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The Wisconsin Engineer

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The Therapeutics of Railway Equipment

By Fred S. Dean, m'03, ME'09

Introductory

RAILWAY equipment is subject to many chronic ills and painful disorders which must be properly diagnosed and scientifically treated by the Maintenance Doctor (M. D.), who is commonly known as the Master Mechanic.

The travelling public appreciate this condition, as it is apparent in many cities, that some cars as they come rambling down the streets seem to be afflicted with rickets or locomotor ataxia and in the advanced stages of the yellow jaundice, scrofula or eczema. Some of these cases appear to be on the verge of a nervous breakdown and fit subjects to be sent to a sanitarium for treatment at the hands of trained specialists.

The various affecting railway equip- equipment will be discussed from a medico- mechanical viewpoint to help properly diagnose and remedy these disorders. This information should help the Master Mechanic to apply the proper counter-irritants, innoculate the patient with the correct anti-toxins or vaccines to give immediate relief and insure a speedy convalescence.

Perfect Control.

Medical Staff — Organization

To succeed with this work, it is essential to have a well organized medical staff with the Master Mechanic in charge. The duties of the various departmental heads should be definitely outlined and all responsibility for satisfactory results placed in their hands. The Master Mechanic should keep in close personal touch with all lines of work through the directing heads of the various departments of the organization.

Patient's Data Card — Records

Some simple scheme of keeping accurate records of the various patients must be systematically worked out. These should include accurate data on armature and other troubles, repairs, costs, pull-ins, etc., to help you make an intelligent analysis of your maintenance and operating problems.

Medical Examinations — Inspections

Medical examinations are of the utmost importance and should be made systematically and at regular intervals either on a time, mileage, or kilowatt consumption basis. These should include a light and heavy inspection and must be done by trained and experienced workmen.

Dispensary — Storeroom

A very important factor is the dispensary or storeroom. It should be centrally located, well stocked, conveniently equipped, thoroughly organized and efficiently managed.

Diseases and Remedies — Maintenance of Equipment

With a competent medical staff, accurate patient's data cards, and a well stocked dispensary, you should be able to diagnose your equipment trouble and apply the proper remedies.

1. Paralysis — *Armature Windings*

This disease attacks armatures in service and in a short time makes them inoperative. This trouble may be minimized as follows:

(a) By the use of correctly shaped coils that have been thoroughly treated in varnish.

(b) They must be properly laid off and connected in line with information as furnished by the motor manufacturers.

(c) While winding, place reinforcing insulating pieces at cross-overs and where there is danger of the windings short circuting.

(d) Test newly wound armatures at 2000 volts to ground and those repaired for 1200 volts.

2. Hernia or Rupture — *Bands*

To prevent armature bands from rupturing and breaking in service, they should be applied as follows:

(a) Coils should extend about 1/32″ above the band grooves.

(b) Use a high grade steel band wire about #14 B&S gauge.
(c) Under the core bands place a strip of .012" sheet tinned plate.
(d) Solder all bands with pure tin solder.

3. ARTHRITIS — *Soldering*

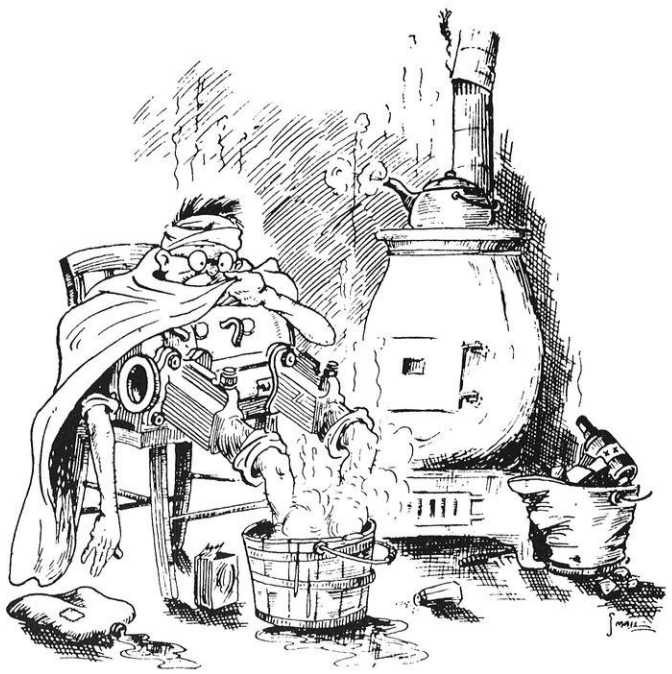
This ailment is characterized by hot or swollen joints which often is the result of poor soldering. This may be prevented by:

(a) Thoroughly cleaning parts to be soldered.
(b) Use a non-acid flux such as alcohol and rosin.
(c) Soldering iron should be well tinned and kept hot.

4. COUGHS AND COLDS — *Diping and Baking Armatures*

To prevent armatures from catching cold, they must be protected against moisture as folows:

(a) Heat in an oven at a temperature of 105 to 115° C from 8 to 12 hours, depending upon the size of the armature.
(b) Dip pinion end down in a good grade of black insulating varnish.
(c) After draining, bake at a temperature of 115 to 125° C for 16 to 22 hours.
(d) Ovens should be fitted with automatic temperature control.



Dipping and Baking is a Good Cure for Coughs and Colds.

5. ITCH — *Commutators*

The itch frequently attacks commutators and causes irritation, scratching and sometimes sputtering and flashing. Best treatment to prevent this is:

(a) Keep mica undercut from 3/64" to 5/64" deep.
(b) All slivers of mica must be removed from the sides of the slot.
(c) Commutator face to be given a smooth and even finish.
(d) Keep Vee ring clean and free from oil and carbon dust.
(e) When assembling, heat commutator between 125 to 150° C and press while hot at about 20 to 30 tons.

6. BROKEN BONES AND SPRAINS — *Armature Shafts*

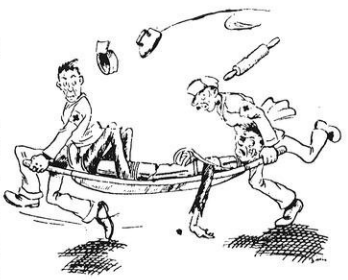
Broken bones and sprains are characteristic of shaft troubles, which may be relieved by the following:

(a) Use heat treated axle or alloy steel.
  (1) Heat treated axle steel is 44% stronger than the untreated axle steel.
  (2) Heat treated alloy steel is 77% stronger than the untreated axle steel.
(b) All bearing seats should be ground and polished to get a smooth slick finish.
(c) Pinion seats must be smooth and given the proper taper.

Shaft Troubles

7. GOUT — *Field Coils and Windings*

This disease resulting from high living and overeating attacks such motors in service that tend to "hog the load" due to field coil troubles. This disorder is helped by the following:



Emergency Treatment for Shaft Troubles.

(a) Use coils properly shaped that are made from the right size conductors and the correct number of tunrs.
(b) They should be provided with added insulation at sharp corners, crossovers and at the pole tip seats.
(c) Treated in an insulating compound using a vacuum high pressure impregnating process.
(d) Given 3 to 4 overlapping layers of insulating tape.
(e) Dipped in a high grade insulating varnish and baked. Coils should be given at least three such treatments.
(f) Properly connected using information as furnished by the motor manufacturers.

8. WHOOPING COUGH — *Brushholders*

Brushholders are quite often subject to this infirmity resulting in whooping, flashing and blowing of the motors. Effective preventives for this trouble are as follows:

(a) Porcelains to be kept clean and sealed tight on the supporting pins.
(b) Shunts put into good repair.
(c) Spring pressure with single finger per holder from 10 to 12 lbs. When more than one finger is used per holder use 6 to 8 lbs. pressure.
(d) Clearance between the carbon and the carbon way should not be allowed to exceed 1/32".
(e) Set the brushholders about 1/8" from the surface of the commutator.

9. HEART TROUBLE — *Carbon Brushes*

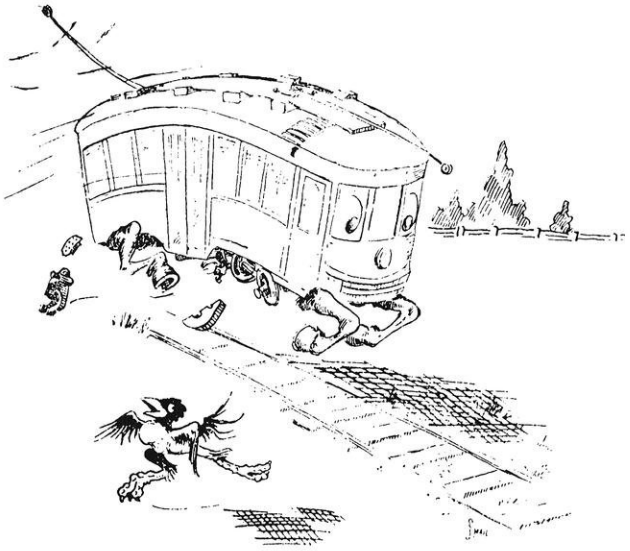
It has been said that "Carbon brushes are the valves to the heart of your motor". This being the case, it is apparent that a great many motors are suffering from heart trouble. The best known relief is to:

(a) Use high grade graphitized carbon brushes.
(b) Select grades supplied by manufacturers that can best insure a uniformity of their product.

(c) Carbons should have a smooth sliding fit in the carbon way.

10. AGUE — *Housings*

Housings sometimes become indisposed and have all the



The First Symtoms of Dropsy.

symptoms of ague as they are subject to chills and severe shaking. This may be relieved by:

(a) Making housings a tight driving fit in box frame motors.

(b) They must be a tight clamping fit in the split type frame.

(c) Use the through bolt type of housings on split frame motors.

(d) See that lock washers are used under the heads of all holding bolts.

11. EPILEPTIC FITS — *Bearings*

This is a common weakness of the bearings which, if not remedied, results in serious complications that sometimes seriously affects the operation of the motor. To minimize this infirmity carefully see to the following:

(a) Use bronze shells with a 1/16″ lining of babbitt for armature bearings.
  (1) The bore must have a smooth slick finish.
  (2) Clearance in assembled bearings should be .006 to .009″ depending upon the size of the bore.
  (3) Bearings pressed into the housing and then finish bored give best results

(b) Use bronze shells not tinned nor lined with babbitt for the axle bearings.
  (1) Chamfer the sides of the window.
  (2) Chamfer the edges of the halves at the parting or split.
  (3) Bore should be such that you have at least .015 clearance when assembled.

12. DIARRHEA — *Babbitting*

Occasionally you will find in service some babbitted bearings suffering with Diarrhea, from which the babbitt has melted and ran out. Such troubles can be alleviated as follows:

(a) Use high grade tin base babbitt metal.

(b) Shells must be well cleaned and carefully tinned.

(c) Keep the metal at correct temperatures by using babbitting pots fitted with automatic temperature control.

(d) Give all babbitted shells a sound test by striking with a hammer.

13. PYORRHEA OR RIGG'S DISEASE — *Gears and Pinions*

A diagnosis of the teeth on many gears and pinions indicate that they are suffering from pyorrhea, in fact, it is commonly said that "four out of five have it". Suggest that immediate treatment be given as follows:

(a) Maintain the correct gear center distances.
  (1) Maximum allowable spread of 3/32″ on motors below 50 HP.
  (2) Maximum allowable spread of 3/16″ on motors of 50 HP and above.

(b) Protect from dust and dirt by means of a suitable gear case.

(c) Must be regularly inspected and lubricated.

14. FLAT FEET AND FALLEN ARCHES — *Wheels and Axles*

Under certain operating conditions car wheels develop flat feet and the axles suffer from fallen arches. To prevent these disorders, apply the following:

(a) Keep sanders in good repair and protected against trouble due to moisture.

(b) Brakes must be properly adjusted and set.

(c) Wheels on the same axle should be kept the same diameter.

(d) Allowable variations on pairs of wheels on the same

Relieved of all Bodily Disorders by Proper Medical Treatment.

truck should not exceed 1/4″ to 1/2″ on the diameter.

(e) Inspect axles for checks and cracks by cleaning with carbon oil and then coat with whiting.

(Continued on page 76)

The Colorado River, the Imperial Valley, and the Boulder Canyon Dam Project

By DANIEL W. MEAD
Professor of Hydraulic Engineering

The Boulder Canyon Project includes:

1. A dam and incidental works in the main stream of the Colorado River at Black Canyon or Boulder Canyon, adequate to create:
2. A storage reservoir of a capacity not less than 20,000,000 acre feet of water.
3. The incidental works at the dam include a power house and hydro-electric plant, needed for the generation and control of electrical energy from the stored water.
4. A main canal and appurtenant structures located entirely within the United States, connecting the Laguna Dam with the Imperial and Coachella Valley in California.

This is the concluding installment of Prof. Mead's article concerning the Boulder Canyon Dam project.

Prof. Mead served on the Boulder Dam commission which was appointed by the National government to make a study of the project. He is an authority on hydraulic problems, and his reputation for engineering integrity and foresight is nationally known. —THE EDITOR.

The Proposed Dam

Perhaps the most important feature of the project is the proposed dam which is to be built to a height of 550 feet above low water, and if built at the Black Canyon site its foundation will be about 127 feet below the low water level.

This dam, if built, will be the highest dam yet constructed and will be more than twice the height of the Arrowrock Dam which is now the highest dam built. It will contain more than 3,000,000 cubic yards of concrete and will require over 20,000 cars of cement.

Comparison of Boulder Canyon and Black Canyon Dam Sites

	Boulder Canyon	*Black Canyon*
Nature of Rock	Granite	Volcanic
Depth to Rock	150 ft.	127 ft.
Width at Low Water	420 ft.	350 ft.
Width at Crest	1020 ft.	880 ft.

The Black Canyon site is near the railroad at Las Vegas and has a more favorable approach for the necessary construction railroad. This site is nearer the Southern California power center and hence will involve shorter transmission lines from the proposed power plant. The volcanic rock formations are less jointed than the granite rocks at Boulder Canyon; they are more easily worked yet are tougher, and will stand better in large tunnel excavation with greater safety to the workmen. A dam at Black Canyon can be built at less expense, and although its crest will be about 50 feet lower (relative to sea level) than the crest of a dam at Boulder Canyon, it will have for the same elevation above low water a somewhat greater reservoir capacity.

It is reported that the Secretary of the Interior has recently (September 24, 1929) instructed the Engineers of the Reclamation Bureau to estimate the cost of a dam twenty-five feet higher than provided in the bill.

