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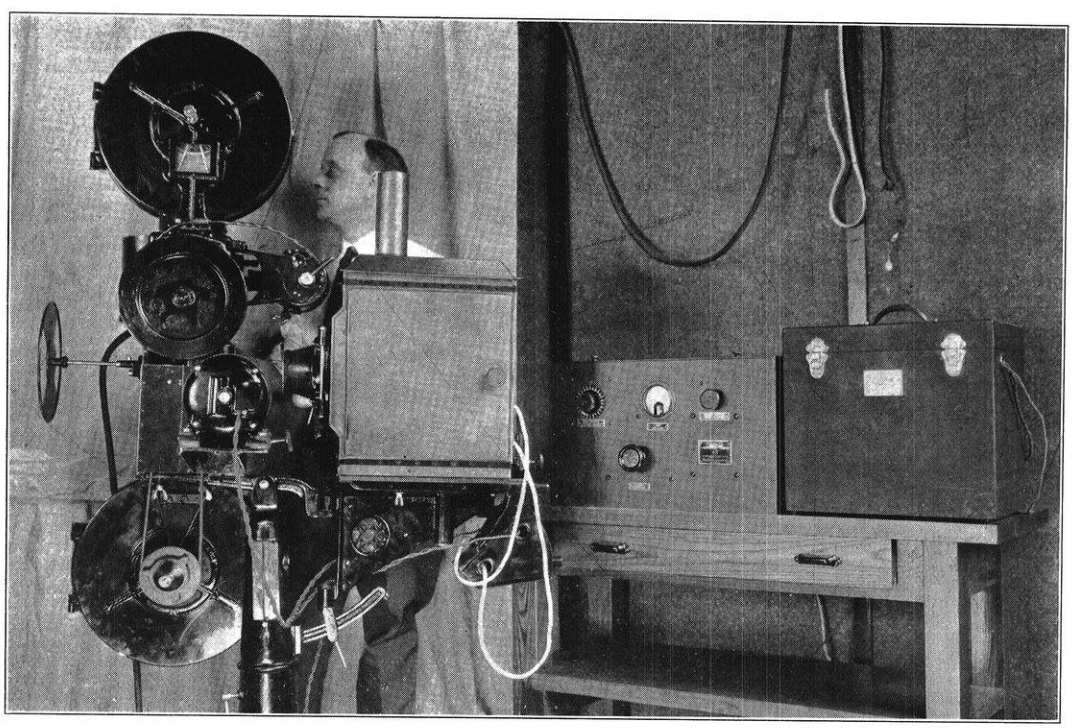
VOLUME XXXII NUMBER IV



PROJECTOR FOR TALKING MOVIE

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VOLUME 32 JANUARY, 1928 NO. 4

- - - - - Once upon a time,
Full many years ago,
There was found a crazy fellow
Who admitted it was so.

He bought the cheapest products
Where e'er he them could buy,
And when they went to pieces
To the merchant he would cry;

"This article you sold me
Is nothing if not punk,
In fact I think your store
Is filled with lots and lots of junk!"

The merchant then the customer
Behind the counter hied,
To show him lots of best grade goods,
Which are all merchants' pride.

The moral is so easy
That every one can see:—
We sell with pride the best of goods,
So buy your needs from me!

"Ketch"

The Wisconsin Engineer
UNIVERSITY OF WISCONSIN

VOL. XXXII, NO. 4 · MADISON, WIS. JANUARY, 1928

PICTURES THAT LIVE

By R. DeWitt Jordan, e'27, *General Electric Company*

AN untrained observer stationed on a high hill for the purpose of mapping a given terrain, finds himself confronted with innumerable details. Before his gaze there unrolls in panoramic succession, hills and valleys, shadowy patch-like woodlands and checkerboard pastures, and for a moment he hesitates on where to begin the mapping process. Obviously he cannot include everything he sees, for there is much that reflects the changing seasons, or the whims of man, lacking permanency. In equal truth there is but little which he may omit, since many things may hinge on the twist of a road, or the dip of a hill. Hence the observer's problem becomes one of separation and combination, the completed whole gathering value from the individual contributions of its kaleidoscopic parts.

The Author

The writer who deliberately sets out to marshall an effective, interesting and withal imposing array of facts about the so-called "talking movie" of today, or for that matter about any engineering project of major importance, may be likened to that previously mentioned observer on a hill. For contrary to all popular opinion, the "talking picture" is not new, and its biography is a tangled skein of facts, counter-facts, fantastic dreams and cold realities.

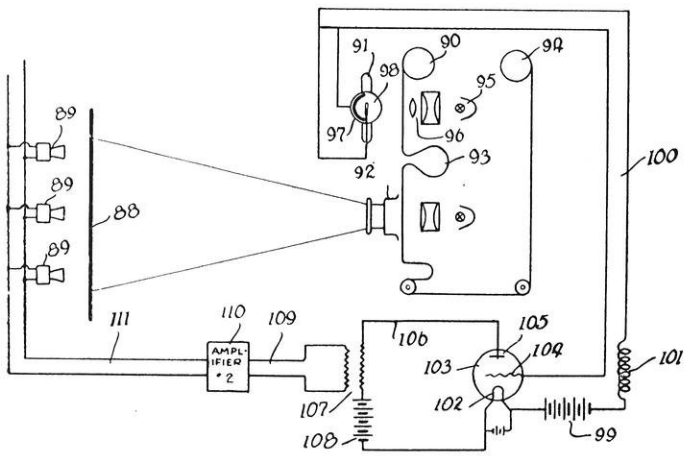
Research scientists—men who deal with a carefully woven fabric of facts or partially substantiated theories, as well as self-termed inventors whose fantastic oddities strew the trails their minds have trod—have labored for more than forty years in the attempt to produce and reproduce sound photographically.

In 1879 Professor Graham Bell and his associate, Tainter, conducted a series of experiments having as their goal the transmission of speech along a beam of light, using as a transmitter a very small mirror attached to a diaphragm. A year later a man by the name of Fritts carried the work of Bell and Tainter one step further by causing the vibrating light beam to be photographically recorded. During the twenty years between 1897 and 1906 very little work was done on the photographic recording of sound.

William Du Bois Duddell, an electrical engineer of Chelsea, England, in a patent filed in 1902 describes what he conceives to be "an improved phonograph". Duddell's work is significant, because, even if modern engineers are reluctant to admit it, the fact remains that Duddell laid down in his paper a foundation for much of the present work on talking movies. His words: "I record by means of an oscillograph or similar apparatus on a moving film, or paper, or other suitable photographic material—" apply to a present extremely successful system of voice recording by photography.

In attacking any problem, or question, one must first

ask oneself, much as in the case of the hilltop observer: What conditions must the solution fulfill, in order to be universally applicable? So with the talking motion picture one must lay down certain principles based wholly on commercial considerations, as limits between which the talking motion picture, in order to be commercially successful, must fall. The first condition is that a standard cinematograph film must be used. The motion picture industry of today is a highly standardized affair, and no producer would be found who would look kindly upon even a very minute change in his tried-and-proven-successful methods. No motion picture director will sacrifice even so much as the border line of a completed film in the interests of phonophotography. Nor can one condemn either the producer or the director for their strong reaction against change. Like all great industries the motion picture business has built fo itself a stronghold only after carefully "baking" over a long period of years innumerable mechanical, electrical, chemical as well as legal "bricks". From the laboratory of the film manufacturer straight through to the winding drums on the theater projecter, every item that possibly effects projection has been carefully standarized, and this standardization is the work of many years. To use the present talking motion picture film requires special adjustments on the projector, and in the larger theaters where reels of film must be fed to the machines without a minute's delay, there can be no lengthy pause in order that the operator may make necessary adjustments when changing from special to standard film.



Wiring Diagram of Apparatus

A second consideration is that the speed of reproduction must be the same as for the standard motion picture film. Originally this speed was 16 pictures per second, the slowest at which the film could be run to avoid flickering. This was before the days of super screen-spectacles. As time went on, the exhibitor tried speeding up his projectors in order to crowd more film footage into the "bill". Speed competition between exhibitors began, and films were shown at speeds up to 120 feet per minute. At this point distortion became so pronounced that the long-suffering film could be driven no faster. Today there is no absolute standard, and it is tacitly understood that the film footage per minute shall be arbitrarily established by the exhibitor. It might be mentioned in passing that while there is no standard rate of speed, the upper and lower limits may be fixed as approximately 60 to 120 feet of film per minute.

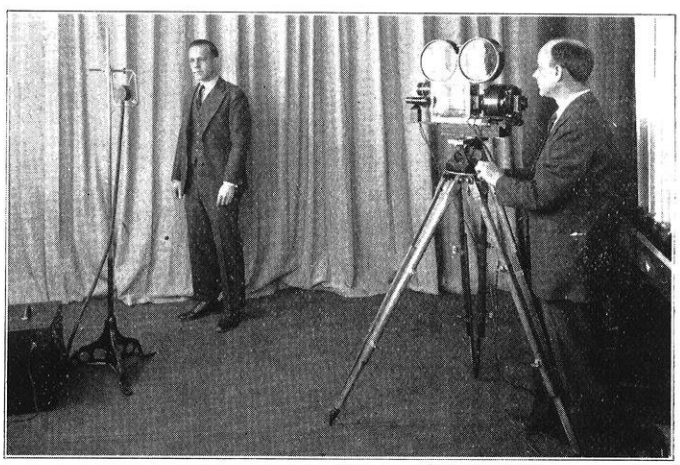
Third, the recording and reproducing devices must be absolutely inertialess, excepting possibly the diaphragm for receiving and the diaphragm for reproducing sound. This requirement applies particularly to the extremely light vibrator of the oscillograph. We shall see later in this article how that peculiar characteristic of the photoelectric cell, namely, its resistance-sensitivity under the influence of light, places it in the inertialess catagory.

Fourth, the receiving device must be sufficiently sensitive to permit its being successfully concealed at a reasonable distance from the speaker, or source of sound, to be photographed. This requirement is fully met by the extremely efficient pick-up devices of modern broadcasting.

Fifth, the reproduction must be very good, and of sufficient loudness to fill any theater where the talking pictures are exhibited. Both requirements have been reasonably well filled by recent developements in loud speaking equipment.

Sixth, the photographic sound record must be so narrow as not to materially cut down the size of the normal picture projected on the screen. We shall see later in this article how the sound band has been limited.

Finally, the apparatus used must be of such a nature that specially trained operators will not be required. The film must be capable of being successfully handled by the ordinary operator wherever he may be located.



