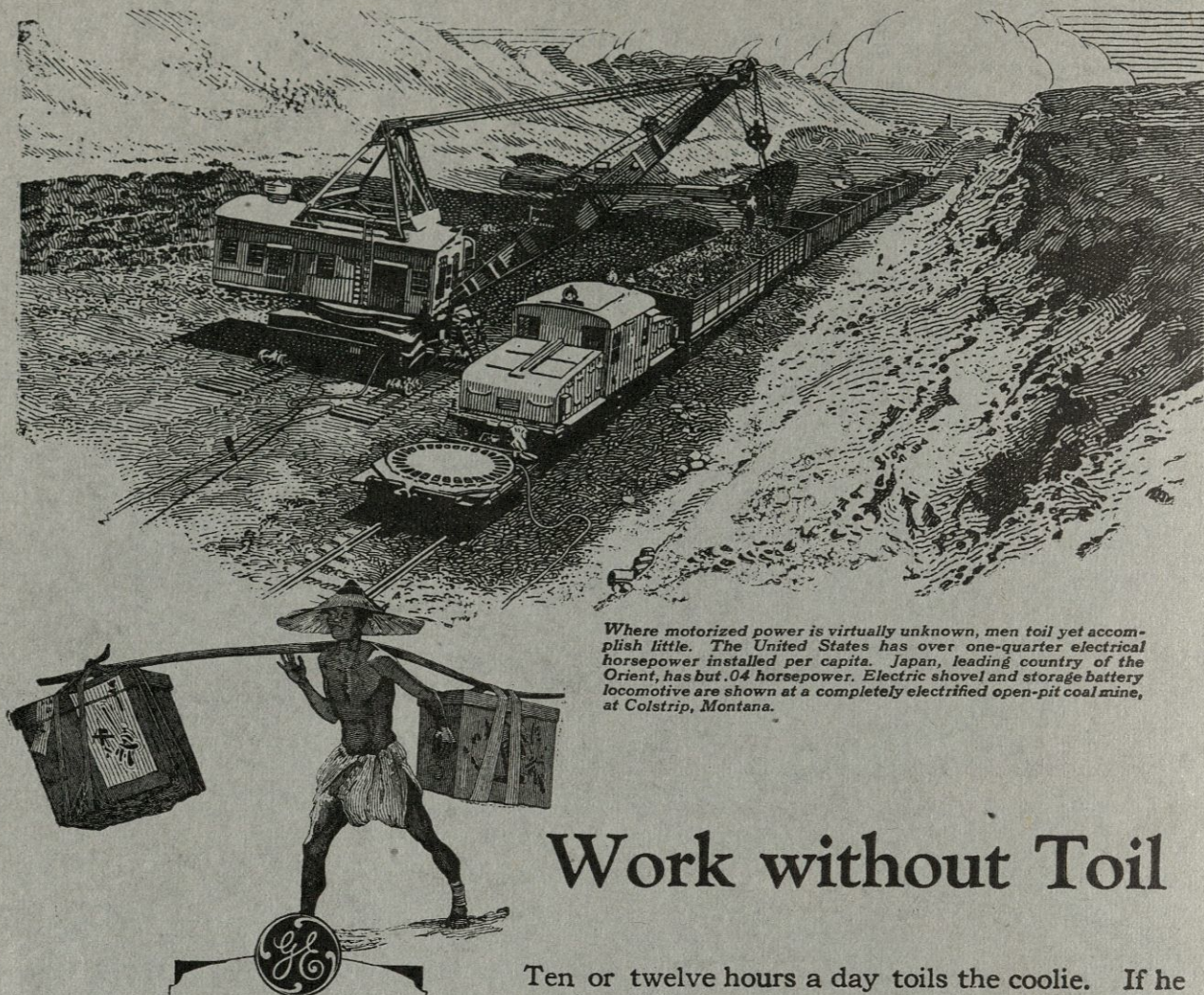
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