The dam originally proposed by the Reclamation Bureau is of the gravity type, curved in plan, and with stresses allowed as high as 40 tons per square foot. (See Fig. 4, left hand section). The extraordinary height of this dam, the great reservoir which it creates, its location above numerous towns and irrigation districts, and the serious losses in life and property which would result from its failure, convinced the Colorado River Board that stresses in the structure should not exceed 30 tons per square foot. The right-hand section in Fig. 4 shows a preliminary study of the dam on this basis, made by the engineers of the Reclamation Bureau for this Board.

The building of such a dam, in a canyon only 350 feet in width and almost a thousand feet in depth, through which floods of considerable magnitude sweep from April to August each year, is an undertaking of considerable hazard. Tunnels must be built in the canyon walls through which the waters of the river can be diverted during construction. A cofferdam above the site must be built to keep the water out of the necessary excavation and to turn the water through the diverting tunnels. A second cofferdam must be built below to prevent water entering the work from downstream and these structures, although temporary in nature, must be sufficiently substantial to stand the flood which must be anticipated before the structures can be built to a height above probable floods. The original plans contemplated the diversion of flood flow of 100,000 cubic feet per second through three tunnels, each 35 feet in diameter. This plan involved an upstream cofferdam 79 feet high and a downstream dam 29 feet high above low water level. This work also involved the quarrying and placing of 757,000 cubic yards of rock and about 164,000 cubic yards of earth in the dams. The excavation required the unwatering of an open excavation in the river bed of a maximu mdepth of 127 feet below low water and the handling of 531,000 cubic yards of sand, silt, gravel and boulders with an indefinite amount of water, and the placing of 235,000 cubic yards of concrete

in the heel and toe of the proposed dam so as to form a permanent cofferdam to protect the remainder of the work. It was planned to accomplish this in one water period of probably less than nine months duration.

The Colorado River Board did not consider such a plan practicable, and advised providing for a diversion of 200,000

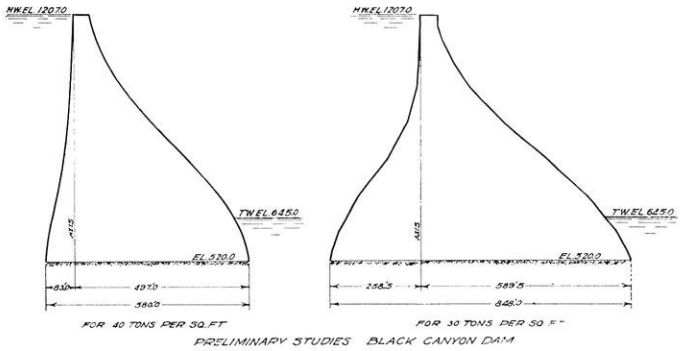


FIG. 4. *Cross-section Design for Black Canyon Dam. The design shown at the left was propesed by the Reclamation Bureau, while that on the right was proposed by the Colorado River Board.*

cubic feet per second through four 50 foot tunnels by an upper cofferdam of 55 feet in height which would store less water above the temporary structure and enable operations to proceed continuously through a normal flood season. The Board also advised the utilization of two of these tunnels for spillway purposes, thus preventing the overflow of the dam under extreme flood conditions. (See Fig. 5).

The Proposed Reservoir

The reservoir to be created by the construction of the Black Canyon Dam will be the largest artificial reservoir ever constructed. It will impound about 26,000,000 acre feet of water or almost two years average flow of the Colorado River. Lake Mendota, on which Madison is situated, is about seven miles long, three miles wide, with a maximum depth of 80 feet and an average depth of almost 40 feet. While this lake is of considerable size, it would take about 67 times the amount of water in Lake Mendota to fill the Boulder canyon reservoir.

The Power Plant

The bill also provides for the installation of an hydro-electric plant below the dam with a capacity of 1,000,000 horse power. It is expected that this plant can be operated on a fifty-five per cent load factor and will generate 3,600,000,000 kilowatt hours per year. The principal market for this power would be in Los Angeles and southern California where the power market at present uses just about this amount but with the rapid increase in the demand for power gives every promise that the power from the proposed plant will be needed about as soon as it can be furnished from this plant.

While the power house (Fig. 5) and equipment must be designed and selected for this particular site, there is nothing particularly difficult about the installation; although its size, distance from the market, and the considerable variations in head under which it must work, are somewhat unusual.

Water Supply

The water supply of the Colorado River at the proposed dam is a most important factor in this project. The original estimate of the Reclamation Bureau for the average supply was about 16,200,000 acre feet per annum. The study of this subject by the Board convinced them that this estimate was probably too high as the period on which it was based was apparently a period of high flow, and that the average flow at the Dam should not be estimated above 15,000,000 acre feet per annum, and that from the experience of the past it was probable that for long periods the flow might average as great as about 17,000,000 acre feet per annum, and for equal periods the average might be below 13,000,000 acre feet per annum. This conclusion makes it doubtful that the estimated output of the proposed power plant could be continually maintained for a fifty-year period, for with the irrigation development which seemed likely to obtain within such a period, together with the probable advent of such a period of low flow, shortages of water should necessarily be anticipated during which the power output might be expected to decrease possibly 40% to 50%.

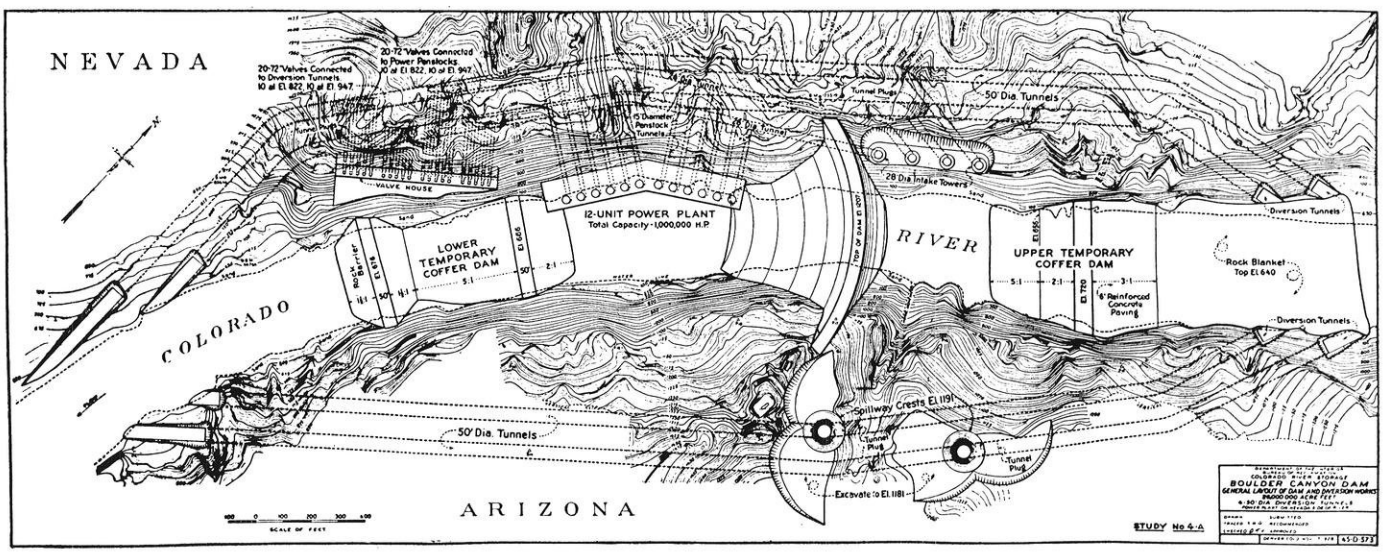


FIG. 5. *The map shows the proposed dam and structures contiguous to it. Note the diversion, discharge and spillway tunnels.*

Flood Relief

Ordinary floods from the Upper Colorado River will be reduced and in general can be eliminated to about 40,000 cubic feet per second. Exceptional floods such as that reported at Topock in 1884 of 380,000 cubic feet per second could be materially reduced but would probably equal or exceed 160,000 cubic feet per second. Floods from the lower tributaries below the dam site will remain unmodified. Floods from the Gila River are exceedingly flashy and for short periods equal in volume the floods from the upper river. Such floods will be perhaps gradually reduced as storage for irrigation is added on the Gila and its tributaries but there will probably continue to be occasional floods of considerable magnitude below the Laguna Dam unless a flood reducing reservoir is constructed on the lower Gila.

The All American Canal

The original Imperial Canal was constructed through Mexican territory in order to cheapen the first cost. The location was possible only on the agreement of the canal owners to supply Mexican territory on demand with a quantity of water equal to that supplied on the American side of the line. In addition, the Imperial District has been hampered by certain restrictions and embarrassed by the disturbed condition in Mexico. To avoid the obligations and difficulties entailed by the location of their main canal through foreign territory, the Imperial Irrigation District desire to construct a canal entirely in American territory, and such a canal is provided by the Boulder Canyon Bill and will be utilized to irrigate additional lands in the Salton area (see Fig. 7).

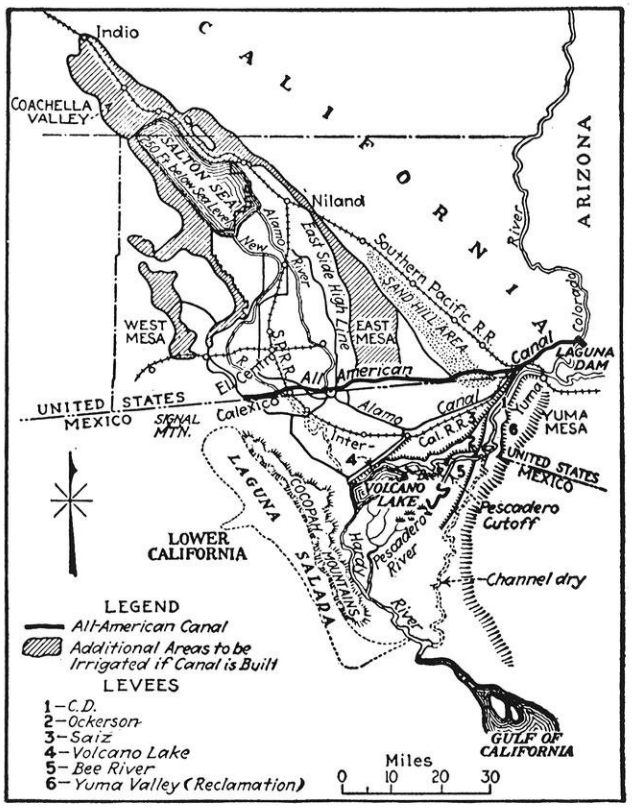


FIG. 7. *Imperial Valley and Delta Conditions. The possible extension of irrigation along the borders of the Imperial Valley by supply at higher level than that of the present canal is indicated by shading. Some features of the disturbed conditions in the delta are indicated.*

Under the proposed plan the water is to be diverted from the river at Laguna Dam, the present intake of the canal for the Yuma irrigation project, 23 miles by river above the intake of the Imperial Canal. This will allow water to be taken from the river at the higher elevation necessary to permit the canal to serve its purposes.

From the intake the proposed line of the main canal leads southwest to a point near the river just north of the international boundary, thence west approximately parallel to that line, to a point about 10 miles west of Calexico, a total length of 75 miles, making connections with the Imperial Valley system. At a point on the east mesa a canal branches off and leads to the Coachella Valley.

Between the Colorado River and the Imperial Valley the canal location, for a length of 10 miles, crosses a region of sand dunes, some of which reach a height of about 150 feet above the canal bed. For much of this distance the canal cut will be over 50 feet deep. The grade of this section of the canal is such that the water surface will be below the mesa level and hence below the bases of the sand dunes. Winds above a velocity of 10 miles an hour cause a movement of the surface sand, which increases with the velocity of the wind, and special provision should be made to prevent undue silting of the canal by the "blow sand" as well as for the removal of the sand that will drift into the canal prism. Although it is clear that difficulties are presented by the drifting sand, it is the opinion of the board that it is feasible to construct, maintain, and sucessfully operate the canal.

Estimates

The Colorado River Board in its review of the estimates for the proposed structures reached the conclusion that such estimates should be modified so as to provide as follows:

Estimated Cost

Dam and reservoir (26,000,000 acre-feet capacity)	$70,600,000
1,000,000 horse-power development	38,200,000
The all-American canal	38,500,000
Interest during construction on above	17,700,000
TOTAL	$165,000,000

In this revision stresses in the dam have been limited to a maximum of 30 tons per square foot, and a diversion capacity of 200,000 second-feet is provided.

Should the canal to Coachella Valley be considered a part of the main canal, the above estimates would be increased by the sum of	11,000,000
This would make the total estimated cost for all items H. R. 5773	$176,000,000

These estimates were based on a construction period of seven years.

The Los Angeles Water Supply

The City of Los Angeles has filed on 1500 cubic feet per second of the waters of the Colorado River for a future extension of its water supply. The present supply of the city comes partially from wells but mostly from the

(Continued on page 62)

The Development of

The Modern Electric Light

By D. M. ERICKSON, e'31

THE first incandescent light of which there is any record was made in 1840 by Sir William Robert Grove, an English judge and scientist. It consisted of a coil of platinum wire covered by an inverted glass tumbler set in a dish of water. This arrangement kept the wire from being cooled by draughts of air; the small amount of oxygen within the glass also reduced the amount of oxidation of the wire taking place. The lamp gave only a feeble light as there was danger of melting the platinum, since platinum gives very little light unless near the melting temperature.

The lamp required considerable current to operate it, as the filament was constantly cooled somewhat by the air. The demonstration was of scientific interest only, for the current to operate it cost several hundred dollars an hour.

Frederic De Moleyns, another Englishman, obtained the first patent ever issued on an incandescent lamp in 1841. His lamp consisted of a glass globe, the upper part of which held a glass tube containing powdered charcoal. The tube was open at the bottom, inside the globe, and through it ran a platinum wire which terminated just below the tube in a small coil. Another platinum wire came up through the globe at the bottom and ended in another coil just below the first one, almost touching it. The space inside the coils and between them was filled with powdered charcoal, which was heated to incandescence by a current passed through the wires. The air within the globe was removed as much as the hand pumps of that time would permit, so the charcoal did not burn up immediately; the small amount that did evaporate was automatically replaced by that in the tube above. This lamp also proved to be impractical, because the globe blackened very rapidly from the evaporation of the charcoal.

One of the most important early contributions to the study of incandescent lights was made by an American, J. W. Starr. His lamp consisted of a rod of carbon operating in the vacuum above a column of mercury. One terminal was a platinum wire running through the upper end of the glass tube containing the mercury, and the other was the mercury itself. Blackening of the glass by the carbon kept this lamp from becoming a commercial success, as it had the others. Other lamps made around this period (1850) all operated in a vacuum, using platinum-iridium, platinum, carbon, or graphite for the burner.