Taking A Talking Movie

To photograph a voice wave is comparatively simple as every student of the science knows, and although motion picture production on a large scale requires highly skilled cinematographers, reasonably successful motion pictures may be made by any amateur photographer. But to successfully combine and simultaneously reproduce the action and its related sounds is

a problem of gargantuan proportions. All branches of science have made, and must go on making, contributions to the art.

In order that we may better understand the many problems involved in producing a talking motion picture, let us study for a moment the various processes involved in recording and reproducing sound photo-electrically. Assume for simplicity that the scene to be recorded is one in which a lady plays on a harp. A standard motion picture camera is set up and focussed on the player. Concealed near at hand is a sensitive microphone similar to the type used in radio broadcasting. From this pick-up device wires lead to an oscillograph vibrator, so arranged that as a tiny beam of light is reflected from the pivoted mirror it strikes upon a continuous strip of film.

The operator in the studio throws a switch, and almost instantly, two synchronous motors, one located on the motion picture camera itself, and the other operating the film reeling mechanism of the oscillograph, are thrown into action and fall almost instantly into step. The lady plays serenely on her harp, and finally when her number is concluded, the operator opens the circuit to the driving motors. The camera ceases to click, and the beam of light from the vibrating element of the oscillograph becomes still. Upon two separate rolls of film the complete performance has been recorded. There is nothing complicated about all this, for almost any laboratory equipped with suitable apparatus could duplicate the recording process. But if the process went no further, it would be of little value commercially. What the public demands of such a system is that not only shall we be able to see the lady play on her harp, but that we also hear her selection, and if by chance the projection should be stopped for a moment simultaneously with the pictured "plucking" of the "g" string, any amateur harpist-movie fan might see in a close-up that "g" had been sounded and not a lower "b" or an upper "a sharp". If the pictured artists ceases to play, the music must stop with the last motion of her hands.

Obviously all this might be accomplished by using not a single machine,

but two separately operated projectors driven by synchronous motors, the one machine to reproduce the music of the harp selection, and the other to project the picture of the player. Unfortunately, however, if we double the amount of apparatus required we more than double the difficulties to be overcome when projection is attempted, and simplicity no longer becomes a criterion of performance. In addition to this, in every shipment of motion picture film from the studio there would have to be two separate reels of film, one with the voice and sound score of the production, and the other with the picture proper. Such a method would obviously appear inconvenient.

To attain simplicity in reproduction, both negatives, one of the picture and the other of the accompanying speech, sounds, music, etc., are printed together upon a single positive film. To do this, both negatives are run through a machine which matches the sound record to the picture and the result is as shown by the enlarged strip of film used as an illustration with this article. It will be seen that the pictorial record is slightly reduced, the voice record taking up a space of approximately one-eighth of an inch. This reduction, however, is so small that when the picture is thrown on the screen, the effect is hardly noticeable. Combining both negatives upon a single positive results, therefore, in a method that adapts itself to standardized systems of projection. It should be constantly born in mind, however, that such a scheme can only be depended upon to give good results when the entire process of manufacture, straight through from exposure of the film to the oscillograph beam and to the pictorial record that is being made, to the final showing, is one of perfectly synchronized sequence.

We have seen how the talking motion picture film has been produced, and now let us turn our attention to the reproduction of the pictured scenes and sounds. In order to explain exactly what takes place when a motion picture of the talking variety is to be reproduced, recourse must be had to a simple schematic diagram (Page 118). In this diagram are shown the essential elements of a motion picture and photo-

(Continued on page 132)

THOUGHTS OF AN IMPLEMENT ENGINEER

By O. B. ZIMMERMAN, m'96 M. E.'00
Experimental Department, International Harvester Co.

Mr. Zimmerman

SPEAKING broadly, the mechanization of agriculture is now passing into its third major phase. First was the period of hand farming that began before the dawn of history when the first man scratched the soil with a sharpened stick and planted the seed of some edible wild plant — a period that lasted until the advent of the reaper and the steel plow, about the middle of the last century. After that came the period of farming with animal power, and with a rapidly developing line of machines to cover all operations from the making of the seedbed to the harvesting of the crop. Now we are at the beginning of the age of mechanical power farming; we are witnessing today a change almost as revolutionary as that which marked the transition from hand to animal power on the farm.

Many points of value might be brought out in a review of the stationary and portable agricultural machines; but the class of mobile units involves many real and distinctive engineering problems and successes.

Interesting, and we may even say at times spectacular, mobile applications are those devoted to row crop, grain field, root crop, and orchard areas, where the machine must go to the work, that is, to the crop, to perform its service. In this feature we see a marked contrast with most industrial operations, where the material is usually brought to the machine rather than the machine to the material; and thus mobile requirements stand out prominently in every detail of the design of this large group of machines.

Owing to its inherent and increasing flexibility and adaptability, the internal combustion motor has proved itself most popular. It also gives us control with the minimum of man power and the maximum of available power per unit of weight without necessary use of much auxiliary equipment and supplies. These advantages have rapidly broadened its uses. Its popularity was helped markedly by the advances in automobile engineering, yet even in the engine details there have been definite divergences in design and many special features have been developed, owing to the special requirements and conditions which the tractor must meet.

For example, the tractor's continuous sustained operation over irregular, rough and dust-making surfaces has necessitated special attention to enclosure or other protection against dirt. This affects the point of intake of air to the carburetor as well as the straining from the air of dust by devices especially made for this purpose. Such provisions are now approaching their logical place as regular automobile equipment.

Other engine features which demand special attention are the custom of loading the tractor almost constantly at or near maximum, the slower operating speeds of from two to four miles an hour, the light weight of the entire tractor as compared with the power exerted, economy of fuel and lubricants on the road or in the field, and successful operation with kerosene or gasoline as economy dictates.

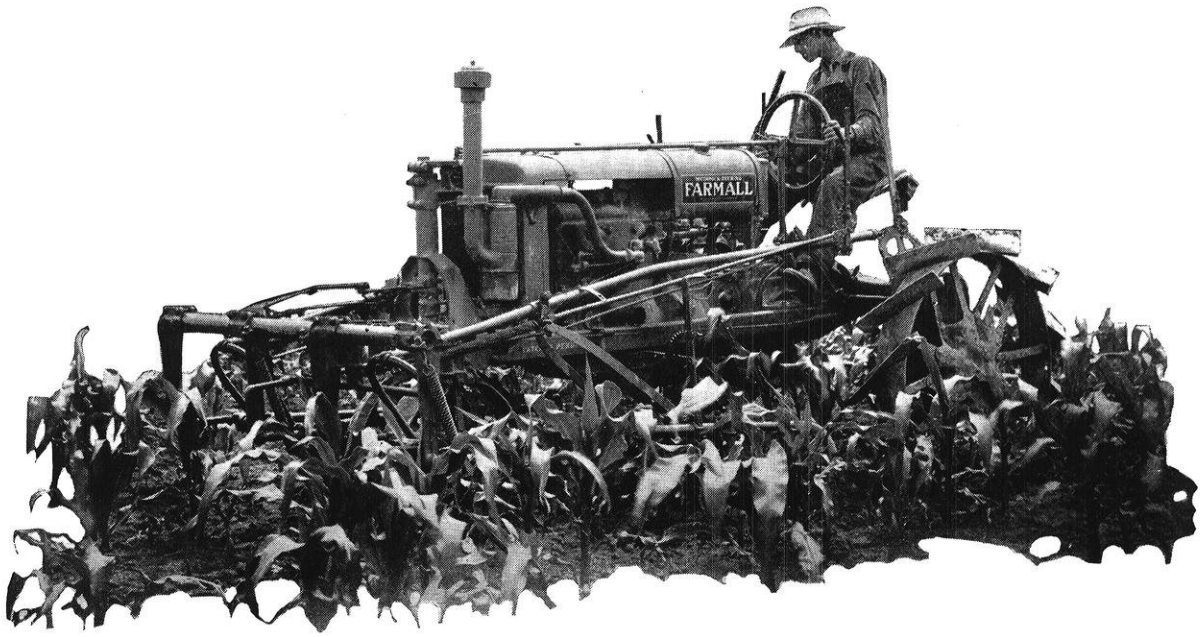
Out of these and many other influencing conditions, after many failures and many partial successes, there has been developed the cheap, light, convenient, reliable, and highly efficient farm tractor of today—a machine that appears to be as well standardized as the automobile in general design and capacity.

We are now witnessing a very definite enlargement of the tractor's scope from restricted use as a pulling machine to the activities of planting and cultivating row crops. Recently we have seen its extension of useful power through the power take-off.

Due to this latter improvement we can now see important modifications in many farm machines as the wheels on drawn machines are relieved from their former function of furnishing a ground traction and the power to operate the machine comes direct from the tractor engine through the power take-off.

Cheating The Crows — Planting Corn At Night

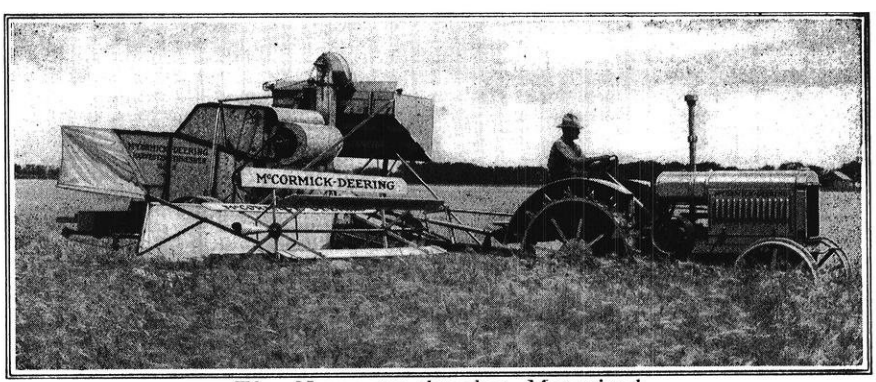
From an operating standpoint the problem of maintenance is noticeably different from that of stationary machinery. Lubrication of different specifications for



Corn Cultivation Made Easy With A Tractor

the widely separated bearings is necessary. Bearings must have a definite flow outward to avoid washing dirt or dust into these bearings; the intended alignments of light-weight, flexible yet strong parts, must be reasonably maintained and still avoid weave or cramp that would interfere with satisfactory operation. Practically all repairs must be made in the field, away from shop facilities, hence speed is the essence of repair. Accessibility and unit construction are therefore far more important than in other classes of machinery. The controls must be convenient, certain, rangy, and responsive to the operator, who may be expert or without special skill.

In agricultural machinery design, the prominent fundamental operations must be met by a light, strong frame about which the designer builds combinations of operating units which shall function as intended and at the same time permit necessary simple modifications or attachments to be made to meet the needs of special crops or unusual conditions. The problem is therefore comparable with that of building a machine tool with its main governed operating parts provided with suitable jigs and fixtures to widen its usefulness and effectiveness.



The Harvester-thresher Motorized

Reliability and simplicity must always be outstanding features of farm machinery design. It is not difficult to design a complicated machine, but it takes genius to devise a simple machine that will accomplish the same results. High articulation in adjustments is essential. Convenience and protection of the operator, whether in maneuver or during field repair, must not be lost sight of in the designing of any machine.

A general glance over such machines as a mower, grain binder, side rake, grain drill, corn planter, or harvester-thresher cannot fail to impress the observer with its likeness of design to light-weight airplane construction, yet these agricultural machines are full of the most difficult problems for the designer. There are numerous wheels, chains, cams, springs, trips, ratchets, irregular shaped parts, braces, ties, intermittent cycle operating parts which make mechanical drawings often as useful as a three-plane sketch of a brush heap.

The automatic power lift or trip is now applied to numerous farm tools, thus reducing the back-breaking heavy lifts formerly required of the operator. Release hitches are being similarly improved.

As one travels through the country in growing time and scans the regularly laid-out corn-fields, he must credit, without reservation, the genius of these who devised a planting tool that can click off the two to three kernels of corn at such regular intervals that rows, even on irregular surfaces, will line up for cultivation in both directions.

Years ago one man could with difficulty perform all needed operations on a farm of 20 acres. Today, with

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MANAGING THE BOSS

By One Who Has Tried It

SCIENTIFIC MANAGEMENT was one of the many notable developments of the past decade. It was originally expounded by the late Frederick W. Taylor, past president of the American Society of Mechanical Engineers, and his ideas on this subject were quickly extended by his many disciples into numerous spheres of human activity. It will probably surprise the reader to learn that the New York Public Library has recently printed a list of references on Scientific Management, comprising fourteen hundred and ninety-four titles. These works cover nearly every phase of the management of an industrial enterprise; but one phase seems to be entirely overlooked. This phase is of importance, not only to the individual actually doing the managing, but also to his company. One is tempted to say that it is the most important phase of all. I refer to the management of one's Boss. For example, if it is important for a factory superintendent to handle his help efficiently in order to obtain maximum results with minimum friction, how much more important it is for this same superintendent to handle his own immediate superior, the general manager, so as to obtain a similar measure of success.

This article is extracted from an article by the same name in an issue of Harper's Monthly Magazine. It represents a viewpoint not usually encountered. In the absence of a course in applied psychology suitable for students who expect to live and work with men, it behooves each engineer to create his own textbook on the subject. The article is well worth a place in such a textbook.

—EDITOR'S NOTE

The general manager, in turn, is responsible for those under him. The principles for handling his subordinates have all been studied for him and described in articles on Management. This same General Manager, however, is often required to manage the President, for the good of the business. It is no secret that the President of a corporation occasionally has to be spurred into action or must be diplomatically restrained if he is inclined towards over-enthusiasm for new projects. The profits of the business often depend upon the success achieved by the General Manager in handling the President quite as much as upon the efficient management of the employees. Yet on the principles and practice of Boss Management, it would seem that no assistance whatever can be obtained from management literature. There are at least two explanations for this. In the first place Boss Management is perhaps the most difficult of all departments of Management. Second, a written description of the methods used by any boss manager is highly dangerous to the writer. Once let the big boss who is being successfully managed recognize himself in print, and this particular example of boss management is apt to come to an abrupt end by the boss manager in question looking for another job.

Famous Boss Managers

History records the names of many who were expert in the art of managing their superiors. Disraeli was a past master of the art of managing royalty, while Gladstone was a conspicuous failure in this respect. It was a common saying in the A. E. F. that General Pershing had a threefold job, "to fight the Germans, fight the French, and fight the War Department." To those in France the War Department seemed very far away and unresponsive to needs. Who will say that Pershing's ability to stir his boss, the Secretary of War into more vigorous action in the Spring of 1918 was an unimportant part of his duties?

Subordinates need managing for several reasons. They may be lazy, and so must be compelled to do their work; they may be careless or insubordinate, and so need discipline. Tho some may deny that their boss is human, all will admit that he has his full share of human failings. Being the boss, he is all the more likely to give his feelings free rein. An employee, no matter how lazy, can hardly make a practice of coming in late, but how about the boss? Even the most profane workman learns to modify his language when talking to his foreman; but who is to curb the boss with a grouch? And so it goes.

Boss Management begins in our early youth with the management of our parents. We constantly want to do things of which they disapprove. Mark Twain said in an article, "Advice to Little Girls": "If your mother tells you to do a thing, it is wrong to imply that you won't. It is better and more becoming to intimate that you will do as she bids you, and then afterwards act quietly in the matter according to the dictates of your best judgment."

This, however, is Boss Management which can hardly be described as "scientific". The true art consists in leading the boss to your opinion by causing him to think it is his own. Boss Management is the best-known example of the "art which effaces itself."

Kinds of Boss Management

There is the over-enthusiastic boss, for example — most valuable to any organization when well managed by his subordinates, most disastrous when unmanaged

(Continued on page 136)

AFTER COLLEGE WHAT?

By A Recent Grad

I have wrestled with the question of "After College what?" and also the one of why we use the term "commencement". I must confess that in the last few months I have begun to see the light, but as yet have failed in the solution of either of the questions outlined.

Since graduation last June I have been in the employ of the Wisconsin Highway Commission, with headquarters at Superior. My duties have been those of surveyor — my work that of making surveys for construction projects to be built during the next three years.

One of my first problems this season was that of training a crew. (In all my previous experience I have been furnished with men who had worked in the departments in which I was employed or who had had experience in work of similar nature). My first assignment this season was a ten mile survey between Grandview and Beloit on state trunk highway 24. My crew consisted of a three year man from Massachusetts Institute of Technology, a high school teacher, and a normal school student.

This article was received by Professor L. S. Smith as a letter from one of our recent graduates. His experiences have been interesting and valuable, and some of the ideas brought out are worthy of second thought.

—EDITOR'S NOTE

Not one man on the party had served with an engineering party on actual work. The man from "Boston Tech" was a keen man at figures but was not especially interested in highway work. The high school teacher was interested in chemistry and chemical engineering. The normal student also had leanings toward the chemical field.

Surprising as it may seem, the man from Boston fitted best in the party as a chainman and rodman, the high school teacher was a live wire all around and after a little training became a first class instrument man, while the normal student who was a real book worm failed to fit in a single position. The man who took the position left vacant, when I dismissed the normal student, was a Wisconsin man.

He was a good worker, but was with me only a short time, returning to the university in the fall term.

I lost my full crew when classes commenced at the various schools and colleges. My Boston man returned to his school to complete his work. My high school teacher returned to Wisconsin to carry on his chemical studies.

My next crew included a man who has worked for the commission in this division for about four years; a brother of the man above, who had served at various times on the county highway forces, and on the state forces; and a third man who had no experience in engineering work, whatever.

The first mentioned had been shifted from crew to crew, and although an excellent instrument man, was a poor party man due to false assumptions as to his importance. The brother had similar characteristics and had been dropped from the state forces and from the county forces on previous offenses. Needless to say, I too dropped both men. The other man is still with me and is developing into a good instrument man. I have two other men who are good workers but are still green at the game. However, my work is running along quite satisfactorily.

Perhaps, you will misunderstand my letter as indicating that all of my time has been spent in molding men to fit my party. Such is not the case, however, I merely offer that part of my experience as an example of the excellent opportunities I have had to study men since "commencement".

Once more I will offer a suggestion for an improvement in either the highways or in the railways courses. The subject is in regard to the matter of taking soundings. The men all hear about methods, etc., but how many are there who leave the institution that can go out and do a reasonable job along this line. I believe that the course at summer camp should be arranged so that each man could spend a day gaining knowledge along this line.

I might add that we had some interesting experiences along this line this summer. We took soundings to a depth of fifty-two feet in the Bibon Swamp — near Bibon, Wisconsin.

Perhaps you know that the present standards of highway construction call for seven degree curve (maximum) in alignment where possible and that all roads are to be built on the government survey lines where possible. We are using twenty-six foot sections on secondary state and federal aid roads and thirty foot sections on primary systems. Our right-of-way has increased from sixty-six feet to eighty feet and in most cases to one hundred feet in width.

At present I am making a survey on the connection of a proposed county road (which it is intended shall be a primary federal road) with the streets of Ashland. The course in city planning has opened my eyes to the possibilities of wise street planning, and I am doing all I can to get the best alignment existing limitations will permit. But there are two sides, one for, and one against, all possibilities, so that the resultant may not be what I have hoped for. However, present indica-

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Campus Notes

FEATURING JOHN ZOLA

Wisconsin's fourth successive cross-country championship this fall can be credited largely to the remarkable ability of John Zola, ch'28, captain of the team and runner, par excellence. John made the remarkable season score of five points for dual and quadrangular meets which means that he placed first three times and second, once. He finished first in the Minnesota and Iowa dual meets and in the quadrangular with Indiana, Chicago, and Northwestern. His one second place was collected in the dual meet with Kansas which Wisconsin won in spite of a failure to get first place. In addition to all this he led all runners at the Big Ten classic held in Ann Arbor, establishing a new record for the Wolverine course.

John Zola

Recently, he has announced his intention to try out for the coming Olympic meet. His only competitor in Wisconsin will be Shimek of Marquette University with whom Zola has never matched himself. In all this Wisconsin and the Engineering school wish him luck and know that if his success in this field is not all that could be desired, he still has ample opportunity to develop in his professional field due to his very good record scholastically.

For these things Wisconsin gives him all due credit and thanks him for having thus added another name to Badger immortality.

SECOND STATE WIDE FOUNDRY COURSE TO BE HELD AT UNIVERSITY

An unusual opportunity for foundrymen of the state to pursue short courses covering the fundamental principles and practices of the foundry is presented in the announcement of the department of mining and metallurgy of the College of Engineering, and the extension division of the university that a second foundry conference would be held in the laboratories of the department of mining and metallurgy on January 31, February 1, 2, and 3.

Following the plan of the first conference held last year, the round table method of presenting the subject matter will be used. A group leader will lead the discussion in each group. By arranging small groups, each man will have the opportunity to bring up his individual problem for discussion. In addition, laboratory tests, demonstrations, and exhibits will be arranged in the various laboratories of the university. Visits to foundries in Madison will be arranged.

The work of the conference is being organized with a view toward meeting the desires of those who attended last year, and will thus need discussion of an advanced nature, and also to accomodate those who attend for the first time this year. Discussion groups on cupola practice, sand conditioning, sand testing, defects in castings, cost accounting, routing and planning, heat treatment of steel, elementary metallography, sampling and analysis of iron and steel, malleable castings, steel castings, brass and bronze castings, and aluminum and light metal castings are planned.