Around 1875, four Russian scientists came forward with incandescent devices, two of which had the burner operating in nitrogen gas. The first one used a V-shaped piece of graphite for a burner, and for a time promised to become quite successful. A company with a capital of about $100,000 was formed to back its manufacture, but the short life (about 12 hours), and the expense of the lamp caused the failure of the project. The other three inventions all proved useless as they blackened too rapidly and were too expensive to maintain.

In the spring of 1878, Edison took up the study of the problem at his laboratory at Menlo Park, New Jersey. He was well equipped to tackle the job, as he had already made several inventions of prominence, and had about 100 men helping him.

Edison's first experiments were made along the lines of previous ones, simply for the purpose of confirming their failure. He quickly gave up carbon as a light-giving element, and turned his attention to platinum. One of his first developments was an automatic thermostatic control to keep the platinum operating near its melting point but to keep it from reaching a dangerous temperature.

The automatic thermostatic control is illustrative of the genius of the man, as well as his never give-up spirit in the pursuit of a scientific achievement which he was attempting.

Edison discovered that after the platinum filaments had been heated to incandescence several times, gases were apparently driven off and the wire became harder and could

(Continued on page 73)

The Wisconsin Historical Museum, on the fourth floor of the library building, has on display an exhibit of electrical apparatus used in the first Appleton power plant, including a carbonized bamboo filament bulb. Bulbs of this type were among the first to be used in this country. The bulb is about six inches high, and two and a half inches in diameter. The socket on which it is mounted is somewhat similar to modern-day sockets except that it is made of wood and is uninsulated.

Various meters and other instruments are also on display. One ammeter, of an early Edison type, consists of 15 turns of about #00 copper wire wound in a small solenoid, with a plunger arranged so that it is pulled into the coil when a current passes through the wire. Movement of the plunger moves the indicator needle on the scale, which has a maximum capacity of 88 amperes.

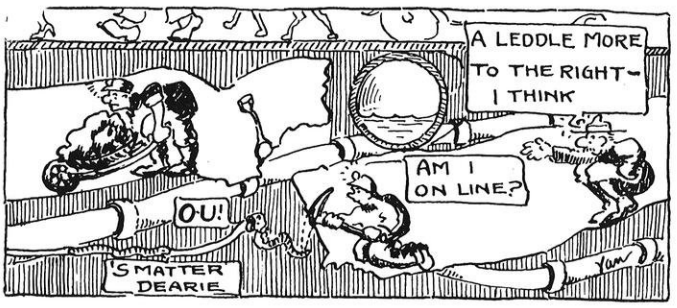
The Appleton plant was the first commercial lighting plant operating from water power, and the first of any type in the United States with the possible exception of the Pearl Street station in New York. The plant was started in October, 1882. Its equipment consisted of an Edison K dynamo, which had a capacity of 250 16 candlepower lights, housed in a 10 by 15 foot shack.

Some Summer Experiences

Compiled by LESLIE F. VAN HAGAN
Professor of Railway Engineering

THE civil engineering students at the University of Wisconsin still adhere to the traditional custom of spending their summer vacations in useful work, usually of an engineering nature. These summer jobs help to finance the school period and, in addition, give the students much valuable experience, as is evident from the following narrations by the present class of seniors.

The necessity for making sure that equipment is in good condition before getting away from headquarters was brought home to one man, who writes: "While working on a topographic survey during the past summer, I learned a lesson that I will never forget. My partner and I left Milwaukee with a rented transit, which we accepted on faith without taking it out of its case. We drove three hundred miles and then spent a day in constructing a stadia rod and completing other preliminary details. We finally located the section corner from which the survey was to begin. Then, taking the transit out of the box for the first time, we found that it had no compass, without which we had no check on orientation or azimuth. Our efforts to obtain a surveyor's compass from the county surveyor were of no avail. We had to send to Milwaukee for another instrument, and the delay cost our employer about $50. Needless to say, our first contact with the man for whom we were to work for a month was a bit strained. The incident convinced me that an engineer should not take anything for granted."



The Engineer Did Not Believe in Planning His Work in Advance of Construction.

The Cut-and-Try Method Fails

The young engineer has to learn that among practicing engineers there are some very crude workmen. "While working as a rodman on a survey party that was locating a sewer", writes a senior, "I observed the methods of an engineer who did not believe in planning his work in advance of the construction. The work progressed rapidly and seemingly all right until, on tunneling under a concrete pavement on an incline, the engineer discovered that the sewer was going to run into a telephone manhole. His solution was to offset the sewer line and install an egg-shaped manhole. This work was started but could not be finished because, in tunneling from the other side, a gas main was encountered. The gas company was asked to raise the main, but the location of certain drip-pots made that impossible. The next decision was to cut under the main. This work proceeded under the direction of the engineer, but, upon reaching the heading from the opposite side, it was noted that the up-stream end of the excavation was lower than the down-stream end by an appreciable amount. All of this peculiar engineering finally ended in the tearing out and relaying of some two hundred feet of sewer."

I Bet Your Life

A Mexican trying to use the phrase, "You bet your life," rendered it, "I bet your life." The contractor who takes long chances with the lives of his workmen might well express his policy in the words of the Mexican. Two of the seniors report experiences bearing on this matter. One of the men was inspector on a trench job. He was able to handle the engineering part of the work but says: When it came to adequate protection for the laborers I was not so sure of myself. My lack of experience and the contractor's negligence caused an accident which I will never forget. The excavator was digging a six-and-one-half-foot trench between two sewer ditches that had been dug and back-filled two months prior to the beginning of our operations. The trench was braced at intervals of twelve feet, which was sufficient for that depth. Upon hitting a layer of sand near the bottom of the ditch, I told the foreman that braces should be placed at shorter intervals, but he assured me that the present system of bracing was all that was needed for such a shallow trench. Soon after this a section caved in and buried one of the laborers. It took us an hour to free the man, who was so badly hurt that he was in the hospital for six weeks. This negligent condition prevailed on most of the jobs detailed to me."

The other man "watched with considerable interest the construction of two grain elevators, which were being built by different contractors whose methods were radically unlike. As the elevators were just across the track from each other there was some rivalry between the construction crews. One contractor urged his men on with tongue-lashings, whereas the other cautioned his men to be careful and not rush things too much. The tongue-lasher was unable to make any better time than his rival, both crews finishing pouring concrete at the same time, but during the removal of the forms, the hurry-up man had a serious accident in which a number of his men were killed."

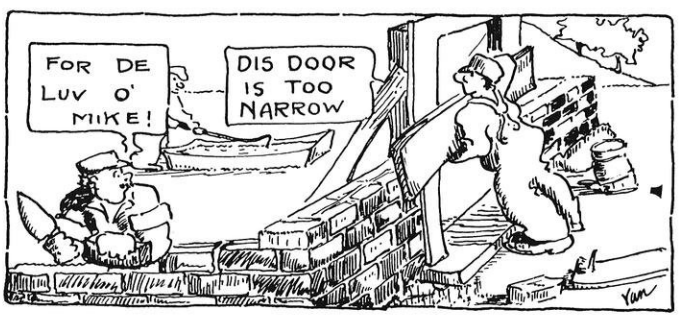
He Entertained Himself with Work

A young fellow who preferred to do something useful rather than loaf while waiting for the boss to show up managed to stretch a temporary job into a permanent one this summer. He got himself a job as rodman with an engineering firm with the understanding that there was only four days work for him.

"On the morning of the third day," he writes, "while I was waiting for instructions, our party chief told me that I was wanted in the office by the chief engineer. I assumed that I was through working for that firm. However, the chief wanted me to read field notes to him while he plotted them on a contour map. We had worked at this for about fifteen minutes when the chief was called away. To while away the time, I checked the plotted points. In a few minutes I had them checked, so I began to plot the remaining notes. When the notes were all plotted I drew in the contours. I was marking the elevations on the contours when the chief, after an absence of two hours, came over to the desk to complete the map. He looked it over with some surprise, checked my work, and then announced, 'You may do all the drafting from now on'."

It is not enough that one should be capable of doing good work; he must also have the opportunity to work. Finding a job is often more difficult than solving a problem in mechanics. A man is fortunate who had a wide circle of friends and acquaintances who believe in his ability and are ready to turn jobs or business his way. One man, after wasting two weeks of his summer vacation waiting for a hoped-for job to materialize, finally started on the hunt.

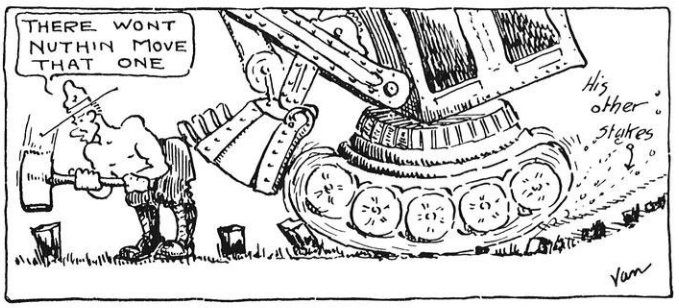
"First I tried various organizations in the engineering line," he relates, "next I tried the factories, and, finally, I



The Bricklayers Were Already at Work When it was Discovered that the Door Clearance was too Small by Two Inches.

tried anything that offered at least a paying salary. In every one of the employment offices, I encountered the same answer to my question: 'Nothing open now. Come a little later.' After a weary week of this experience I became down-hearted and envious, cursing those people who had jobs offered them on a golden platter by relatives or friends, but before long I found myself in the same classification, for I was offered a job by a friend. Now I realize what an exceedingly poor salesman I must have been, for I could not sell myself. I had to wait until I was offered a job; I could not secure one through my own salesmanship. Colleges should add a course that would train students to sell themselves."

The danger of allowing unapproved drawings to circulate promiscuously was learned by a senior who made a design for a small building. "Upon completion of the plan," he says, "I had a blue-print made and gave it to the chief draftsman to be checked, prior to submitting the plan to the chief engineer for approval. This was the usual procedure. It happened that the field engineer needed a print for the preliminary yard lay-out, and the draftsman let him have the print already mentioned. Instead



Even Six by Six Hubs were Destroyed by the Movement of Heavy Equipment.

of returning it, the field engineer passed it on to the contractor, and the brick-layers were already at work when it was finally discovered that the door clearance was too small by two inches."

He Learned to Reference His Points

Students in college are always told that a transit point should be carefully referenced so that it can readily be found even though the stake is removed by construction operations. However, there is little opportunity to practice actual referencing operations and, therefore, the idea does not make much impression on the average man. On the job, the necessity for careful referencing quickly becomes apparent. One senior learned this while working on the construction of a dam. His story runs thus:

"The first thing we did after the ground was cleared was to stake out the location of the dam. Points on the arc of the dam were established, and each point was referenced by three or four stakes. No one in the field party had had any experience on dam construction, and it seemed to all of us that it was a waste of time to set more than two reference stakes; but orders were orders and we put them in. When construction started, our points, both main and reference, began to disappear. We replaced them, trying to find out-of-the-way places, with six by six cedar hubs placed two feet in concrete. Even some of these were destroyed by the movement of heavy equipment. This experience convinced me of the importance of plenty of reference stakes, for when a point had to be replaced it had to be replaced in a hurry. Delay meant loss of time and money to the contractor and caused friction between him and the engineer."

He Can Look Any Man in the Eye

The student on the summer job begins to develop in himself a confidence that comes only from contact with

(Continued on page 74)

Editorials

ASK ME ANOTHER

"THE WELLAND CANAL," guesses a senior civil in answer to a question, "is owned by Germany and is one of the boundaries of Denmark." It is doubtful whether many of his class-mates could set this man right about the matter. In fact, a recent test made in the course in Engineering English showed that only six men out of twenty knew that this famous canal, which is now being rebuilt, is in Canada and around Niagara Falls.

Of the twenty men who wrote the test, eleven knew the state in which the Boulder Dam is to be located, eight were familiar with the recent cable failures on the Mt. Hope and Detroit-Windsor bridges, five knew who Leonardo de Vinci was, eight knew that Professor Kommers was investigating fatigue of metals.

A good deal of regret has been expressed because graduate engineers are unfamiliar with the great creators and their works in the fields of music, art, literature, and drama. The fact is that they are just as unfamiliar with their own profession. The musician, the artist, the English major, even the architect, studies the history of accomplishment in his field, but the engineer, with few exceptions, does not. Where can one find a course in the History and Appreciation of Engineering? Beginnings have been made in one or two institutions, but the idea hasn't caught on as yet. There is need for such a course.

AMERICA'S WIZARD OF LIGHT

AMERICA today is celebrating the Golden Jubilee of Light. The whole country is honoring those eminent engineers who have made the electric light and who have brought it within the reach of the millions.

Fifty years ago Thomas A. Edison, working in his small and poorly equipped laboratory, developed the first incandescent light. Since that time, electric lighting has evolved from that first crude experiment to our present nation-wide illumination system. The service performed by this intrepid inventor is immeasurable. His work made possible the production of a cheap and efficient lighting system, the development of the modern radio, the great beacons which guide the air traffic of our country along its routed path, and thousands of other developments along commercila and scientific lines. His work is an example and an inspiration to the thousands of engineers who are working to perfect some work that will lighten the labor of the world and to make living more comfortable and livable.

It is only through the work of men like Edison that the scientific age in which we live could be projected on the country in the short space of fifty years. Something of the service performed by these men is illustrated by the words of President Hoover in his dedication address at the completion of the Ohio river channel project. He said, "It is the glory of our scientific age that its sooty processes in the end bring results that make childhood stronger and happier, and give to manhood and womanhood a life richer and more varied."

WHY AN ENGINEER?

WHAT is it that characterizes an engineer? A doctor is identified by his diagnostic attitude and a lawyer by his antagonistic bearing. A merchant has two arms for selling, and a banker ten fingers to count with. What is it that makes an engineer engineer, what segregates him from the other professions?

Incidentally, the outward appearance does not necessarily betray the trade. A judge without his robe is still a judge and does not lose any of the great qualities of his profession. Take the banker away from his money and he still possesses something inalienable to his personality. Similarly, if we steal the engineer's slide rule, throw away his hand books, and drag him away from his usual environment of data sheets, curves, formulae, and statistics, we still have an engineer.

Four year educational training, however lightly pursued, has a certain definite effect upon the person who is already inclined toward engineering. The intense materialistic essence of the profession somehow pierces even the denset barriers. Years of practice will tend to develop to an alarming degree this inclination toward an almost totally physical viewpoint, and this is the earmark of the engineer.

Take a representative from a dozen different professions, remove them from their houses of business, dress them alike, and you still have a dozen different men. While the artist unconsciously compares lines and colours, while the novelist analyzes personalities, the engineer unable to discard his essential being, looks for inches and feet, for pounds or gallons or anything that may be represented by a number.

We, who are yet but knee-deep in the profession, are apt to ridicule and satarize this brand of trade-specialization. And yet these habits are really the essentials and the means of success. The artist without his eye for color is a dabbler, and a novelist without his character studies is a prattler. Jokers call a professor absent-minded without thinking that his state of complete concentration is his secret of success.

So the intense materialism is practiced by engineers until it becomes second nature to them, is their secret of success. His intense analysis whcih are often carried out to an alarming degree are his sceptre of power and authority. Without professionalism, we cannot have the profession. Losing the profession we lose a contribution to society.

Shoot Straight,
Ride Hard,
Dance Well.
So Live That You
Can Look Any Man
Straight In The Eye
And Tell Him
To Go To Hell.

FROM WEST POINT "*Pointer*"

Alumni Notes

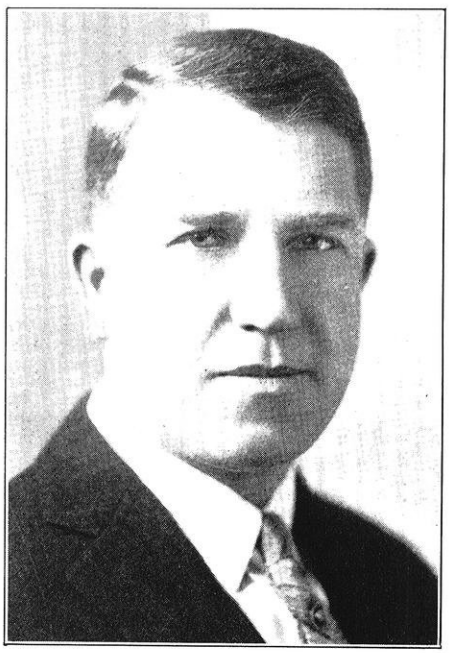
Famous Wisconsin Engineers—*Leon R. Clausen*

By R. L. Van Hagan

Back in the spring of 1897, a twenty year old youth named Leon R. Clausen, received a diploma certifying that he was a bachelor of science in electrical engineering, as a result of four years spent at Wisconsin, and set forth to try to live up to the various implications of said diploma. No blare of trumpets marked his entry into the arena of the business world; in fact, his early jobs included such items as a period with the Chicago Edison Company as wireman helper — about the lowest position on the payroll — and another period as baggageman for a railroad, and no wireman's helper or baggageman rate trumpets. However, the years slid by, and Leon R. stayed in the aforesaid arena and learned how to "take it". Today he is sitting pretty as president of the J. I. Case Company of Racine and one of Wisconsin's outstanding business men. An outline of the steps by which he climbed should be of interest to our readers, most of whom have their future still before them.

Leon Clausen was born in Fox Lake, Wisconsin, on October 18, 1877, and was graduated from the Fox Lake high school in 1893. He entered the university in the fall of the same year. He played in the band for four years, but did not go out for athletics although he enjoyed playing scrub football and baseball and liked hiking and rowing. He has carried his interest in outdoor sports always and still finds time for sailing, horseback riding, and golf. His most important contribution as a student was helping to establish the *Wisconsin Engineer*.

His career since graduation has been an interesting one. The first job was as electrian for the Davidson theatre at Milwaukee. After a few weeks of this he became a designer and tester of rheostats for the Cutler-Hammer Co. This job lasted for a year and a half and was followed by a few weeks with the Edison Company of Chicago as wireman helper and then by a year as train baggageman between Chicago and Minneapolis on the C. M. & St. P. Ry. Next came a period of eight or



Leon R. Clausen

nine months in the Chicago yard of the company maintaining train-lighting equipment.

A jump to Portland, Oregon, landed him in a job installing storage batteries and power equipment for the Central Energy System of the Sunset Telephone Co. To vary matters a bit, he signed on as roustabout in a saw-mill piling slabs and handling logs in the boom. From that to loading vessels at the docks of Portland, then, in 1901, back to the C. M. & St. P. Ry. as straw-boss in the signal department.

The plot begins to thicken at this point. In September, 1903, he was made signal engineer for the road in charge of the installation and maintenance of all new block signals and interlocking plants on the entire system. Just four years later he was made division superintendent on the Prairie du Chien and Mineral Point Division, and in the spring of 1908 he was transferred as superintendent to the Chicago Division.

In June, 1912, Clausen broke the ties of years and left railroading to enter the implement business in the employ of Deere & Co. He was first assigned to special work at Moline and then made manager of a subsidiary plant at Ottumwa, Iowa. In the spring of 1917 he was made acting vice-president in charge of all plants and in the fall of the same year became a director in the company and vice-president in charge of manufacture. He continued in this capacity until he became president of the J. I. Case Company in July, 1924.

While division superintendent in Chicago, in 1909, he was married to Agnew Snow of Mineral Point. He has two daughters, Jane and Mary.

A man who goes places must do things besides the routine of the job, and Leon Clausen is no exception. During his railroading days he was vice-president and then president of the Railway Signal Association. He also belonged to the American Railway Engineering Association and served on a number of committees in both associations. After entering the implement business he became a member of the National Association of Farm Equipment Manufacturers and of the American Society of Agricultural Engineers. He is also a member of the Milwaukee Club and of the University Club of Milwaukee.

A good citizen must respond to certain demands upon his time and energy for the public welfare. Mr. Clausen has been interested in hospitals and has served as chairman on various hospital boards. Directorships on chambers of commerce and manufacturers associations round out his service. He is now president of the Racine Manufacturers Association.

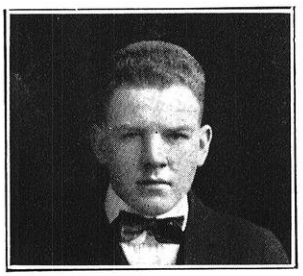
ELECTRICALS

Betts, R. Leland, e'29, is working with the Detroit Edison Company as cadet engineer. Address: 306 Holbrook St., Detroit, Michigan.

Russell, Cecil W., e'29, is employed as student engineer by the General Railway Signal Company of Rochester, New York. He has recently moved to Detroit where he is working on the installation of electric car-retarders and switch machines on the west-bound "hump" of the Michigan Central. Address: 2431 Oakdale Avenue, Detroit, Michigan.

Edmunds, Wade M., e'21, gives as his future address: Apt. Postal No. 8 Bis, Mexico, D. F.

Harder, Gordon J., ex-e'30, is installing A. C. meters for the Wisconsin Power, Light and Heat Company at Randolph, Wisconsin. Address: Beaver Dam, Wisconsin.



Kurtz, Edwin B., e'17, has been appointed professor of electrical engineering at the University of Iowa in place of Professor J. T. Rood, who was formerly at Wisconsin. Professor Kurtz had been acting dean of engineering at the Oklahoma A. & M. College and before that had been on the faculty of Iowa State College. He was at one time chairman of Engineering College Magazines Associated.

Pepper, Theodore B., ex-e'31, is enrolled in the Graduate Student Course of the Westinghouse Company, at East Pittsburgh. On completion of his course Mr. Pepper is planning to enter the radio department.

Scheer, George H., Jr., e'28, left the employ of the Radio Engineering department of the Westinghouse Company at East Pittsburgh on the tenth of August. On the third of September he joined the engineering staff of Silver-Marshall, Inc., of Chicago, after spending three weeks at home. He writes: "Burton Fairweather, e'28, was on his vacation at the same time and we got together several times for sailing, tennis, etc." Address: 5424 West 64th Street, Chicago, Ill.

Smart, John W., e'23, former editor of the "Wisconsin Engineer", is plant engineer at the Fort Madison works of the American Fork & Hoe Co. Address: 533 Avenue C, Fort Madison, Iowa.

Summers, Erwin R., e'26, former editor of the "Wisconson Engineer", announces the arrival of a daughter, Barbara Elaine, on September 29.

Thiemann, Vincent A., e'25, former member of the staff of the "Wisconsin Engineer", is now in the engineering department of the Wisconsin Public Service Corporation at Green Bay. Vin received his masters degree last June following a year of graduate work at Harvard. He is a member of the hydraulic power committee of N. E. A. Address: Y. M. C. A., Green Bay, Wisconsin.

Toepfer, Adolph H., e'29, is now doing research engineering work at the Westinghouse Electric and Manufacturing Company. Address: 1330 Wood Street, Wilkinsburg, Pennsylvania.

Vater, George W., ex-e'30, is in the radio division of the Allen Bradley Company of Milwaukee. Address: 2528 Wells Street, Apt. 6, Milwaukee, Wisconsin.

West, Kenneth A., e'24, gives his new address as 152 Avenue A, Pittsburgh, (21), Pa.

CIVILS

Beck, L. J., c'29, and recently instructor in topographic engineering, is on the engineering staff of the Trojan Engineering Corporation of New York. He writes, "I guess I told you I expected to come East this fall, and I came, but here is the big joke — the first job I get sends me back to Wisconsin again! The company is considering a couple of hydro sites in the St. Croix district and I am going to make some surveys for them the rest of this fall. I have had a lot of fun so far seeing things and running around with Red Fuldner's girl. We saw the Bremen last week. Incidentally, met Burton Fairweather, e'28, in Pittsburgh on my way out. He is with the Bell Lab. I find the news items on Wisconsin football here are rather diminutive, but try to imagine what I am missing. I will stop in Madison on my way out." Temporary address: Care of Wisconsin Hydro-Electric Corporation, Amery, Wisconsin.

Beran, John, c '29, after attending summer camp this year, went to work for the A. T. & T. in the long lines department. He is inspector on the construction of a new repeater station going up at Ewarts, Iowa, and finds the job to his liking. Permanant address: Room 1401, c/o P. H. Williams, 208 W. Washington St., Chicago. He can be reached temporarily at Ewarts.

Berg, John, c'05, CE'19, returned for Homecoming and visited his sons who are enrolled in engineering.

Blanchar, John E., c'29, is working in the office of the district engineer of the War Department at Milwaukee. Address: 208 E. Juneau St.

Dahlman, John H., c'29, who spent the summer in Colorado and New Mexico, returned to Milwaukee late in August and went to work for the S. M. Siesel Co., on the Milwaukee County court house in charge of all lay-out. He writes: "There are over three hundred footings to be laid out for pile driving and, later, for digging and pouring. There are 6,700 piles to be driven. We have just reached the halfway mark, so there still promises to be a lot of foundation work to be done in cold weather. I am starting a night-school course at the Milwaukee Vocational School. It will cover the newer types of form-work for concrete construction and design." His address is: 515 Crescent Ct., Wauwatosa.

Fleischer, Juilus, c'29, returned for Homecoming and announced that he is working for the Empire Refining Company of Maine at East Chicago, Indiana.

Gillette, Paul C., c'18, has been making a valuation of a water supply property on Long Island since last February. Address: Apt. 1, 59—85th Street, Jackson Heights, Long Island, N. Y.

Grant, Prof. Eugene L., c'17, is again teaching engineering economics at Leland Stanford University, where he was a visiting professor last quarter.

Hollister, S. C., c'16, vice-president of the W. W. Light Co., and the National Freight and Delivery Company of Philadelphia, visited the college on October 5.

Johnson, Frederick M., c'06, is with the Bureau of Public Roads with offices in the South Chicago Post Office building. The Asphalt Association and the U. S. Bureau of Public Roads are making an investigation of the cost and utility of oiled earth roads in Illinois. Field work for the Bureau was done during the summer under the direction of Mr. Johnson.

Kunesh, Joseph F., c'14, who has been in Hawaii since 1927 detailed by the U. S. Geological Survey to co-operate with the Honolulu Sewer and Water Commission in working out plans for that city's future water supply, has recently completed an elaborate report on the subject to the ter-

(Continued on page 70)

Campus Notes

WATSON GIVEN SCHOLASTIC PRIZE

Engineering Student Receives 'Tau Beta Slide Rule' From Honorary Society

The "Tau Beta Slide Rule," presented annually by Tau Beta Pi, honorary engineering fraternity, to the sophomore who makes the best scholastic record during his freshman year in the College of Engineering, was won this year by Charles C. Watson, electrical engineering student.

The presentation was made at the freshman lecture by Robert W. Kubasta, senior electrical student and president of Tau Beta Pi. Watson, during his freshman year, earned 101 grade points on 34 credits, only one point less than the highest possible number.

Watson is the son of Prof. and Mrs. James W. Watson, both Wisconsin graduates. Prof. Watson is in the department of electrical engineering. The winner of the award received his preparatory training at the Wisconsin High School, Madison, where he made a brilliant scholastic record and was salutatorian of his class.

In addition to establishing a record as a student, he has found time to build up quite a printing business during his spare hours.

GLIDER CLUB ORGANIZED

A university glider club has been organized for the purpose of stimulating interest in aviation. There are, at present, twelve members; the membership is being limited to twenty members until the first glider is built. At the first meeting, E. T. Hansen, instructor in steam and gas engineering, was elected president; Don Miller, m'31, vice-president; G. W. Gibson, m'31, secretary-treasurer, and Wesley Miller, m'31, chairman of technical committee. The plans for the glider are being worked over and detail drawings are being made. It is expected that actual construction of a glider will be begun shortly after the opening of the second semester.

ENGINEERING HONORARY SOCIETIES

It should be the ambition of all incoming Freshmen to become a member of at least one of the honorary societies in the college. The basis upon which elections are made are scholastic ability and general interest in campus activities. It is the purpose of this article to acquaint the new men with the various honorary organizations and their officers.

Tau Beta Pi is the general engineering honorary fraternity. Election to membership is based upon scholastic attainments; Juniors and Seniors in any engineering course. The officers of the Wisconsin chapter are: Robert Kubasta, president; Theodore Bolliger, vice-president; Fred Schefe, treasurer; Everett Johnson, recording secretary; Robert Fairweather, corresponding secretary; Fred Hornig, cataloguer.

The honor society open only to civil engineers, and whose requirement in addition to good grades is an interest in university affairs, is Chi Epsilon. Its officers are: Edward Heberlein, president; F. T. Matthias, vice-president; R. S. Plotz, treasurer; George Washa, corresponding secretary; James Arnold, secretary.

Electrical engineers are eligible to election to Eta Kappa Nu. Wisconsin chapter has as its officers: Ed Howes, president; Robert Fairweather, secretary; Everett Johnson, corresponding secretary; James Van Vleet, treasurer; Theodore Bolliger, Bridge editor.

The local chapter of Pi Tau Sigma, the honorary mechanical engineering fraternity, has as its officers: Orville Cromer, president; John Mueller, vice-president; Ralph Kraut, treasurer; Fred Schefe, corresponding secretary; John Pawlowski, sergeant at arms.

Alpha Tau Sigma, organized at this university last year, is open to those who have distinquished themselves in the field of engineering journalism. The officers of the Wisconsin chapter are: Sylvester Guth, president; Frank Matthias, vice-president; Rezin Plotz, secretary; Jack Lacher, treasurer.