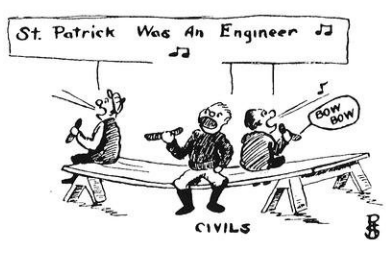
GOVERNOR O. K.'s M. E. BUILDING

Governor Zimmerman signed a bill Tuesday, December 13, appropriating $10,000 as a preliminary move toward putting the new Mechanical Engineering building in blueprint form. Before very long, the plans will be drawn up and with the advent of construction crews, the building will become a reality. The only regret the Juniors and Seniors have is that the building will be completed too late for them to utilize. However, not one of them is sorry to see the plans being completed for the good of the Engineering school and for the benefit of future students enrolled in it.

TORKELSON ADDRESSES A. S. C. E. BANQUET ON SOUTH AMERICAN TRIP

"The American engineer should remain in the United States instead of going to some wild and undeveloped South American country after graduation," declared Mr. M. W. Torkelson, Madison engineer, at the seventh annual banquet of the American Society of Civil Engineers held at the Christ Presbyterian church, December 15. Over seventy-five members of the society were present.

"The foreign engineers that I found on my South American trip were all awaiting an opportunity to enter the United States," Mr. Torkelson said. "The American engineers were disappointed and were eagerly looking forward to the completion of their contracts. Venezuela, whose capital is Caracas, is the least known of the South American countries — probably because it has no revolutions. Columbia has been very highly developed with American capital."



Professor C. I. Corp, faculty advisor of the Society, explained the value of the society to the undergraduate. L. J. Beck, president, announced the sophomore membership awards to the two sophomores whose activities during their freshmen year in the A. S. C. E. has been outstanding. The men are R. J. Poss and B. F. King. The toastmaster was R. T. Homewood, '27, instructor in hydraulics.

A. I. E. E. AND A. S. M. E. HOLD JOINT MEETING

The electrical and mechanical societies were well entertained on Wednesday, December 14, by a talk on "Acoustics" given by R. Norris, ch'15, of the Burgess Laboratories. His talk, while acquainting all those present with the latest development in this new branch of engineering, was made very interesting by his sparkling wit. He exhibited an electrical machine for making a "standard noise" and another for picking up this noise, in various parts of a room for determining the acoustical qualities of that room. Also he demonstrated how theatres are designed for best results and showed some of the sound absorbers that are used in advantageous positions to effect that result. On the whole, the joint meeting can well be called a success judging from the interest manifested by the students in asking questions of Mr. Norris.

It is suggested that more joint meetings be held not only among two of the societies at a time, but also among all as a whole. In this way good speakers and a large crowd could be assured.

BUILDING THE BRIDGE

An old man, going on a lone highway,
Came at the evening, cold and gray,
To a chasm vast and deep and wide,
Through which was flowing a sullen tide.
The old man crossed in the twilight dim,
The sullen stream had no fear for him;
But he turned when safe on the other side,
And built a bridge to span the tide.

"Old man," said a fellow pilgrim near,
"You are wasting your strength with building here;
Your journey will end with the ending day,
You never again will pass this way;
You've crossed the chasm, deep and wide,
Why build you this bridge at evening tide?"

The builder lifted his old gray head —
"Good friend, in the path I have come," he said,
"There followeth me after today,
A youth whose feet must pass this way.
This chasm that has been as naught to me,
To that fair-haired youth may a pitfall be;
He, too, must cross in the twilight dim —
Good friend, I am building this bridge for him!"

—Anon.

FACULTY PRESENTS RESEARCH DEVELOPMENTS

Investigations into chromium plating, attempts to case-harden steel by means of gas, the development of methods of treating waste products from pea canneries and creameries to make them inoffensive, and the designing of a double-speed induction motor for use in certain industrial operations were among the many research activities described and discussed at the annual meeting of the Research Committee of the College of Engineering.

Chromium, because of its extreme hardness and its resistance to tarnish, Professor O. P. Watts told the gathering, is coming into use as a plating material with great rapidity. The plating of dies with chromium has increased their life thirty fold, and a similar plating of electro-types used in printing has made it possible to take as many as two and one-half million impressions from the same plate. Chromium plating is now being applied to radiator and headlight bands for automobiles. Professor Watts, who has been investigating methods of applying the plating, has been invited to address a group of engineers in the General Motors organization in December.

A number of important results have already come from the small sanitary laboratory recently established by Professor C. I. Corp, who described numerous research projects that are being conducted in the Department of Hydraulic and Sanitary Engineering. The problem of treating pea-cannery wastes was brought to the laboratory by the State Board of Health. A method was devised and tried out in a near-by town with satisfactory results. Encouraging progress is also being made in the development of a method of treating milk wastes. Other investigations are going on under the direction of Professor B. W. Pegues, of the University of Louisiana, who is doing graduate work, Mr. Glenn Cox, and Professor L. H. Kessler.

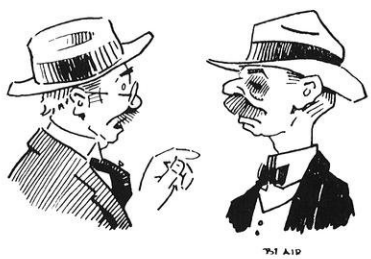
The Department of Electrical Engineering, according to Professor E. Bennett who described its activities, is pushing a great variety of investigations. Professor John E. Rice is working on the design of a new induction motor to meet certain demands of industry. Professor J. T. Rood has developed and is improving a device for the accurate measurement of noises for the Wisconsin Utilities Association, for the ultimate purpose of reducing noises arising from the operation of street cars. Professor L. J. Peters and Mr. G. Koehler are investigating the performance of receiving cicuits and vacuum-tube circuits and other phases of radio engineering. Mr. R. R. Benedict, a graduate student, is studying the behavior of various insulating materials.

(Continued on page 134)

Alumni Notes

LATEST CIVIL HOMECOMING NEWS

The classes which have been invited to attend the First Annual Homecoming for Civil Engineers to take place at the summer survey camp, the week end preceding the Fourth of July have been announced by Prof. R. S. Owen as follows: Classes of '11, '12, 13, '14, 19, '20, '21, and '22.



The good word is that everybody may attend but the above mentioned classes should be there in particular because it is their homecoming. All the professors and instructors in the Civil Engineering department will be on hand at camp to welcome their protegés of days gone by.

CIVILS

Abbott, Ellis P., c'08, has recently been made sales manager for the Crane Export Corporation. His headquarters will be in New York City although his duties will necessitate much foreign travel. He sailed November 23 from New York for South America on the first of his trips. Until recently Mr. Abbott has been chief engineer in the refining department for the Humble Oil and Refining Company with offices at Houston, Texas, and is well known as a refining expert, especially on the gulf coast.

Mr. Abbott has been actively engaged in engineering work for nineteen yars. He has been a designer of steel and concrete bridges in Portland, Oregon, and has done construction work in other Pacific coast cities.

Behrens, Ray E., c'19, assistant engineer of the Milwaukee Regional Planning Department, attended the Twenty-ninth Convention of the American Institute of Park Executives at Philadelphia and New York from September 26 to October 1. His address is 189 Stickney Street, Wauwatosa, Wis.

Crump, Arthur W., c'15, is associated with the American Appraisal Company, at the Milwaukee office. There are twenty-four other offices in the United States and one in Berlin, and the organization appraises on an average of $4,000,000 worth of property each day.

Gillette, Paul C., c'18, writes, "I had the very good fortune of getting married this last October to Miss Martha Taylor of Tampa, Florida. It all happened in Kentucky where I met her while I was on the hydro-electric project at Dix River."

Mr. Gillette has been in the valuation of public utilities for over two years. Until last June with Barker & Wheeler in charge of their valuations in Vermont; and since then with the Public Works Engineering Corporation, of New York, on the valuation of the New Chester Water Company at Chester, Pa., and of the West Virginia Water Service Company at Charleston, W. Va.

Kennedy, Frank M., c'08, holds the rank of Major in the Air Corps and has been assigned to the offices of the Chief of Air Corps at Washington.

Loverud, Earl K., c'23, has entered the employ of the Harnischfeger Corporation of Milwaukee. Earlier in the year, Loverud visited South America and spent some time on the west coast. His permanent address is Stoughton, Wisconsin.

Markwardt, L. J., c'12, CE'22, was elected president of the Technical Club of Madison at the December meeting of the organization. Mr. Markwardt is at present lecturer at the Forest Products laboratory at Madison, Wisconsin.

Schad, James A., c'16, gives his new residence address as 100 Adams Street, Hinsdale, Ill.

Sogard, Larry, c'24, is junior engineer with the Sanitary District of Chicago, and writes, "I am now doing instrument work and inspection on the construction of a 14-inch cast iron sludge line, being laid between the new north-side treatment works and the westside works, now under construction." His address is 501 N. Central Ave., Chicago, Illinois.

Stearns, Edward W., c'07, is with the Port of New York Authority as Assistant to the Bridge Engineer, a position he has held since January 1st, 1927. His residence address is 103 N. Walnut St., East Orange, N. J.

Vernon, J. Rexford, c'18, is the proud father of a son, Rexford Rand, born November 20, at Evanston, Ill.

Wagner, K. E., c'10, is managing the Western office of the Whitacre Engineering Co., 228 N. La Salle St., Chicago. He and Mrs. Wagner (Ruby Walton, U. W. '19) have just moved into the new home they have built at 1831 Kincaid Ave., Highland Park, Ill.

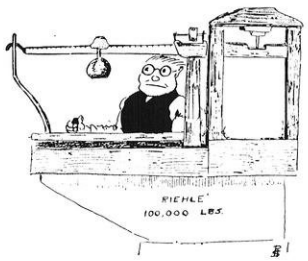
Wheaton, Herbert H., c'22, is associate professor of engineering at the Fresno State College, at Fresno, California.

Whitney, A. B., c'08, whose home is in Upland, Calif., sends his subscription from Paris, France. He tells us he will be in Europe for a year.

Wisner, John C., c'26, who is with the First Division of the Wisconsin Highway Commission has been stationed at Beloit for nearly a year in charge of the construction of the Portland Avenue Bridge. On completion of the job about December

first, he returned to the division headquarters at Madison, and lives at 109 N. Spooner Street.