A. I. CH. E. ORGANIZES

The student chapter of the American Institute of Chemical Engineers held an organization meeting on Tuesday, October 29, in the auditorium of the Chemical Engineering building. At this meeting, Jack Lacher was elected president, Harvey Altpeter, vice-president; Ed Spicka, secretary-treasurer, and Gordon Zimmerman, Junior representative to Polygon.

At the close of the business session an informal discussion on a substitute for St. Pat's Parade was held.

WATSON GIVEN PROMOTION

K. M. Watson, of the chemical engineering department was promoted from instructor to assistant professor of chemical engineering. Prof. R. A. Ragatz of the same department was granted a year leave of absence.

LIGHT ASSOCIATION VISITS COLLEGE

The delegates in attendance at the fall meeting of the Great Lakes division of the National Electric Light Association spent the afternoon of Thursday, October 24, visiting the laboratories and buildings, and seeing the various research projects being conducted at the college of engineering. At a banquet held at the Hotel Loraine the same evening, Prof. D. W. Mead, of the hydraulics department, delivered an address on the Boulder Canyon Project.

UNIVERSITY PROFESSOR PRESENTS PAPER AT PITTSBURG MEETING

G. L. Larson, professor of steam and gas engineering, left Monday, November 4, for Pittsburg to attend a meeting of American Society of Heating and Ventilating Engineers held in the society laboratory. Prof. Larson presented a discussion on air leakage through brick walls. He is at present doing research work on air infiltration through wood walls.

SOPHOMORES MAKE HIGH HONORS AND HONORS

A large number of engineers were included in a recent announcement of men making Sophomore high honors and honors. High honors are awarded to any student securing, during his first two years, 165 grade-points, plus 2 grade points for each credit above 60 he has taken; honors are awarded any student securing, during his first two years, 135 grade points plus 1½ grade points per credit for each credit above 60 he has carried.

The list appears herewith:

SOPHOMORE HIGH HONORS

	Credits	Points
Civil Engineering:		
Drow, J. T.	68	182
Ladwig, F. C.	68	184
Mechanical Engineering:		
Cowie, Alexander	68	186
Steckler, Norbert	87	191
Electrical Engineering:		
Fredendall, G. L.	69	190
Kuehlthau, W. A.	71	192
Chemical Engineering:		
Langlykke, A. F.	71	200

SOPHOMORE HONORS

	Credits	Points
Civil Engineering:		
Kosak, Leo Frank	69	163
Newlin, C. H.	70	150
Mechanical Engineering:		
Gibson, G. W.	67	161
Karsten, W. F. R.	68	172
McCreary, R. A.	71	165
Meyer, Arnold F.	60	142
Miller, Donald Jay	68	154
Mortensen, M. F.	74	160
Electrical Engineering:		
Bell, Almon LeRoy	70	155
Cobine, James Dillon	74	165
Teare, William Henry	65	168
Woodford, A. G.	69	170
Zabel, H. H.	69	159
Chemical Engineering:		
Essock, Jack	67	147
Williams, G. C.	70	183
Zimmerman, G. B.	70	159

A. S. C. E. TO ENTERTAIN NATIONAL PRESIDENT

The local chapter of A. S. C. E. will entertain Dean Anson Marston, Dean of Engineering at Iowa State college at the annual banquet of the society to be held November 20. This is the second time in four years that a national president of A. S. C. E. has been brought to Madison, and plans are under way for a successful meeting.

THREE MEMBERS OF THE WISCONSIN ENGINEER STAFF ATTEND E. C. M. A. CONVENTION

The Wisconsin Engineer was represented at the 9th annual convention of Engineering College Magazines, Associated, held at Purdue University, Lafayette, Indiana, from Oct. 31 to Nov. 2. The editor, F. T. Matthias, the business manager, S. K. Guth, and the alumni notes editor, R. S. Plotz, made up the delegation from the Wisconsin Engineer staff.

The Engineering College Magazines, Associated, is an organization which is composed of engineering student publications from twenty-three of the leading engineering colleges in the country. The purpose of the organization is to assist the individual magazine to make its publication better and more attractive and to more completely train its staff in the fundamentals of technical journalism.

The member magazines of this organization are widely distributed over the United States, from Oregon State to Massachusetts Institute of Technology to Alabama Polytechnic Institute. The government of E. C. M. A. as vested in an executive committee consisting of three members, the Chairman, the Eastern Vice-chairman, and the Western Vice-chairman. This organization criticises each issue of each member magazine and suggests methods of improving its editorial content and general make-up. The executive committee is elected by the member magazines.

From its beginning, in 1920, with only ten member magazines, E.C.M.A. has extended its wholesome and helpful influence throughout the country through the medium of its present twenty-three members.

REGENTS AWARD CERAMICS FELLOWSHIP

The Executive Committee of the board of regents has approved the appointment of William P. Whitney to fill the recently created ceramic fellowship in the college of engineering.

Mr. Whitney, who is a graduate of the University of Illinois, has had considerable practical experience in this line of work. The research, which will be carried on under the direction of Prof. G. J. Barker of the mining department, will be devoted to a study of problems of brick work as related to Wisconsin clays.

POLYGON ABOLISHES ST. PAT'S PARADE

Polygon, in a recent meeting, decided definitely to abandon the St. Pat's Parade and to substitute for it a somewhat different type of Engineer's Day.

It was proposed that the students of the engineering college hold an open house to visitors during which the visitors could obtain an idea of the work of the college. The classroom and laboratory work, according to the proposed plan, would be thrown open to visitors and an exhibit of some of the modern developments in engineering science be shown.

Two reasons were advanced by Polygon for this action. First: The Parade has not been very successful in the past few years, and 2nd, The Parade does not appeal to more than a small minority of engineering students. An exposition of the kind described would be more in keeping with the progressive attitude commonly attributed to a professional and scientific body.

RESULT OF RECENT RESEARCH

A sophomore, taking T. E. 108, wrote on a recent exam: "The preliminary adjustments of a level are the parallax and leg adjustments. Purpose: To obtain correct tension on the legs of the instrument. Tighten or loosen leg screws until the leg can fall slowly by its own weight."

NEW EQUIPMENT FOR STEAM AND GAS LABORATORY

To make the list of laboratory equipment more up-to-date, and to facilitate the work of testing, the steam and gas department has installed new revolution counters on all the engines and in addition have purchased a Leeds-Northrup electric humidity recorder, an Esterline-Angus electric recording tachmometer, and a Migdley high speed optical indicator. It is the hope of the department that equipment may be added from time to time, and that when the new Mechanical Engineering Building is completed, the laboratory will be the best of its kind in the middle west.

PAGING PROF. VAN HAGAN

In an application for membership in the Engineering Society of Wisconsin, an engineer writes that he has received a "colledge" education.

Engineering Review

BUILDERS OFFER PROTECTION FROM CONSTRUCTION HAZARDS

Builders, according to the September issue of "Construction Methods", are gradually beginning to think more of safeguarding the public than rushing through their contracts, disregarding the principles of safety. They are beginning to realize that safety methods, applied on the job, safeguard both the workers and the public.

Of the latest methods of protection, depicted in "Construction Hazards", three of them are outstanding in their simplicity and effectiveness. Ladder safeguards, such as wooden cleats, nailed at the sides of the foundation of the ladder prevent slipping and sometimes the loss of life. Building hoists, commonly used by building contractors in building large structures, are the source of much danger to passers-by. This danger has been eliminated by the use of a wire screen placed on all sides of the hoist, thus preventing any material that falls from the platform to fall on the street. Scaffold protection was used in the construction of the Union Central Life Insurance Company's annex at Cincinnati, Ohio. A wire roofing above the scaffold protected the workers from falling material from above, and a plank, placed upright on the floors of the scafford, prevented objects from rolling off down onto the street. Guard rails placed around floor openings and ladder landing are also being extensively used. Another protection for the worker on the lower floors is the laying of temporary plank roofing, this prevented accidents due to dropping of small tools or material on the worker below.

Contractors have found that a little extra cost in prevention of accidents saves them thousands of dollars in damage suits.

The Associated General Contractors, by the use of their letterheads, advises all contractors to go the limit in accident prevention methods. "Construction Methods", in their article, urges all contractors who have any new safety methods to send to them descriptions, pictures if possible, of their methods so that they may publish them in their magazine and further the cause of safety in building.

PROPOSED DAM SITES FOR FLOOD CONTROL ON SKAGIT RIVER, WASHINGTON, OF DOUBTFUL VALUE

The Skagit River, the largest tributary of Puget Sound, is navigable for the lower 50 miles, says a report of the Geological Survey, and on its upper reaches might generate power enough to supply all the region thereabouts. The upper 70 miles has a fall of more than 1,400 feet, nearly all of which could be used to produce power. With the natural flow about 187,000 horsepower could be generated on this stream 90 per cent of the time, and with regulation by storage reservoirs this could be increased to almost 487,000 horsepower. Additional power could be furnished by the tributary streams in the Skagit River basin.

A reservoir to serve primairly for flood control has been proposed for the Skagit River below the Sauk River, the dam to be located near Faber Ferry. A dam 250 to 300 feet high in this vicinity would, it has been estimated, create sufficient storage capacity to control the combined floods of the Skagit and Sauk rivers and probably would produce all the power needed by the neighboring region for some time to come.

Two proposed dam sites near Faber Ferry, about 5 miles above Concrete, were examined in September, 1926, by J. T. Pardee, a geologist of the Geological Survey, Department of the Interior, whose report indicates that these sites are of doubtful value. At each site the depth to a solid foundation at one end of the dam might be so great as to make the most prohibitive. The bed of the stream is partly underlain with uncemented silt and probably could not be made watertight at a reasonable cost. The report can be consulted in the office of the Geological Survey at 406 Federal Building, Tacoma, Washington, or the main office at Washington, D. C.

UNUSUAL METHODS USED IN REPAIR OF ROOF GIRDERS IN STREET UNDERPASS

The Port Morris Branch tracks of the New York Central Railroad pass under Brook Ave. in the borough of the Bronz, New York City, between East 157th Street and East 159th Street through a steel encased tunnel. The clearance over the tracks, 15 feet, 9 inches, and the length of tunnel, about 600 feet, were the contributing factors in the excessive corrosion of the exposed steel caused by locomotive gases. Due to the corrosion, it became necessary to strengthen or reconstruct.

Due to the fact that Brook Ave. is a busy street and the surrounding area entirely occupied by buildings, it was deemed inadvisable to reconstruct only as a last resort, as reconstruction would have seriously interfered with street traffic.

The method finally decided upon was to electrically weld reinforcing cover plates to take the place of the corroded plates. There were 107 girders to be repaired in the structure by the removal of the corroded plates and the substitution of the new reinforcements.

The interesting feature of the work was the method used in transfering the dead load to the new cover plate replacements. This was done as described below.

With a plate in position, a continuous 30 inch weld was made on both sides of one end of the cover plate. The entire plate was then heated to about 100 degrees F., enough to obtain an elongation of about 0.1 inches, corresponding to a 11,000 pounds per square inch in the plate. When this expansion was secured, the 30 inch welds at the free end were made before the plate had cooled. Thereafter, tack welds were made at 3 inch intervals on each side. With the cooling of the metal, the plate contracted, and strain-gage readings, taken on several plates, agreed, in computed stress, very closely with the desired stress. The flange angles were relieved of stress by the amount taken by the plate.

—*Engineering News-Record.*

SURVEYING INSTRUMENTS ON DISPLAY

The Cascade Tunnel of the Great Northern Railroad, recently placed in service, is admitted to be one of the great engineering accomplishments of recent years. This project depended entirely for its success upon the accuracy with which the surveys were made. This may account in some measure for the interest that has been shown in the surveying instruments, used by the Great Northern Railroad in establishing the line and grade of the new tunnel, which were on display in our members' lounge. Through the courtesy of D. A. Steel, M. W. S. E., who was instrumental in bringing the instruments to Chicago for exhibit at the annual convention of the American Railway Engineering Association, the instruments were placed in our rooms for the engineers of Chicago to examine at leisure.

This tunnel is nearly eight miles long, and was completed in just three years' time. In making the survey it was necessary to carry the line over a range of mountains with a maximum rise of 3500 feet. It would never have been possible to build the tunnel in three years by working only from the ends, so the contractors sunk a shaft about 650 feet deep from an intermediate valley and advanced the tunnel both ways from this shaft and also from both portals. When the last heading had been holed through, it was found that the maximum error of closure in either grade or alignment was 0.78 of a foot, which means a deviation of only four and one-half inches either side of the center line. Such accuracy in surveying under such difficulties is nothing short of phenomenal, to say the least.

Final refinement of survey was accomplished by a special theodolite which justly receives the most attention in the display. This instrument was mounted on iron pipes set in concrete bases established at seven different stations. Some of the preliminary work was done in the dead of winter and the workers were sometimes obliged to remain at their posts for over a week waiting for a brief period of visibility that would make accurate instrument work possible. All sights were made at dawn or dusk to avoid refraction from the direct rays of the sun. Sometimes the thermometer was forty degrees below zero and it was necessary to erect temporary shelters for the men.

The most important part of the work was the exact location of the shaft above referred to and the projection of the line of the tunnel both ways from the bottom. This shaft measured only twenty-four feet in the direction of the tunnel, and the centers from which the line was projected only nineteen feet apart. The plumb bobs used in the shaft were sixty pounds in weight, suspended by means of piano wire and immersed in tubs of water to prevent swinging. The line was also extended down the sides of the shaft by precise measurements.

This exhibit of surveying instruments was accompanied by a collection of photographs which are of great interest.

—*Journal of the Western Society of Engineers.*

AVAILABILITY OF INFORMATION ON ALASKA

Since the building of the Alaska Railroad from Seward to Fairbanks has made the interior of the Territory more accessible, public interest in information relating to Alaska has much increased, and the demand for Government publications on that subject has accordingly been greater. In order to furnish in compact form the more salient facts regarding the Territory, the Interior Department, with the cooperation of several governmental bureaus that are working in Alaska, has issued a pamphlet entitled "General information regarding the Territory of Alaska," which is distributed free by the Office of the Secretary of the Interior.

The Interior Department, through the Geological Survey, has also for 30 years been making investigations in Alaska and has published several hundred reports containing detailed information not only on the geology and mineral deposits but on general geographic features of the country. Each year the Geological Survey prepares a summary statement regarding the production of minerals and the mining developments of the preceding year in the Territory. All these reports are distributed free, or, upon exhaustion of free editions, are sold by the Superintendent of Documents, Government Printing Office, Washington, D. C. Requests for free copies may be addressed to the U. S. Geological Survey, Washington, D. C. A number of the reports may also be obtained from the offices of the U. S. Geological Survey at Denver, Colo.; Salt Lake City, Utah; San Francisco and Los Angeles, Calif.; and Juneau and Anchorage, Alaska; the Alaska division of the Seattle Chamber of Commerce, Seattle, Wash.; the Alaska Agricultural College and School of Mines, College, Alaska; and the Alaska division of the Los Angeles Chamber of Commerce, Los Angeles, Calif.

A GLIMPSE OF THE ULTIMATE IN ELECTRICAL POWER SERVICE

"The electrification of the steam railroads operating in the more populous sections of the country is coming," said Mr. Thomas McCarter, in a paper read before the New Jersey Utilities Association. As he sees into the feature, it will not be a question of whether this change shall be made, but rather of the time when conditions will best permit it to be carried out.

Mr. McCarter also predicted that present load of 450,000 K. W., which is now carried by electric power plants of New Jersey, will be trebled by 1936, and by 1946 will be five times the present loads. The means of providing, in the best and most economical way, of facilities to meet this great increase, is the problem which is the most perplexing to the electric companies today. The power interchange of power between neighboring systems is the only economical solution of the problem as McCarter sees it. He explains further, that the peak loads of different localities seldom come at the same time of day, so power interchange could be effected which would eliminate the extremly high investment necessary to provide machinery for carrying peak loads, when they are only in use for a small part of the day.

"Power interconnection is the next step in the progress of the electric industry toward the goal of complete service to the public", said Mr. McCarter, "it is accomplishing great things and in the future will do greater. New Jersey should not lag in its development, for in no other state is adequate electric supply more necessary to the public welfare, and in few states can power interchange play a more impotant part in securing it. Its foundation is co-operation within the industry, and between the industry and the communities. Its results will benefit all."

—*Power Plant Engineering.*

(Continued on page 66)

THE COLORADO RIVER, THE IMPERIAL VALLEY, AND THE BOULDER CANYON DAM PROJECT

(Continued from page 50)

Owen's Valley. The latter source can apparently be extended somewhat and will furnish a softer and better supply than can be obtained from the Colorado River. It is also claimed that the power which can be developed from the Owen's Valley source will be equal in value to the expense involved. If, however, Los Angeles and its suburbs continue to grow at the present rate, and unite in a metropolitan district, the Colorado River source may become necessary as apparently the only remaining practicable source. The cost of development from this source will be very great as the plan involves conduits about 300 miles in length, and a lift, depending upon the height and length of tunnel through the mountains, estimated at about 1635 feet including friction. The cost of development may be as great as that of the Boulder Canyon Project or possibly greater. It is estimated that this water supply may be needed for the Metropolitan Water District by about 1980. In the meantime the water can be used for the irrigation of citrus fruits, and this use may be an important factor behind the project. This project and the desire for cheap power seem to be the main reasons for the strenous efforts of the citizens of Los Angeles in urging the passage of the Bill, although the general improvement of the Imperial and Coachella Valleys is an important factor in the growth of southern California.

Conclusions of the Colorado River Board

The Colorado River Board after its study of the project, including an inspection of the proposed locations of structure and works, found the project feasible from an engineering standpoint with certain changes in plans and with a certain increase in expense.

In regard to the economic phases of the project, the Board called attention:

1. To the necessity of some understanding with Mexico as to the amount of water to be furnished that country from the Colorado River, which is an important point, uncertain, and vital to the states of the Colorado Valley.
2. To their belief that Southern California could probably absorb the power output from this project as rapidly as the power could be developed.
3. To the probable shortage of power which would occur whenever extreme low flows for a long period of years occurred, as they probably would within the next fifty years. Due to this shortage it would seem impossible to amortize the entire cost of the project within fifty years, including the cost of the all-American canal and the cost of flood protection.
4. To the probability of amortizing by the income from power of the remaining cost of the project if the cost of the all-American canal and part or all of the cost of flood protection could be eliminated.

The Report of the Colorado River Board was transmitted to Congress by the Secretary of the Interior on December 3, 1928.

During the December session of Congress, the Swing-Johnson bill was revised, passed, and approved. The bill as passed:

1st. Increased the appropriation for the project by $40,000,000 or to a total of $165,000,000;

2nd. Provided that the cost of the all-American canal shall be paid from the appropriation but shall be repaid by the lands benefited as provided in the reclamation law;

3rd. Allocated $25,000,000 of the amount appropriated to flood control, and provided that such amount shall be repaid to the United States out of 62½ per centum of revenues, if any, in excess of the amount necessary to meet periodic payments during the 50-year period of amortization or if not so paid then to be paid from the 63½ per centum after the period of amortization.[2]

4th. Provided that the remaining cost (about $100,000,000) shall be amortized within a 50-year period from the net income from the sale of power or rental of power privileges and from storage services.

5th. Provided that the law shall be inoperative until the Colorado River Compact is ratified without reservation by the seven states of the valley, or if this is not done within six months, until six of the state, including California, has so ratified the compact.

6th. Provided that before any moneys are appropriated for construction, the Secretary of the Interior shall provide for revenues by contract, adequate in his judgment to pay all expenses of operation and maintenance, and the repayment to the United State of the costs within fifty years or, in the case of the canal, in the manner provided by the reclamation law.

Arizona did not ratify the compact but it has been ratified by the other six states. On June 25, 1929, President Hoover issued a proclamation putting into effect as of that date the Boulder Canyon Project Act.

R. F. Walter, Chief Engineer U. S. Bureau of Reclamation, has been appointed Chief Engineer of the Boulder Canyon Project, and a Board of Consulting Engineers, consisting of Louis C. Hill, Andrew J. Wiley and William F. Durand, has been appointed. It is understood that work on the plans is in progress but it seems improbable that active work on construction will begin within a year or more.

Young engineers who may desire to secure work on this project will be obliged to apply to the Reclamation Bureau and to take a civil service examination.

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[2]The bill provides that if during the period of amortization revenues in excess of the amount necessary to meet the periodical payments to the United States necessary to refund within 50 years the amount expended on this work, Arizona and Nevada, between and within which states the dam and reservoir are to be constructed, shall each receive 18¾ per centum of such excess revenues, and that after the payment to the United States of all moneys advanced with interest at 4 per centum, the revenues from the project shall be kept in a separate fund to be expended within the Colorado River basin, as may be prescribed by Congress.

It is understood that the Secretary of the Interior has expressed a desire to have the power plant developed by private parties but that no proposals for such development have been received, and that therefore the power plant will probably have to be constructed by the government.

Conclusions as to the Project

There is a great need for some plan to eliminate the various troubles in the Colorado Valley which have been outlined in part in this article. Congress has seen fit to authorize a solution in the manner heretofore described. The Boulder Canyon Project is based upon data too incomplete to afford a basis for exact judgment. The success of the Boulder Canyon Project in solving the various needs of the Colorado River Valley which it is intended to solve remains to be demonstrated. That it will for the present solve the vital problem of a sufficient water supply for the lower valley, without curtailing the use of water for the present irrigation districts in the upper valley and for further development in the entire valley, is certain. The flood problem will be only partially solved; the maximum flood which occurs infrequently will still be a menace to the lower valley as will also the floods from the lower tributaries. Whether or not the money expended in its construction by the Federal Government can and will ever be returned, as the advocates of the project promise, time only will answer.

The writer has not been able to reach a conclusion as to whether or not the Boulder Canyon Project as prescribed in the Bill passed by Congress is the best solution for the development of the lower Colorado River. There is undoubtedly much which could be said on both sides of this question.

It chanced upon a winter's night,
safe sheltered from the weather,
The board was spread for only one,
yet four men dined together.
There sat the man I meant to be, in
glory spurred and booted,
And close beside him to the right,
the man I am reputed.
The man I think myself to be, a seat
was occupying
Hard by the man I really am, who to
hold his own was trying.
And though beneath one roof we met
None called his fellow brother,
No sign of recognition passed—
They knew not one another.
—From an Old Scrapbook

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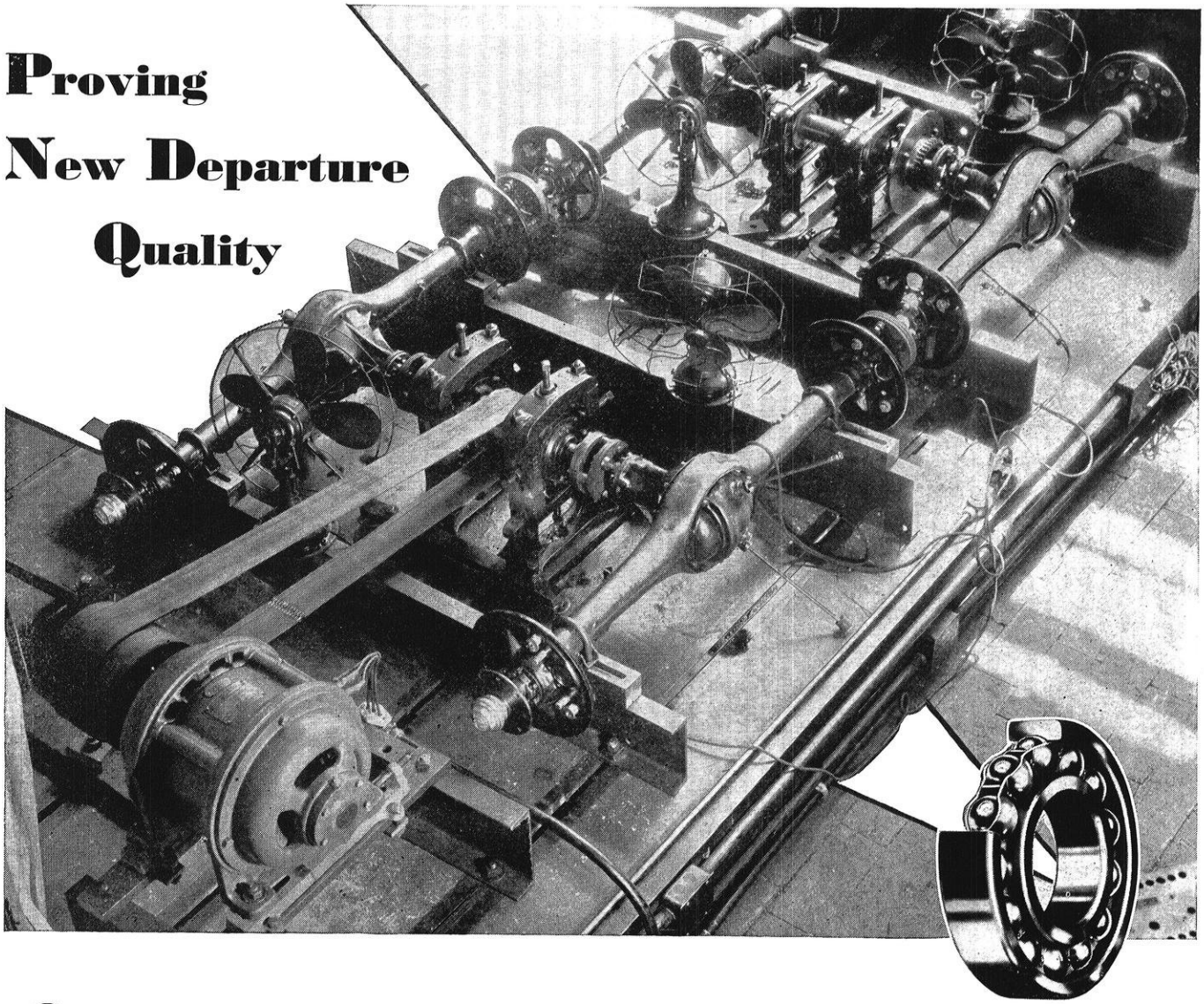

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The picture is that of a four-square automobile rear axle test being conducted in the laboratory. Torque of any magnitude may be imposed on the axles through a specially constructed torsion meter. Torque and direction of drive are reversed periodically so that the bearings in each axle receive identical treatment. Temperatures are regularly recorded and bearing failures are detected with the aid of a stethoscope. The variable speed motor allows any speed up to the equivalent of about 60 miles per hour. At the conclusion of the test, results are thoroughly examined by metallurgists, chemists and engineers, each group being required to formulate a comprehensive report of its findings.

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NEW DEPARTURE

BALL BEARINGS

1278

ENGINEERING REVIEW

(Continued from page 61)

FIRES IN COAL STORAGE PILES

Some interesting comments on the causes of fires in coal storage piles were made by A. J. Hoskin, Purdue University, at the Indiana Fuel Conference last year. Some of his main points follow:

The universal accepted theory of spontaneous combustion of stored coal is that the coal is heated by its own oxidation, that is, by the combination of some of its substance with the oxygen from the atmosphere. It has been proven that the quantity of heat generated is proportional to the quantity of oxygen involved, regardless of the rate of the reaction.

Ordinarily the heat escapes to the atmosphere or the ground fast enough to prevent any substantial rise in temperature. Occasionally, however, conditions exist which result in exceptionally rapid oxidation or a restricted removal of heat, and a fire ensues.

Early in the history of coal storage the blame was laid on sulphur or pyrite. This has been shown to be an incorrect assumption; sulphur has little or no effect.

Any fresh bituminous coal exudes a natural gas which is combustible. It is the same gas (marsh gas) that causes explosions in coal mines. Unmined coal is somewhat saturated with this gas, whereas old or weathered coal is practically destitute of it. The rate of gas emission is at a maximum when the coal is freshly broken from the seam. This gas oxidizes readily and explains the more rapid spontaneous heating of fresh coal; a mass of coal seldom fires if it survives the early period of storage. Numerous authorities believe that any mass of self heated coal, having reached a dangerous temperature, if cooled successfully, is thereafter immune from heating.

Some operators believe that proper ventilation prevents abnormal heating while others condemn ventilation as the most potent factor in such heating. Practices in storage based on these opinions have netted unsatisfactory results. The full ventilation notion is practically rejected, not because of theoretical error, but because certain limitations in every method that has been tried tend to induce rather than prevent dangerous heating. A medium condition that may be termed restricted ventilation prevails in usual practices. An occasional fire indicated that air is available in sufficient quantities to permit a dangerous rise in temperature, and the usual explanation is that the air stored originally with the coal is augmented by fresh air that diffuses through the interstices of the pile.