Wiepking, C. A., c'21, has taken a position with the Bureau of Street Construction in the Department of Public Works of Milwaukee. Mr. Wiepking has been engaged to develop a municipal testing laboratory where all paving eventually, all materials used in municipal construction will be subjected to laboratory tests. A temporary laboratory has been located at 35th and Clyborn Streets, and during the summer, field tests were made on all concrete work done in the city. The 1928 municipal budget provides a sum of $58,000 for the erection and equipment of a complete testing laboratory this year. Besides the design on the new laboratory, Wiepking is working on a complete portable laboratory mounted on a motor truck for the purpose of making field tests right on the job. **R. W. Gamble,** c'16, Superintendent of Street Construction and Repair, is in charge of the department in which the laboratory is being developed. Wiepking was formerly instructor in Mechanics at the University. His present address is 742—46th St., Milwaukee, Wisconsin.



CHEMICALS

Norris, R. F., ch'15, gave a lecture on architectural acoustics at a joint meeting of the student chapter of the A. S. M. E. and the A. I. E. E. on December 14. Mr. Norris is connected with the Burgess Laboratories, where his work on acoustics has been carried on.

Pitzner, Alvin F., ch'21, was married to Miss Alice Girard, daughter of Major A. O. Girard, of South Bend, Indiana, on the 28th of May. Mr. Pitzner is practising patent law at 1015 Monadnock Block, Chicago, Illinois.

Ross, George H., ch'26, of Chicago was married to Miss Elizabeth Cooley Adams on November 15, at Springfield, Massachusetts. Mr. Ross is employed as assistant engineer with the Illinois Power and Light Co. They will be at home after January 15 at 550 Gooding St., La Salle, Ill.

ELECTRICALS

Ackerman, A. J., e'26, was recently married to Miss Cecelia H. Stockman of Mankato, Minn. Mr. Ackerman who was formerly with Stone and Webster, Inc., Boston, is now with the Aluminum Company of America in their Hydraulic Engineering Department, and is located at Pittsburgh, Pa.

Allen, John S., e'97, formerly a member of the Wisconsin Railroad Commission, and now a consulting engineer at 1 S. Pinckney St., Madison, Wisconsin, has been made a director of the Madison Technical Club.

Bean, George E., e'24, is at present employed by the city of Milwaukee as assistant civil engineer. His address is 253 Biddle St. Until recently he was located at Blackfoot, Idaho.

Carlson, M. S., e'25, who is employed by the General Electric Company, has been transferred from Schenectady to the Switchboard Sales Department at 6901 Elmwood Avenue, Philadelphia, Pa.

Davis, Robert J., e'27, has changed his address to Y. M. C. A., Schenectady, New York, and writes that our news "of the school and the gang is mighty welcome."

Erickson, Ray, e'27, former varsity track man, who is working in the Research Dept. of the Bell Telephone Laboratories writes, "I was rather lucky when I got back here. I bummed around until the middle of August and then decided to get to work. When I went over to the lab. my old boss immediately put me to work. I am in the same department — the Research Department — but in a different group. Formerly I worked on transmitters; now I am doing receiver development and all the associate receiver development is in my hands. . . . **Irv Gerks,** e'27, and **Paul Koos,** e'27, are working here and I see them occasionally." The Bell Laboratories are at 463 West Street, New York City, N. Y.

Hill, George, e'23, has been made manager of the Los Angeles office of the Curtis Lighting Company; he was transferred to the coast from the Milwaukee office.

Johnson, C. E., e'26, has been transferred to the Investigation Division of the Commonwealth Power Corporation, at Jackson, Michigan. He writes that a live Badger Alumni Association in Jackson makes things very enjoyable. His address is 413 First Street, Jackson, Mich.

Jordan R. DeWitt, e'27, is preparing an article in connection with his work on the "Talking movie" at the General Electric Laboratories at Schenectady, New York. Jordan writes that he is still single but would like to get some tips on how to remain happy though single from any of the boys who can talk from experience.

Kates, Willard A., e'21, a former editor of the Wisconsin Engineer, has moved from 418 S. 44th Street, Philadelphia, to 27 Chatham Road, Ardmore, Pa.

Murphy, M. N., e'01, has changed his residence to 7558 Crandon Avenue, Chicago, Ill.

Schneider, Claire L., e'18, has become vice-president of the First National Bank of Sheldon, Iowa, as a result of the purchase of the total stock of the bank by himself, his father and his brother Ralph. Prior to the purchase of the bank the Schneiders were connected with the Capital City Culvert Co. of Madison, Wisconsin. Mr. Claire Schneider was treasurer and general manager and his father was vice-president.

Schuchardt, R. F., e'97, with the Commonwealth Edison Company, Chicago, has been given the sole nomination for the presidency of the American Institute of Electrical Engineers. While the actual election does not take place until May, with this unanimous nomination Mr. Schuchardt's election is practically assured. His predecessors in tht presidency have been men of the type of Steinmetz and Pupin.

Seastone, John, e'26, is in the Research Department of the Westinghouse Manufacturing Company, at East Pittsburgh, Pa., and spends his spare time in his surburban bungalow at R. F. D. 1, Turtle Creek, Pa.

Truran, Walter W., e'17, is in charge of Toll Fundamental Plan work of the Vice President's organization of the New York Bell Telephone Company and finds the work very interesting. His address is 25th floor, 140 West Street, New York City.

Wolfe, Harry C., e'26, who recently left the Westinghouse Company at Pittsburgh to take a position with the Chromium Corporation of America, has just been transferred to the Cleveland office of the latter firm. He gives his business address as 3125 Perkins Ave., Cleveland, Ohio, and resides at 1839 E. 90th Street.

Wu, W. C., e'23, gives his new address as 195 Claremont Avenue, New York, N. Y.

(Continued on page 134)

NEW SERUM NEEDED SAYS GRAD

The Grad of Recent Vintage glanced into the office of his former faculty adviser and waved his hand in greeting, and that action led to a brief but interesting pow wow.

"I'm now superintendent for a firm of architects," announced the Grad, "and am busy watching construction in addition to doing some structural design."

The talk flowed here and there.

"Oh, I have ambitions," said the Grad in answer to the question, "but I believe that I am learning some things that I need right here in the field. I am learning, for one thing, that different men must be handled in different ways.

"I went onto one job as architect's representative and the contractor came up to me aggressively with a mean look and 'Who are you?' for a welcome. I looked him over from feet to face (the Grad is big and an athlete) and came back at him with, 'Well, who the hell are you?' That jarred him up so that he began to snap out of it. 'Oh, you are the architect's man, aren't you?' he asked. 'Yes', I said, 'what can I do for you?' Our relationship was settled right there.

"In another case, a different approach was necessary. I went onto the job and found the contractor obviously pugnacious and set for a squabble, but not ready to start it. He was waiting for me to start something. I talked to him for two hours without a word about the job. By the end of that talk, he had relaxed enough so that I could bring up the matter of the work at hand without starting a fight. He proved to be anxious to do the right thing. He even tore out a lot of wall on one occasion because it wasn't what it should be, and he did it willingly. In the end, he took my suggestions about the job and liked it."

The topic of mistakes came up.

"Oh, I make mistakes enough," said the Grad, "I remember that I worried for a week about one of them. It wasn't that the mistake was important. It really didn't matter much, but I hated to have the boss know that I would make an unimportant mistake. It isn't like the feeling that I had when I was a student and made a mistake in a school exercise. It didn't get under my hide when the *instructor* showed me my error. Its different outside; a man has to be right and he has to be right the first time, too."

The bell rang and the professor arose to leave.

"When the sense of error strikes me," said the Grad as he prepared to go, "and the hot sweat trickles down my spine, it doesn't resemble in the least the slight feeling of annoyance that used to arise in my bosom when I was caught in an error while a student. If the biologists could only make a serum of that sensation and inject it into the frosh engineers, what a difference it would make. Goodbye."

LEARNING WITHOUT LANGUAGE

"A hypothesis," wrote a junior civil, "is the longest side of a right triangle." Don't laugh, gentle reader. It is no laughing matter. In the first place, such glaring ignorance of common words is not an uncommon thing in our college. There are plenty of bright young engineering students who think that *refractory* means the place where students eat, that *alluvium* is a bright metal, and that a *sextant* is the man who rings the church bell. We have today in our universities the curious spectacle of men and women trying to acquire learning from books and lectures without first having learned the meaning of words. Any instructor who doubts this will have an illuminating experience if some day he will select from the text book ten words whose meaning is important and put them on the board and have the class try to write definitions for the words. The instructor will learn to his surprise that his class will probably average about four right out of the ten. It may be interesting to speculate about the causes for such a condition, but it will probably be of more practical benefit to devise means for improving matters. Of course, the vocabulary should have been acquired before the man reaches the university; but it hasn't been, and the job is up to the university and the student.

THE CANDIDACY OF HOOVER

Herbert Hoover is to be a candidate for the presidency of the United States. The announcement comes from Senator George E. Moses in a recently published article. Hoover is not to come before the Kansas City convention as a dark horse, but as a candidate with so strong a backing that those politicians who control the G. O. P. affairs will be forced to recognize him as a formidable contender for the nomination. This is good news to all who are hoping for the election of a genuine statesman and a continuance of the sound policies under which this country has operated successfully in recent years. Hoover is generally recognized as the logical nominee of the Republican party, but the man on the street has been inclined to feel that "Hoover is too good a man to be acceptable to the politicians." Although he calls himself a party man, and, presumably, submits himself to party discipline, he is independent in thought and action and follows the policy that leads to ultimate good rather

(Continued on page 134)

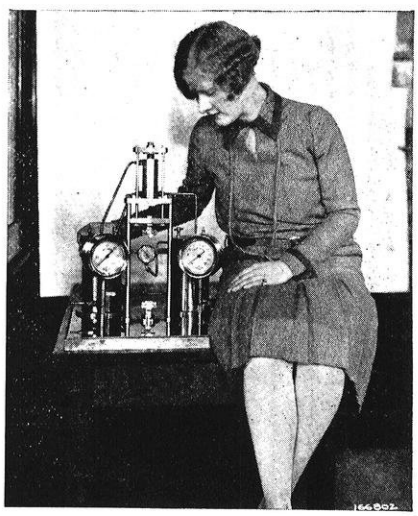
Engineering Review

TESTING THE TRESSES

The super-barber of tomorrow may be asking his customer —

"Would you like a nice hair tension test today?"

The girl in the picture has just taken a test to find out how marcelling affects the brittleness of her tresses. She is seen reading the results of the test in the dials of a highly sensitive machine recently developed. It was built primarily to determine the strength of such delicate materials as hair springs, radio filament wires, loud speaker diaphragms, and small spring washers for electrical instruments. This machine records accurately just how much force these fragile units will withstand in actual operation. It is operated by compressed air and oil.