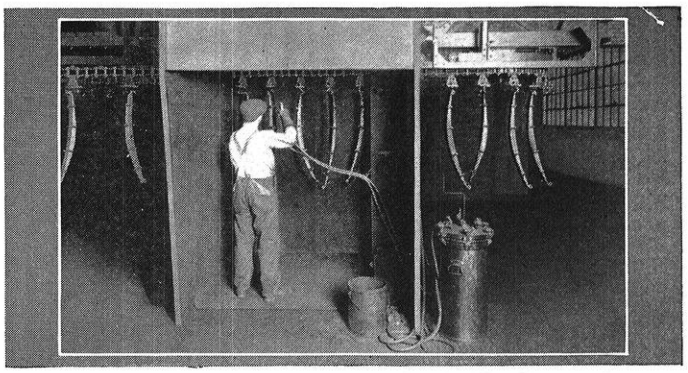
Many kinds of extraneous material find their way into coal during its mining and shipment or in storage. With the exception of metal scraps these foreign materials have low ignition temperatures and should be considered as potential kindling. Utmost caution is required to see that storage coal does not contain bits of wood, paper, rags, waste, charcoal, hay, weeds, leaves, as well as coal remnants from former shipments or storage. Each of these types of kindling has been held responsible for coal pile fires.—*Power.*

Setting the Pace *in* Automobile Assembly

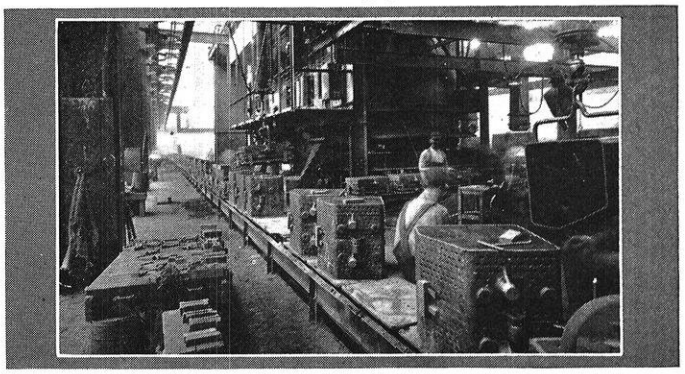
THE enormous output of automobiles per working day in America's Automobile Factories is an outstanding accomplishment of American Engineering Skill and Enterprise.

The Automobile Industry has set the pace by adopting manufacturing methods and equipment to meet new demands for greater output and lower manufacturing costs.

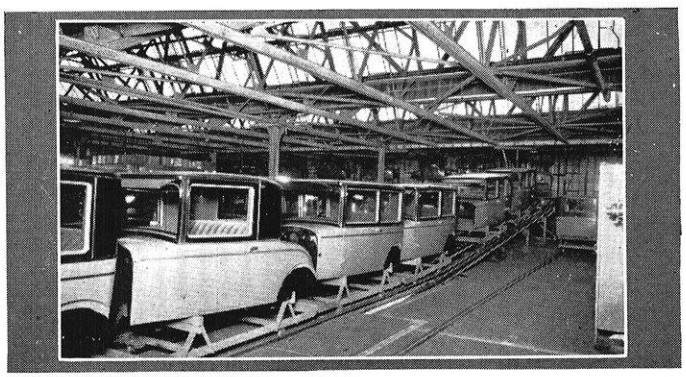
Considering these facts, it is significant that



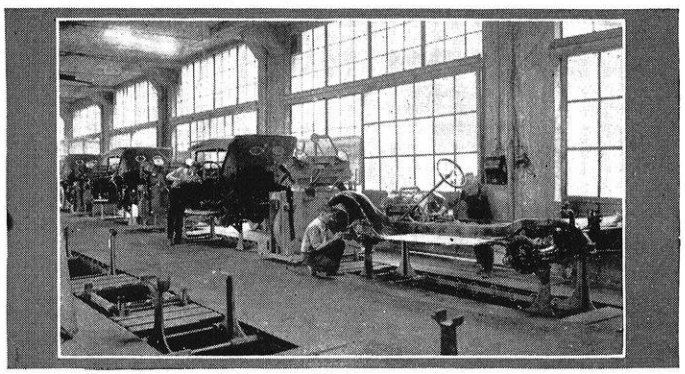
Spray-painting automobile springs on Rex Trolley Conveyor in Studebaker Corp. plant.



Rex Mold Conveyor in foundry of Studebaker Corp., South Bend, Ind.



Rex Conveyor transporting bodies in a Chevrolet Motor Co. plant.



Successive steps to final assembly on Rex Conveyor.

America's Largest and Foremost Automobile Manufacturers are using Rex Progressive Assembly and Mechanical Handling Equipment, manufactured by the Chain Belt Company.

Rex Mechanical Handling Equipment has found its place in the foundry, in the shops and on into the assembly plant. It is contributing to lower manufacturing costs in automobile production by: saving floor space, increasing output, controlling mass production, reducing direct and indirect labor charges and labor turnover, and improving the quality of the product.

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HEAVY LEAKAGE UNDER HIGH ROCKFILL DAM IN CALIFORNIA

When the Bowman dam, a rockfill structure 170 feet high built by the Nevada irrigation district on the Yuba River in California, was first subjected to the pressure of a full reservoir, considerable leakage developed at the downstream toe around the conduit through which water is drawn from the reservoir. Since the only control valves in this conduit are at the lower end, the conduit could not be unwatered for inspection. Under a head of 160 feet of water the leakage at one time exceeded 100 sec.-ft., but it was found possible to reduce the flow to a comparatively small amount by forcing chips and small wood blocks into the upper end of the conduit, allowing them to be drawn by the current into the cracks in the conduit through which the leakage is believed to have occurred.

—*Engineering News-Record.*

STANDARDS FOR CAST-IRON AND MALLEABLE PIPE FITTINGS APPROVED

For the past seven years sub-committees of the American Engineering Standards Committee have been studying the problem of unifying the specification for flanged and screwed fittings used in this country. Standards for all sizes of cast-iron pipe flanges and flanged fittings for maximum working saturated steam pressure of 125 pounds per equare inch now have been approved by the standards committee, and by the three sponsor organizations, namely the Heating and Piping Contractors National Association, Manufacturers' Standardization Society of Valve and Fittings Industry, and the American Society of Mechanical Engineers. Also there have been approved standards for cast-iron screwed fittings, for maximum working saturated steam pressure of 125 and 250 pounds per square inch, and standards for malleable iron screwed fittings for maximum working pressure of 150 pounds per square inch. Dimensions and theorectical weights of these fittings are presented in full in bulletins A. E. S. C.—B16a—1928, of the standards committee, whose address is 29 West 39th Street, New York City.—*Heating and Ventilating.*

REFRACTORY CEMENT USES CHROMITE

A new high temperature cement has been recently placed on the market by the General Refractories Company. The basic component of this cement is chromite. It contains no sodium silicate or other quick-setting elements. The natural atmospheric quick-set has been intentionally retarded sufficiently to permit easy trowling without frequent addition of water. It sets hard and uniformly, and is said to maintain a constant bond through all temperatures. The fusion point is over 3,500 degrees Fahr. and the tensile strength is over 300 pounds.

"I didn't begin with askings,
I took the job and I stuck;
And I took the chance they wouldn't,
And now they're calling it luck."

—*Kipling.*

ALUMNI NOTES

(Continued from page 57)

ritorial legislature. The report, which is in several volumes, is an unusually fine piece of work both from the standpoint of engineering and of technical report writing.

Kutzke, William A., c'29, who began a training course for foreign service with the Standard Oil Company, is now doing contracting at his home town, Portage, Wisconsin.

Lidicker, William Z., c'27, is with the Management and Engineering Corporation in the Bank and Insurance Building at Dubuque, Iowa.

Neeuwsen, Quentin J., c'27, and **Ellison, Fred J.**, m'23, have incorporated with a Mr. J. Samuel Hartt to form the Southwestern Wisconsin Gas Company, the purpose of which is to furnish illuminating and heating gas to communities that are too small to support a regular plant. They plan to serve small communities with a new petroleum gas which has recently appeared on the market.

Otis, Edward N., c'24, gave a joint concert with his brother recently in Madison. While he was in college Ed sang in the glee club as a soloist.

Schuyler, P. K., c'21, CE'29, president of the Federal Bridge Co. of New York City, has written "A Review of the Toll Bridge Field," which appears in the October number of "Roads and Streets".

MECHANICALS

Bemis, Reginald, m'29, is working for the Braden Copper Company as junior mining engineer. He seems favorably impressed with South America, as he writes: "The Spanish girls are so keen you don't have to know Spanish to get on with them." His address is: Care of Braden Copper Company, Rancagua, Chile, S. A.

Buese, Frank A., m'22, one-time manager of the "Wisconsin Engineer" and now in the development department of the Holeproof Hosiery Company of Milwaukee, was among the visitors to the college on Dad's Day.

Hauser, W. H., m'04, is in the mechanical engineering department, Denver and Rio Grande Railroad Company. Address: 2590 Bellaire Street, Denver, Colorado.

Jahn, Carl W., m'27, is working for the Bucyrus-Erie Company in South Milwaukee. He is living at home at 3423 Villard Ave., Milwaukee.

Maurer, C. N., m'16, has resigned from his present post as state traffic engineer with the Wisconsin Highway Commission where he has been employed for the past ten years. He has received several offers from private concerns, but has not yet decided what he will do.

Sogard, Ralph H., m'25, spends his days, and possibly some of his nights, at the Tecumseh power station at Topeka, Kansas. Address: 134 N. Broadmoor, Topeka.

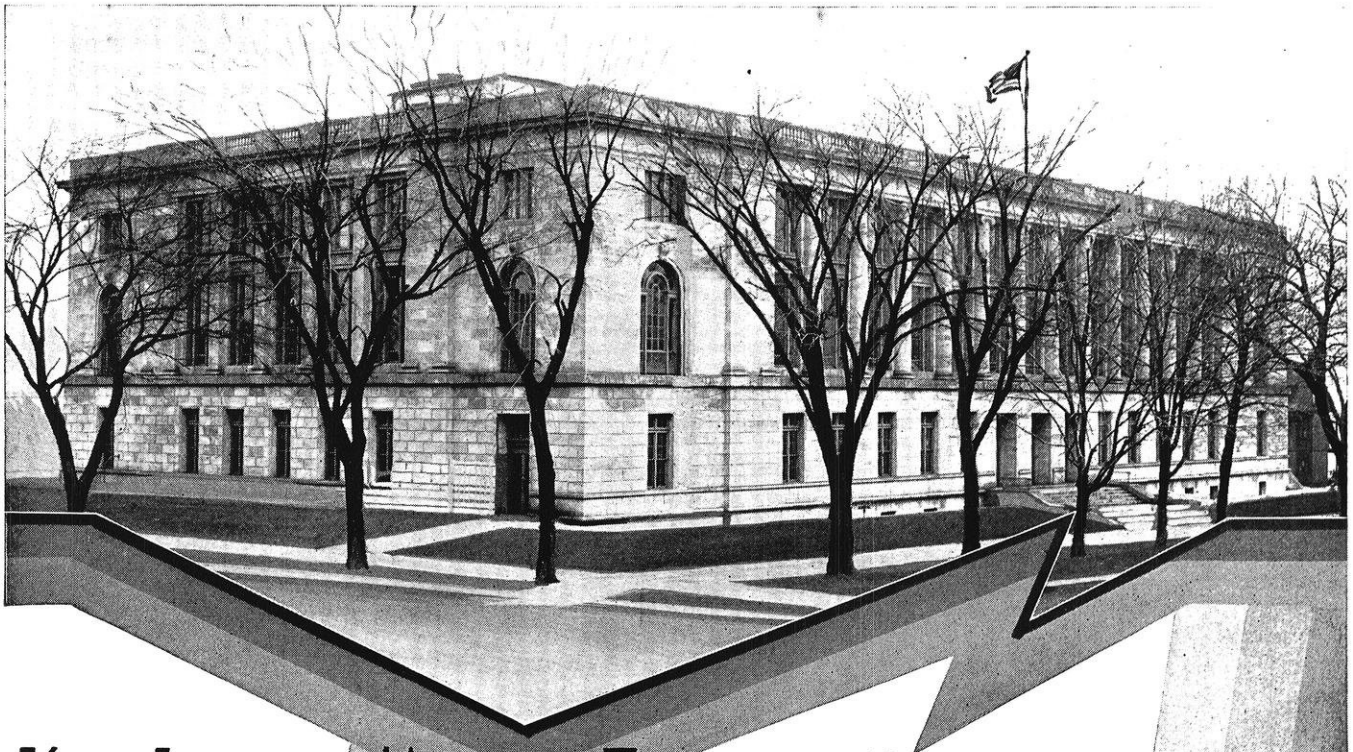
Wallman, Otto F., m'22, has transferred from the engineering department of the Wisconsin Telephone Company to the department of operation and engineering of the American Telephone and Telegraph Company. Address: 146 North Grove Street, East Orange, New Jersey.

Williams, Millard J., m'27, is in Cincinnati doing advertising and sales promotion work for the Cincinnati Milling Machine Company. Address: 520 Howell Ave., Cincinnati, Ohio.

CHEMICALS

Colburn, Allan P., ch'26, ChE'27, gives his new address as 1305 Jackson St., Wilmington, Del.

Baehr, William B., ch'24, is vice-president and secretary of the North Continent Utilities Corporation of Chicago. He is also secretary and director of research for the North Shore Coke and Chemical Company of Waukegan, Illinois. Address: 360 Palos Road, Glencoe, Ill.



Koehring-Mixed Foundation
for Federal Building

Probably one of the most interesting and attractive of the federal buildings erected during the last year is the United States Post Office and Court House at Madison, Wisconsin. In addition it is one of the first in the building program resumed since the World War.

Situated in the shadow of the state capitol and only a few hundred feet from Lake Monona, one of the four lakes which surround Madison, the three-story building of Bedford stone has an ideal setting.

Employing the latest methods in the interior transfer of mails the Post Office department arranged the rooms, conveying machinery and platforms to bring about greater ease and speed in the handling of all classes of mail.

In the main lobby, marble slabs cover the walls from the floor to a height of eight feet. Quarter-sawed oak is the interior finish throughout the building.

Despite other unique features found in the Madison Post Office, its foundation of dominant strength concrete is similar to that of other well-known building projects throughout the world — concrete mixed by a Koehring.

The ingredients of concrete are the same in all cases but the Koehring re-mixing action — a fundamental principle of Koehring concrete mixers and pavers — coats every particle of sand and gravel with cement to produce dominant strength concrete.

"Concrete—Its Manufacture and Use," a complete treatise and handbook on present methods of preparing and handling portland cement concrete, will be gladly sent on request to engineering students, faculty members and others interested.