—*Westinghouse Bulletin*

CAST STONE

A process for casting stone in much the same manner as that in which iron is cast is now in use. A flexible mixture is obtained by using one part of cement to three and one-half parts of marble or granite aggregate, with eight gallons of water to one bag of cement. Three sizes of aggregates are used, the largest screening through a one-half inch mesh. It is possible to make statuary castings which resemble the finest carved work. Necessarily the batch must be agitated while it is being poured to secure uniform distribution of the aggregate. An advantage of cast stone work is that large pieces may be made hollow.

—*Scientific American.*

PREDICT METRIC VICTORY IN NEW CONGRESS

That the United States during the coming session of Congress will take final legislative action to place its merchandising on the decimal metric basis in weights and measures was the declaration made at the recent executive conference of the All-American Standards Council, held in San Francisco. A bill introducing the metric system was brought before Congress some time ago but was killed by one of the committees to which it was referred. A canvass of the United States Senate has indicated an almost certain majority for its adoption at the next session. The United States and the British Commonwealths are, at the present time, the only civilized nations which are not using the Metric System in merchandising.

NATIONAL UNIFORMITY IN BOLT AND NUT SIZES

Tables of standard sizes for square and hexagonal bolt heads and nuts, and for the corresponding wrench openings were recently approved by the American Engineering Standards Committee as a Tentative American Standard. The tables were established by a sectional committee appointed under the procedure of the A. E. S. C. by the organizations sponsoring the work, the Society of Automotive Engineers and the American Society of Mechanical Engineers. The new standard is meant to introduce national uniformity in a field where wasteful diversity has reigned for some time. The new sizes are intended to supersede all existing standards which have grown up from commercial standards.

SILENT ELECTRIC SHOVEL NOW IN OPERATION

Those who live or work in the vicinity of new real estate developements or other public improvements such as subways and bridges, will welcome the news that a noiseless, smokeless shovel has been developed by the building industry for use in the noiseless revolution which is now going on throughout the country. This latest scientific development consists of a shovel which is equipped with a special mill-type motor. This motor is operated by variable voltage control. This affords all the speed range and all the flexibility of steam but does away with the chugging and hissing noises and eliminates all smoke. This new shovel is also more economical than the old type as there are no firemen necessary, no fuel to handle and haul, no problem of water supply, and no lost time waiting for steam pressure.

ELECTRIC ARC DECOMPOSES WATER

What will 6,000 volts of direct current, at the rate of 5 to 6 amperes, do to a stream of water? This heavy current will decompose the water into its constituents, hydrogen and oxygen, and reburns the hydrogen to form more water. In addition, slight impurities in the water were burned, the flame being colored reddish-purple by potassium salts, golden yellow by sodium, and green by copper. The arc varied in length from 3 to 5 inches, and expanded 25 kilowatts power — enough to light 600 ordinary 40-watt house lamps. Despite the strong flow of water, the arc continually tried to assume a cork-screw shape, apparently following the magnetic field produced by the current in the water stream.

PICTURES THAT LIVE

(Continued from page 119)

graphically-recorded voice projector. The positive film is first placed on the left hand drum (90), and is then fed down through suitable guides and carriers past the lens (96). Tension is maintained by a roll (93) located midway between the first lens slit at (96) and the regular motion picture lens (92). The aperture in front of lens (92) must be of such a nature as to allow only the motion picture proper to be projected, cutting out from the screen any trace of the voice record. Tension is maintained on the film by successively arranged rollers, and the film is taken up again on drum (94).

Consider that a length of film has been placed in the machine as indicated in figure 1, the actions are then as follows. The synchronous motor on the motion picture projector is started up and the film begins to unreel past the upper aperture at (96) at a definite rate of speed. This aperture is no wider than the voice band on the film, and as the film passes by the slit a powerful beam of light from the bulb (95) passes through it and strikes the sensitive element (98) of a photoelectric cell — the electric eye of the talking motion picture. Here the light pulsations caused by passing a beam of light through the fine photographic markings on the film are converted to electrical impulses in a circuit which contains the grid of an initial stage of vacuum tube amplification (104). The action of a photoelectric cell is quite well known, the so-called "electric eye" depending for its action upon the effect of varying light intensities on certain metals. Seliunimum, for example, has the property of changing its electrical resistance when placed under a light, and so adapts itself to use in phonophotography. There are many types of photoelectric cells, all of which are used more or less in reproducing photographically recorded voice impulses, but a detailed discussion of such devices is quite beyond the scope of this article.

After passing the first amplifier (104) the electrical impulses generated in the "electric eye" and transmitted through its copper nerves (100), pass to a high power audio frequency amplifier No. 2 at (110), the output from this latter amplifier being carried directly to the loud speaking apparatus (89) located in the vicinity of the screen (88). The loudness of the sound so produced is dependent both upon the amount of light striking the sensitive photoelectric cell and upon the amplification used.

It will be seen that since the film passes the voice-pick-off aperture first, there must be some rearrangement of the sound and picture records in order to synchronize the sound with the picture as each exposure passes the projection aperture at (92). To accomplish this, the distance between apertures must be accurately measured, and when the positive print is being made up as previously explained, the voice record is printed a corresponding distance behind the picture record. With the standard "Simplex" projector this distance amounts to approximately 17 inches.

Thus we arrive at an understanding of how the talking motion picture is photographically composed through the use of dual cameras perfectly synchronized, and we also see how the positive print which is a combination of two separate negatives is used as a reproducing medium, recalling to our eyes and to our ears definitely arranged scenes and sounds.

Thus far no mention has been made of what may be regarded as the most important characteristic of the dual camera method of recording talking motion pictures, namely the extreme flexibility of the scheme itself. In the previously mentioned example of the lady playing on a harp, it was assumed for simplicity that both the tones and picture records were made with all of the attendant apparatus near at hand. That such an arrangement is unnecessary was clearly demonstrated in a recent experiment made on "Edison Night", October 21, 1927. On this occasion a camera driven by a synchronous motor was set up and focused upon the little group assembled before a radio microphone in Mr. Edison's laboratory. When the interview between Mr. E. W. Rice, Jr., and Mr. Edison was about to begin, the camera motor was started, and at the same time the synchronous motor on an oscillograph recorder located nearly two hundred miles away fell into step. Telephone wires carried the interview taking place in West Orange, New Jersey, directly to the vibrating element of the oscillograph, and from the two films made simultaneously at widely separate points, a positive print was easly made as previously described.

Linking together in concrete form much of the worth while work of the past with the present is the new "talking motion picture projector" or "Kinegraphone", a name which has been coined to describe in itself the entire apparatus used in recording and reproducing sound and action pictures in synchronism. This machine is at present largely in an experimental state, and hence, little information is avaiable upon its mechanical and electrical details. It must therefore, suffice to say in passing that the Kinegraphone embodies to a certain extent the reproducing scheme herein set forth with certain necessary modifications and additions.

At present it is extremely difficult to do more than predict a few of the many uses which may in time be found for the talking motion picture. Of immediate interest to the general public is the fact that the talking motion picture may be adapted to supplying a full orchestral accompaniment for pictures. This is of great value to the exhibitor in a small town who finds it impossible to spend a great deal of money on the music score of his motion picture exhibitions. Through the new type of talking motion pictures people in small communities will be enabled to both see and hear famed speakers or musical organizations. Educationally, such a system will be of great value, since it will be possible to record lectures and demonstrations simultaneously, and to later show them in widely separated classrooms not equipped with sufficient laboratory apparatus to make such experiments feasible. It is entirely possible

to predict that when the time does arrive when motion pictures will register with absolute fidelity all of the natural colors involved in photographing a production, suitable talking motion picture apparatus will have been developed so that entire operas may be shown upon the screen and simultaneously heard by the audience.

Is this a little visionary? Perhaps. Impractical, impossible or improbable? Three times "no" in the future.

FRENCH ARMY WILL TRAVEL IN AUTOS RUN WITH CHARCOAL

The French army is gradually converting its automobiles into wood burning vehicles.

The camions, gun tractors, ammunition carriers and ambulances of the future French army divisions will travel on "green" coal.

So far, only the large trucks have been transformed to wood burners. But the use of wood as a national fuel is being systematically developed in order that France in case of another war may be independent of the foreign monopolies which now control the gasoline supply of the world.

According to various experts, the French forests can provide an annual production of approximately 800,000 tons of charcoal for wood burning engines in addition to the 275,000 tons now annually produced.

This would insure a sufficient supply for the army. Gasoline, of course, would still be needed for aeroplanes. But the recently discovered oil wells in Mesopotamia are expected to supply France with enough oil for the needs of the air service.

LARGEST TRANSFORMER IN THE WORLD

Capable of furnishing sufficient electrical power to light, heat, and transport a city of half a million people, seven transformers the largest in the world, have just been completed at the Sharon Works of the Westinghouse Electric and Manufacturing Company. The gigantic electrical mastodons are for use near Philadelphia in connection with the new Conowingo Dam project of the Philadelphia Electric Company.

The transformers are gigantic in size and appearance. Each stands over 31 feet in height, weighs over 200 tons and has a voltage of 220,000 volts which is the highest in actual use in electric power transmission. Each year $12,000,000 worth of electricity will pass through the seven transformers.

Several cars will be required to ship each transformer. To carry the heaviest part, railroad officials found it necessay to bulid a special flat car, having twelve wheels and a carrying capacity of 220,000 pounds.

The seven transformers require 20 car loads of oil for cooling and insulation.

WHAT IS YOUR ENGINEERING HOBBY?

Get some photos of it, write it up, and send it in to the *Engineer*. This is your magazine. Contribute to it.

THE AUTO IN GREAT BRITAIN

When Mr. John Bull intends to purchase an automobile, he goes to a *concessionary* and the following procedure takes place:

Johnny adjusts his monocle, raises the *bonnet* of the car in question, and examining the *engine*, notes with satisfaction that it is small; thus being economical in respect to tax and *petrol*. The salesman tells him that the car will run even more economically if he uses *petrol* with tetra-ethyl *spirit* in it, also the *decarbonising operation* will have to be performed less frequently. The prospective customer tries his weight against the *wings*, and looking under them notes the brand of *tyres* used. Meanwhile the salesman raves and expounds the advantages of the valve in head motor over the motor with *side-by-side* valves. Mr. Salesman goes on and tells his victim how roomy the two passenger *dickey-compartment* of the *drop-head* coupe is. The prospect is told how the posts on *eyether* side of the *screen* are narrow so as to allow clear vision. The *tell-tale* and other instruments are grouped nicely on the dashboard. Johnny Bull is asked to notice that the car is equipped with Shurfire *sparking plugs*, Mixum *carburetter*, Greaso oil caps at all chassis lubrication points, and a convenient *change gears lever*. The car also has a Neverslip cone clutch (never *disengage* either). After noticing that the car has the ultra modern feature of having the *petrol* tank *amidships*, and arranging the trade-in price on his *crock*, Mr. Bull drives off with a 1½ liter 10/23 H. P. Hoopla Hoopla Six. —*W. Wilson.*

EDITORIALS

(Continued from page 128)

than the policy that considers immediate expediency. Such a man is bound to be unpopular with short-sighted people. That has been demonstrated by the attacks already made upon him for his stand on certain farm-relief suggestions. In spite of this, there is a strong sentiment in favor of Hoover among the rank and file of the country. If that sentiment can find an outlet, there is apt to be a Hoover landslide at the convention and at the polls.

CAMPUS NOTES

(Continued from page 125)

Professor L. E. A. Kelso, Professor A. Meyer, Mr. G. F. Tracey, Mr. L. C. Larson, and Mr. C. A. Andree are other members of the department who are engaged in research problems.

The case-hardening of steel by means of gas instead of by the use of charcoal is being studied by Professor R. A. Ragatz, who is trying to determine the cause for certain erratic behavior in the process which interferes with its successful use. Professor O. A. Hougen is also working on a gas problem in connection with the removal of rust, moisture, and tar from the gas. Mr. K. M. Watson and Mr. A. J. Kromholz are other members of the Department of Chemical Engineering who are making investigations.

That close and satisfactory relationships are being rapidly established between the College of Engineering and various industries throughout the state was announced by Professor Ben G. Elliott, who, for several years, has devoted a considerable portion of his time to visiting the industries and establishing close contacts between them and the college. —*L. F. V.*

ALUMNI NOTES

(Continued from page 127)

MINERS

Hiestand, J. R., min'21, who was formerly with the Wisconsin Highway Commission at Lancaster, Wis., is now with Knox T. Thomas, Consulting Engineer, of Atlanta, Georgia. At present he is engaged on municipal work at Cartersville, Ga., but spent the holidays in Madison visiting relatives.

Jones, T. D., min'22, who has been Superintendent of the refinery at the Omaha plant of the American Smelting and Refining Company, has been transferred to Perth Amboy, New Jersey, where he will build and later operate an electrolytic lead refinery.

Peterson, Arthur, min'18, has been promoted to the position of General Superintendent of the Cornwall Ore Mines of the Bethlehem Mines Co., Cornwall, Pennsylvania.

Siren, Edward R., min'25, has become mining engineer for the American Smelting and Refining Company, and is at present located at Parral, Chihuahua, Merico. He was formerly employed by the Montreal Mining Company, of Montreal, Wisconsin.

Werba, Edward O., min'19, has left the American Light and Traction Company of Grand Rapids, Michigan, and is employed as travelling engineer by the Central Public Service Corporation of Chicago, Illinois.

Yundt, Evan R., min'27, has moved to 7255 Yates Avenue, Chicago, Ill. Mr. Yundt is with the Illinois Steel Company.

MECHANICALS

Caldwell, Earl L., m'24, is in the Structural and Technical Bureau of the Portland Cement Association of Chicago. His address is 5920 Ridge Avenue, Chicago, Ill.

Case, Clinton D., m ex'28, is ensign in the U. S. Navy, and is stationed aboard the U. S. S. West Virginia, cruising the Pacific coast.

Connell, Edward J., m'15, asks us to send his copy of the Engineer to Lock Box 484, c/o Joseph T. Ryerson & Son, Inc., Jersey City, N. J.

Dorner, Fred H., m'05, past president of the Engineer's Society of Milwaukee, was elected manager of the local section of the American Society of Mechanical Engineers for a second term. Mr. Dorner is one of the charter members of the society and is the only member who has served two terms as its president.

Greiling, Winfred W., m'28, has become manager of the Toledo office of the Amercian Blower Company. He is living at 130-23rd Street, Toledo, Ohio.

Johnson, Clarence, m'27, has left the employ of the T. M. E. R. & L. Co. of Milwaukee, and is now sales engineer for the American Blower Co. of Milwaukee. He is living at his home, 1844 Taylor Avenue, Racine, Wisconsin.

MacArthur, Donald, m'04, has changed his street address to 80 Douglas Road, Glenn Ridge, N. J. He is Vice President of the Seaboard By-Product Coke Company of Jersey City, New Jersey.

Williams, Millard J. m'27, who is working for the Worthington Pump and Machinery Co. at Holyoke, Mass., writes, "Well, here I am up in Massachusetts at another plant of the corporation trying to get some dope on triplex power pumps. . . . I am quite near the territory that was flooded in the New England floods of last month, but everything has subsided by this time. I expect to get over to Lynn, Massachusetts, right after New Years, but the way things look now, I guess that I will be eating Christmas dinner in this town." "Mike's" address for the time being will be care of the company at Holyoke, Mass.

AFTER COLLEGE WHAT?

(Continued from page 123)

tions are in my favor.

I have had experience on two railroad grade separation surveys, and one alignment survey for a proposed gravel road improvement, besides the ten mile survey first mentioned and the Ashland job we are now working on. I have also had the opportunity to make three bridge crossing surveys, and one alignment survey, all of which have been of real educational value to me.

MANAGING THE BOSS

(Continued from page 122)

or unmangeable. When a promising plan is suggested his vigorous imagination, leaping over the obstacles, grasps at once the possibilities. He fairly sees the machine, if machine it be, already constructed and running. The idea looks so good that he wants to

build ten right away.

In the management of this kind of boss it would seem desirable that the first trials of any new idea should be carried out sub-rosa and that the boss should not be allowed to see the gradual progress made in overcoming unexpected difficulties, but should be called in for a demonstration only when final success has been attained.

A type of boss — the bully — needs but little discussion. He takes advantage of his power to tyrannize over his subordinates. To those who will stand it he is abusive without measure, to others he is as abusive as he dares to be. The only way to manage such a boss is to tell him plainly that he must speak like a gentleman or not speak at all. Such a man generally learns quickly whom he can revile with impunity and whom he must handle more carefully.

The most irritating type is the timid boss — he who is always afraid to take an important step. The only way to manage a boss of this kind is for the subordinate to supply the courage which his boss lacks. He must force the decision and take the responsibility on himself. The result of this is, if the new idea turns out well, the boss takes all the credit; if it fails, the subordinate gets the blame. However, one who is unwilling to face this situation is unworthy of a position of responsibility as boss-manager.

First cousin to the timid boss is the lazy one. Such a boss may be a man of considerable ability with an attractive personality and excellent judgment — capable of accomplishing much for the business if properly managed. While the manager of such a boss can remedy the situation somewhat by extra labor to make up for the small amount of work turned out by his boss, this does not entirely solve the difficulty. There are some things which only the boss himself can do — some people that he must see personally, some letters that only he can write. Here again, an assistant well versed in the science of Boss Management can increase the output of his department by fifty or a hundred percent by skillful management. He must goad his boss into action. At times he will have to make himself very disagreeable and state things very plainly in order to overcome the torpor of his chief. He can have the satisfaction of knowing that his boss will be secretly — almost pathetically — grateful. No one is so genuinely grateful as a lazy man if someone will provide him with the stimulus to action which he himself constantly lacks, and knows that he lacks.

One of the greatest privileges in life is to work under a boss whom one can admire and respect — a man who is a real leader, who gives his own best effort to his work and exacts the best from those under him. Such a man may be a hard taskmaster, he may be impatient or incompetent, but his subordinates never want to leave him for a boss who will accept sloppy work.

Such leaders are bosses, not merely by virtue of their position, but because they are the best men in the

organization "by a long sea mile". Wherever they sit is indeed the head of the table by general consent. Real leaders of this type are found in all walks of life. Such were Carnegie, James J. Hill, Major General Summerall, U. S. A., Bismarck, Lord Kitchener, President Roosevelt.

It is the greatest stimulus, the greatest inspiration to work under such a boss. Rather than a large salary, rather than pleasant work, rather than good future, a young man should pick an inspiring boss. The rest will take care of itself.

Too often, however, we must build with the tools at hand. We must work with the bosses whom fate sends us. In such cases, we can perform a great service by an intelligent practice of the Science of Boss Management.

THOUGHTS OF AN IMPLEMENT ENGINEER

(Continued from page 121)

modern equipment, one man alone can operate 160 to 320 acres, according to his crop. In lister wheat territory, with tractor power, one man can handle 320 acres and not work more than 100 to 150 days a year. With five men and five 15-30 tractors, with three 14" bottoms, traveling three miles per hour, a farm of 640 acres can be plowed in 12 days, where formerly five men and ten horses took 64 days to cover that area.

Corn cultivation has always been one of the slowest, meanest, hardest jobs in farming—a hot and dusty task, as exhausting to the farmer as to his horses. Under horsepower cultivation the single handed farmer has all he can do to take care of 40 acres of corn. With the all-purpose tractor he can handle 125 to 150 acres; and with that kind of a tractor and lister cultivator, he can easily handle 250 acres.

Grain can be planted, cultivated, or harvested in a similar manner regularly and easily at the rate of 25 acres a day per man; 50 acres per day can be covered under pressure. One man with three boys handles nearly 2000 acres of Kansas land, year in and year out. These examples definitely indicate progress which has been made in mechanizing agriculture.

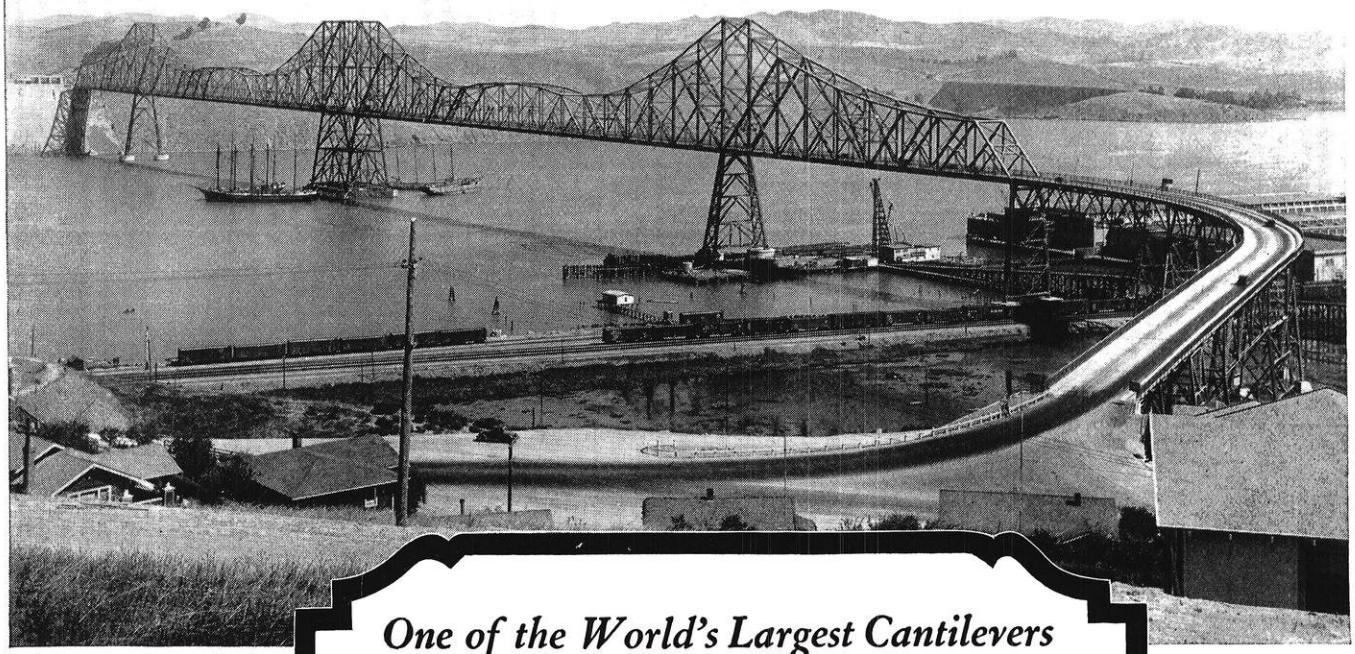
Another way of indicating the gains made by machinery can be stated in terms of man-hours devoted to an acre to produce a crop by various methods. For example: Using the standard binder method in grain it takes 4.6 man-hours to harvest an acre; using a header, 3.8 man-hours, while with the harvester-thresher it is .75 man-hours, or a reduction to less than one-sixth.

Moreover, owing to the handling methods used, the loss of grain shattered or shaken out in the process of gathering amounts to the following: Standard binder method, 6 per cent loss; header method, 3½ per cent, harvester-thresher, 2½ per cent, which saving alone is a marked advance.

It is logical, then, that the harvester-thresher is extending its uses into areas formerly not considered suitable to this method of harvesting.

Much gain also can be attributed to what may be

Bridging Carquinez Strait

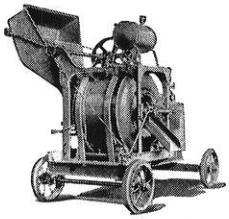


One of the World's Largest Cantilevers

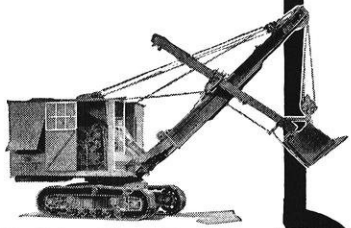
THE new highway toll bridge across Carquinez Strait in California replaces an old historic ferry on the route from San Francisco east and north to Sacramento. It is the cantilever type with two main spans of 1100 feet each, making it the second largest of its kind in the United States and the fourth largest in the world.

The Carquinez bridge is also noted for its deep pier foundations which are 132 ft. below water level with a total height of 440 ft. The total length of the main structure is 3350 ft., including two anchor arms of 500 ft. each and a central tower span of 150 ft.

A Koehring 14S mixer was used in mixing the concrete for the floor of this giant cantilever and a ten year old Koehring mixer did the mixing for the piers —dominant strength concrete for lasting dependability. Three Koehring Heavy Duty Shovels excavated 207,000 cubic yards of material in building the 1.8 miles of the southern approach.



Koehring Heavy Duty Construction Mixer No. 14-S



Koehring Heavy Duty Shovel No. 301

The revised edition of "Concrete — Its Manufacture and Use," a complete treatise and handbook on present methods of preparing and handling portland cement concrete, is now ready for distribution. To engineering students, faculty members and others interested we shall gladly send a copy on request.

KOEHRING COMPANY
MILWAUKEE, WISCONSIN
Manufacturers of
Pavers, Mixers—Gasoline Shovels, Cranes and Draglines

KOEHRING HEAVY DUTY

KOEHRING

Please mention The Wisconsin Engineer when you write

called the timeliness of action with these high-capacity machines. Plowing can be done at the most suitable hour, night and day operation of the untiring tractor being entirely possible. A longer growing season is certain in the higher latitudes, especially.

It is not alone the inadequate returns of farming that tend to force men out of agriculture. The excessively hard work even with the best horse power equipment has had its effect in the same direction. Mechanical power appliances are rapidly reducing both these drawbacks. Tractor farming not only improves the farmer's net return by inceasing the production per man, and thereby reducing production costs, but it also takes still more of the back-breaking labor out of farming. Any man who has ever tried it will remember the weariness resulting from a full day's work driving a horse-drawn binder. With one loader, the power take-off and a 10-foot binder, a man can get twice as much work done in a day and not be half as weary.

Often the farm implement industry encounters the preconceived notion that while power farming equipment can and does reduce farm operating costs, it costs too much. This notion is a sheer fallacy; it is equally unsound whether you measure the price of power implements in terms of what they will earn, or whether you consider the actual investment in dollars. The fact is that any farmer can purchase all the power equipment needed to operate a farm of 160 acres for the same amount of money it would cost him to buy a medium-priced automobile.

Especially is the farm implement field full of invitation and challenge to the engineering profession. A score of more years ago we used to hear talk in engineering circles about reducing the designing and development of farm implements to an exact science. That hope as a prophecy has not been in any degree fulfilled.

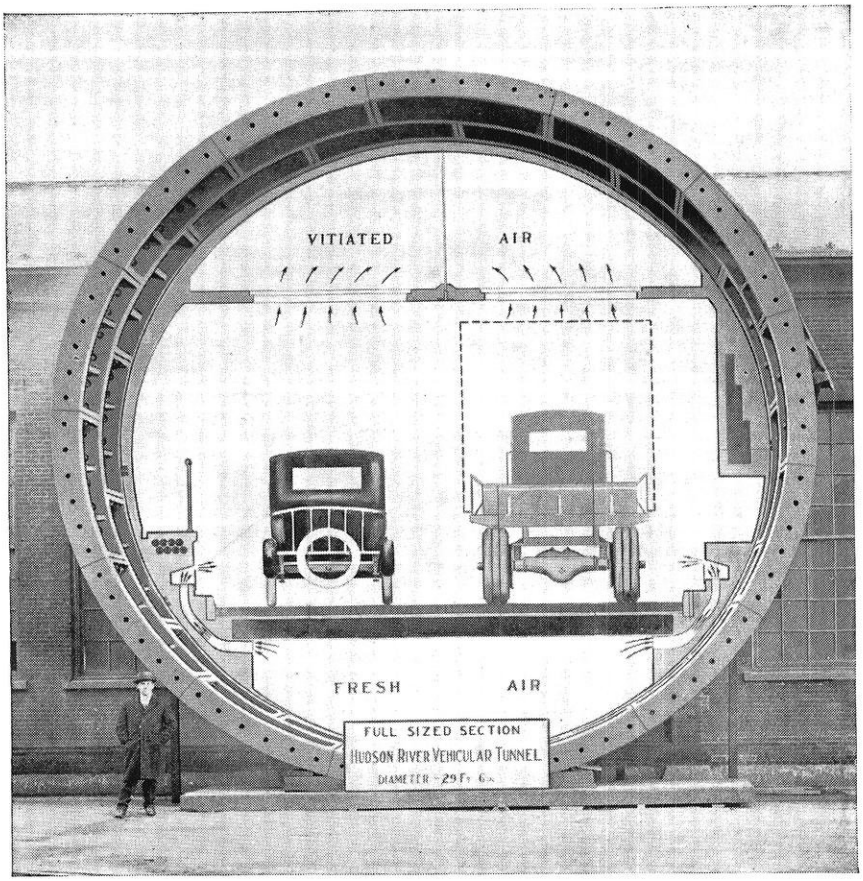
For one thing, perhaps the mechanical-minded young men of our generation, whether from farm, factory, or technical school, have been more attracted by automobile engineering with its more glittering rewards and its better defined science than by farm implement engineering.

Lately we have seen the beginning of some significant collective efforts in our field. One such effort is that of the National Committee on the Relation of Electricity to Agriculture, which is actively and cooperatively analyzing the possibilities in that field through a series of research projects. Another similar cooperative effort is that of the Committee on Farm Machinery Research, which has undertaken a survey of numerous agricultural engineering problems. The committee is organizing the work, reducing duplication and assigning well defined problems. Here we see the U. S. Department of Agriculture, the American Society of Agricultural Engineers, the agricultural colleges, the National Association of Farm Equipment Manufacturers, and others, cooperating to determine basic facts with a view to outlining efforts toward greater economic success in the design and use of farm implements.

R. E. BEDWORTH,
Salesman,
Yale, '17

J. P. MAXWELL,
Head Design Engineer,
Missouri, '19

M. J. RUBEL,
Ass't Design Engineer,
Institute of Technology,
Vienna, Austria, '21



YOUNGER COLLEGE MEN
ON RECENT WESTINGHOUSE JOBS

H. H. RUGG,
Design Engineer,
South Dakota
School of Mines, '16

R. De CAMP,
Engineer,
Montana, '17

J. E. WALTER,
Contract Administration,
Carnegie Tech, Ex '25

The Holland Tunnel

Where do young college men get in a large industrial organization? Have they opportunity to exercise creative talent? Is individual work recognized?

THE HOLLAND TUNNEL is one of engineering's greatest triumphs, because—

—it is twice the size of any tunnel ever bored beneath the bed of the Hudson River.

—it is over a mile and a half long.

—it is designed for automobiles to use.

Because they generate poisonous carbon monoxide gas, motor cars create an entirely new need for tunnel ventilation. Yet even when the Holland Tunnel is filled to capacity and 2000 motor cars are passing through it in each direction, the air is fresh and pure.

This is a type of engineering undertaking with which young men in an organization of the size of Westinghouse frequently are brought into intimate contact. Opportunities to work on the stupendous, the never-before-undertaken, are not rare here. Hence young men of capacity, of enterprise, of genius, find much to challenge their imaginations and abilities.

A battery of 56 fans driven by Westinghouse motors pump fresh air into, and foul air out of, the Holland Tunnel. Twenty-eight more Westinghouse-motored fans are a reserve. Westinghouse planned the lighting system in the tunnel; also the system of remote control.

Westinghouse