KOEHRING COMPANY
MILWAUKEE, WISCONSIN
Manufacturers of
Pavers, Mixers—Gasoline Shovels, Pull Shovels, Cranes and Draglines
Division of National Equipment Corporation

KOEHRING

THE MODERN ELECTRIC LIGHT

(Continued from page 51)

be operated at a much higher temperature than previously. Since he was operating his filaments in a high vacuum to facilitate the escape of the gases, Edison decided to once more try a carbon filament, which he thought might last in the vacuum, and get away from the excessive cost of the platinum filaments. He finally succeeded in carbonizing a piece of ordinary sewing thread. This he mounted in a glass globe, using platinum wires, which have the same coefficient of expansion as glass, to make the connections to the outside. The filament was gently heated while the lamp was still on the exhaust pump, eight hours being required before the gases stopped coming off the carbonized thread. When the current was applied to the lamp on October 21, 1879, it burned for 45 hours before giving out. A patent was immediately applied for, and was granted a few months later.

This lamp of Edison's was the beginning of the modern electric light; all the lights in use today use its basic features. Edison soon found that carbonized paper filaments lasted for several hundred hours, which he considered long enough to make the lights commercially practicable. Consequently, it was decided that a public demonstration of the lights should be held. Several houses in the vicinity of Menlo Park were wired, and lights were erected on the country roads nearby. So much publicity was given the event by newspapers, and the public interest was so great that the railroads ran special trains to Menlo Park for the demonstration.

Carbonized bamboo soon replaced the paper filaments, as it made a stronger and better filament. The efficiency of the early lamps was rather low, the bulbs being designed to produce about 16 candlepower while consuming nearly 100 watts. The glass blackened rapidly with age, so that the efficiency dropped off as the lights were used. The equivalent wattage size of modern lamps gives about seven times as much light when new, and eleven times as much when old, as did Edison's first commercial lamp.

Subsequent development of the incandescent light was devoted largely to a search for more suitable filament materials, and for gases which could be used in the bulbs to give better operation. Osmium, a very rare and expensive metal, was used for a time in filaments and was fairly satisfactory, except for its fragileness and expense. Metallized carbon filaments, produced by heating carbon filaments to a very high temperature, were tried and found to give an efficiency 25 percent higher than the ordinary carbon lamp. Tantalum was also used for a time, and gave satisfactory results except that the filament crystallized and broke rapidly when it was used on alternating current.

In 1904, two Germans, Just and Hanaman, succeeded in making a filament of tungsten, an extremely hard and brittle metal. The tungsten lamps gave an efficiency about double that usually obtained from the carbon type so widely used at that time. Their filament, though, was formed by pressure methods, and consequently was not very strong. At that time, it was thought impossible to

draw tungsten into wire on account of its brittleness, but a few years later Dr. William D. Coolidge invented a process for making the metal ductile. Drawn tungsten filaments were much stronger and more efficient than the older types of filaments, and as a result, almost immediately superseded all other varieties.

It was found that if the tungsten bulbs contained an inert gas, such as nitrogen, the filament was kept cooled somewhat and could be made to produce more light than otherwise. The gas-filled lamps are not used extensively in the smaller sizes, since they are less efficient than the vacuum bulbs in those sizes.

SOME SUMMER EXPERIENCES

(Continued from page 53)

a real responsibility. That confidence cannot be fully developed in school. Here is a story in point.

"I was employed as a surveyor for a power company. The company had a huge dam far up in the wilderness, which needed repair on account of leaky gates and scaling and cracked concrete. Plans for repair included lining the piers and gateways with sheet metal, which was to be cut and prepared in a factory many miles away. Accurate dimensions had to be taken before the steel could be ordered. One day the chief gave me a car, a tape line, a laborer, and a most complex blue-print, and, in one breath, said: 'Here, get these dimensions of the dam as tabulated on this blue-print. Everything clear?' Being too foolish, dumb, and proud to ask questions, I nodded my head. 'Do a good job or we'll all be fired,' were his parting words.

"During the 30-mile ride to the dam, I pondered upon what it was all about, for two years in college had not taught me an atom about dams. In fact, I had never yet seen a large dam. I kept saying to myself, 'What a fool I am! I'll surely mess this job.' At the dam I sat on a pier about half an hour, trying to think what it was all about. Finally it occurred to me that the fancy curve on the blue-print resembled the spillway, and all of a sudden the entire situation was clear and simple. The ogee, the piers, the crest, the tainter gates all seemed to say, 'Pleased to meet you.' I got the dimensions rapidly and accurately (incidentally the steel is now in and fits excellently) and spent the remainder of my three-day sojourn walking around with my head up. I had started as a self-conscious greenhorn, but now I felt like the village smithy who could look any man in the eye."

HOME SPUN

The bigger the man the less he tries to impress people with his bigness.

Some men would rather fail by rule than succeed by breaking away from tradition.

Be quick to pardon other people's mistakes, but don't be too lenient with your own faults.

No man is held down—some men fail to go up.

THE THERAPEUTICS OF RAILWAY EQUIPMENT

(Continued from page 47)

(f) Axles out of true more than 1/64" should be straightened.

15. OEDEMA OR DROPSY — *Axle Caps and Gear Cases*

The axle caps and lower halves of the gear cases sometimes get an attack of dropsy and must be picked up from the streets and brought into the shop for treatment. Well known remedies for this are:

(a) The use of high grade heat treated bolts.
  (1) They are less liable to break in service.
  (2) The heat treatment (quenched and drawn) makes these bolts tough and strong.
  (3) The amount these bolts will stretch without taking a permanent set (rubber band action) is double that of the standard hardware bolt.
(b) Bolts should be fitted with lock washers and kept drawn up tight.

Dropsy

16. CONSTIPATION — *Lubrication*

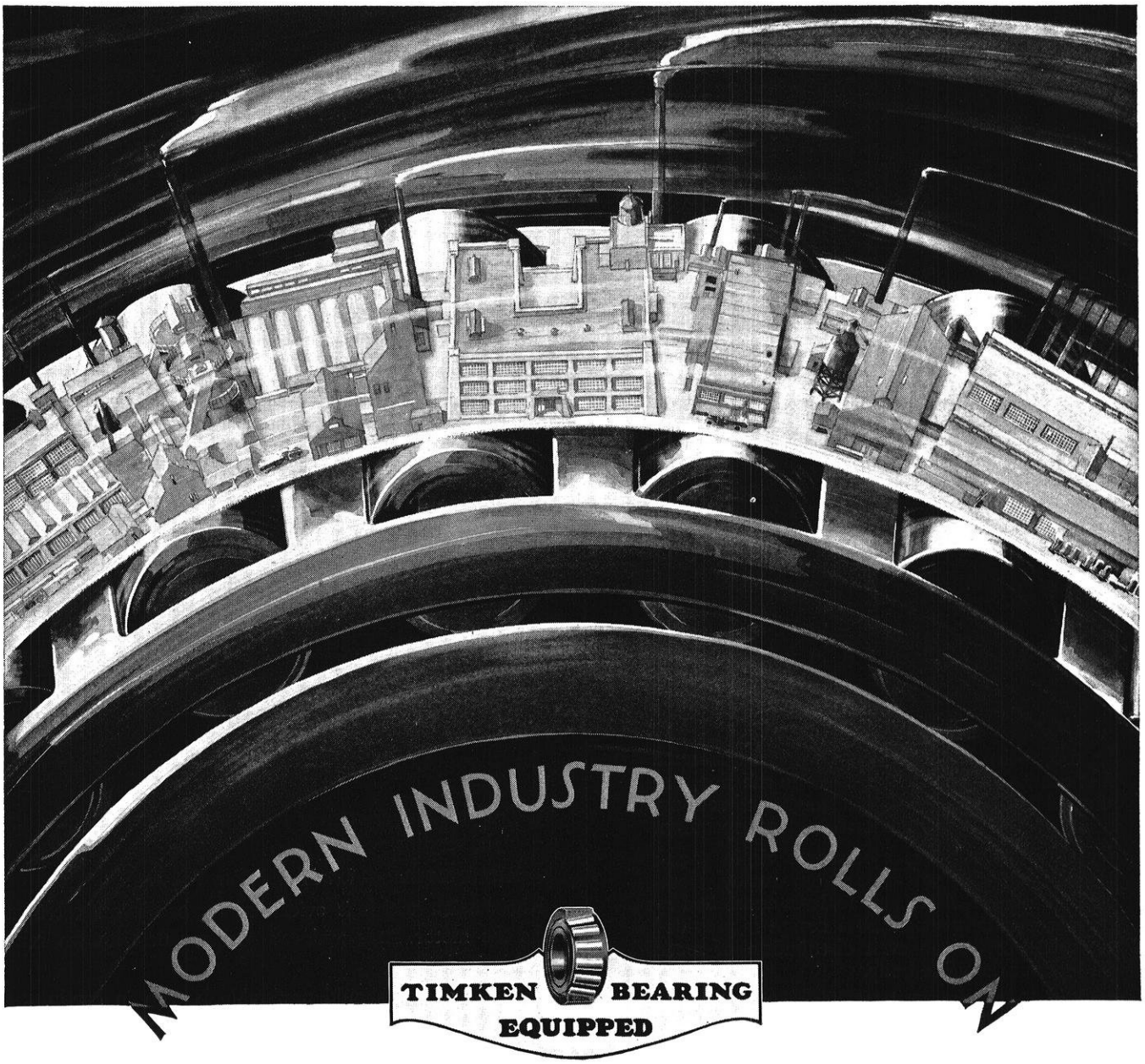
A universal car equipment trouble is Constipated Lubrication for which many doctors would prescribe a change in diet from the heavy car oil to "Nujol". Our recommendations to relieve this trouble are to:

(a) Use a good grade of long strand wool waste which has been saturated in oil for at least 24 hours.
(b) Pack bearings using a wick of long fibre wool waste extending from the bottom of the oil well to the bearing window.
(c) Back up this wick by tamping waste in the waste chamber to keep the wick forced up against the journal at the window.
(d) Use a high grade mineral oil furnished by reliable suppliers.
(e) Oil and waste type of bearings require oiling about every week or ten days.
(f) Gauge the oil levels to determine the amount of oil needed.
(g) Pour the oil in the oil well and not on top of the waste.
(h) Repack at suitable intervals.
(i) The "oil sealed" type of housings and axle caps are being used with much success by a number of operators.

18. LOCOMOTOR ATAXIA — *Controllers*

Locomotor ataxia is characterized by faulty control of the muscles of the body and thus is quite a common ailment of the car equipment. The restoratives are:

(a) On air operated switches keep valve seats ground.
(b) Piston leathers must be kept clean and renewed when worn.
(c) Lubricate with a good grade of approved oil.
(d) Contact tips and arcing horns must be kept in good condition.
(e) On the drum type controllers, pressure fingers should be checked and properly adjusted.



With a mighty surge Industry rolls on... and modern production rolls on Timken—*the one bearing that does all things well.*

Timken ability and versatility are destined to play a more and more important part in the future life of the nation, and student engineers will find it well worth while to make a close study of the present applications and possibilities of Timken Bearing Equipped—wherever wheels and shafts turn.

Whether the loads be all *radial,* all *thrust, or both in combination,* Timken Bearings —with their exclusive Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken steel—can be entrusted with the peak of the production load of the world.

Industry, Agriculture, Transportation, Mining feel the mighty momentum of modern methods... replacing the obsolete with "Timken Bearing Equipped"... stepping up the speed... defeating deadly friction ...beating down high costs... slashing maintenance... placing lubrication at an irreducible minimum... setting depreciation at defiance.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN *Tapered Roller* BEARINGS

(f) Tips and segments to be cleaned and smoothed up, then lubricated with a thin film of oil.
(g) Test overhauled controllers for 2000 volts to ground.
(h) Keep the inside of all types of controllers clean by blowing out with compressed air.

19. TYPHOID FEVER — *Resistors*

Resistors are designed to withstand a high temperature, however, they sometimes develop a bad case of typhoid fever which tends to weaken them and cause internal troubles. This should be guarded against in the following manner:

(a) Grids accurately ground at the contacts on the bosses should be used as they will eliminate the use of copper washers at these points.
(b) Use grids that have the correct ohmic resistance values.
(c) Give assembled grids a 2000 volt test to the frame.

20. TETANUS OR LOCK JAW — *Circuit Breakers*

Healthy circuit breakers do considerable blowing and coughing but occasionally one is stricken with lock jaw, usually with fatal results. To prevent such attacks give some attention to the following:

(a) Keep contacts cleaned, filed smooth and properly adjusted.
(b) Tripping mechanism to be lubricated so it will work freely.
(c) Blowout coils put in good repair and properly insulated.
(d) Check and adjust the setting of breakers about every six months.

21. RHEUMATISM — *Leads and Car Wiring*

Rheumatism which is evidenced by bad joints often attacks the motor leads and car wiring. Best known relief for this is:

(a) Car wiring should preferably be run in conduits.
(b) Ends of cable leads must be carefully cleaned and soldered in the connectors.
(c) Connections at the motor leads should be made by knuckle joint or the clasp type of connectors.
(d) These connectors must be carefully insulated and properly supported.

22. SCURVY — *Cleaning Detail Parts*

It is apparent that scurvy attacks a good many of the detail parts of the equipment and to clean up this epidemic requires treating and disinfecting as follows:

(a) Dip detail parts in a hot solution of lye or caustic to clean off the grease and dirt.
(b) Many parts such as brushholders, grids and control details are cleaned by means of a sand blast.
(c) Burning off the grease from housings, gear cases, etc., in a fire is not so satisfactory as it tends to distort them.

23. SMALL POX — *Trolley Wheels*

The condition of some trolley wheels would indicate that they have been suffering from an attack of small pox. Remedies to prevent this scourage from spreading are as follows:

(a) Wheels should be well balanced and given a smooth finish in the groove.
(b) Contact springs on the harps must be kept in adjustment.
(c) Adjust spring pressure on the trolley base to get from 25 to 30 lbs. pressure in city service, and from 30 to 35 lbs. for interurban service.

24. ASTHMA — *Air Equipment*

The air equipment sometimes gets out of order and chokes up apparently suffering from acute asthma. When this is the case proceed as follows:

(a) Oil and dirt should be blown out of all piping.
(b) Test system for leaks.
(c) See that the air intake strainers are cleaned and in good condition.
(d) In cold weather, it is advisable to drain the air reservoirs after each trip.

25. ERYSIPELAS AND LEPROSY — *Painting Cars*

When a car's diet of paint and varnish is cut down or entirely suspended, erysipelas or leprosy rapidly develops, which usually makes them outcasts to the riding public. Suggest the following:

(a) Keep cars painted to attract and encourage patronage.
(b) This should be done at least every two or two and one-half years.
(c) Use paints prepared and sold by reliable manufacturers.
(d) Stencils and transfers tend to reduce the cost of lettering, etc.

26. CRIPPLES — HOOF AND MOUTH DISEASE — *Pull-ins*

Crippled cars result in pull-ins, which usually affects the passengers with the "Hoof and Mouth" disease, for as they walk they talk about the poor car service. The best relief for this trouble is regular and systematic inspection under the direction of a capable organization.

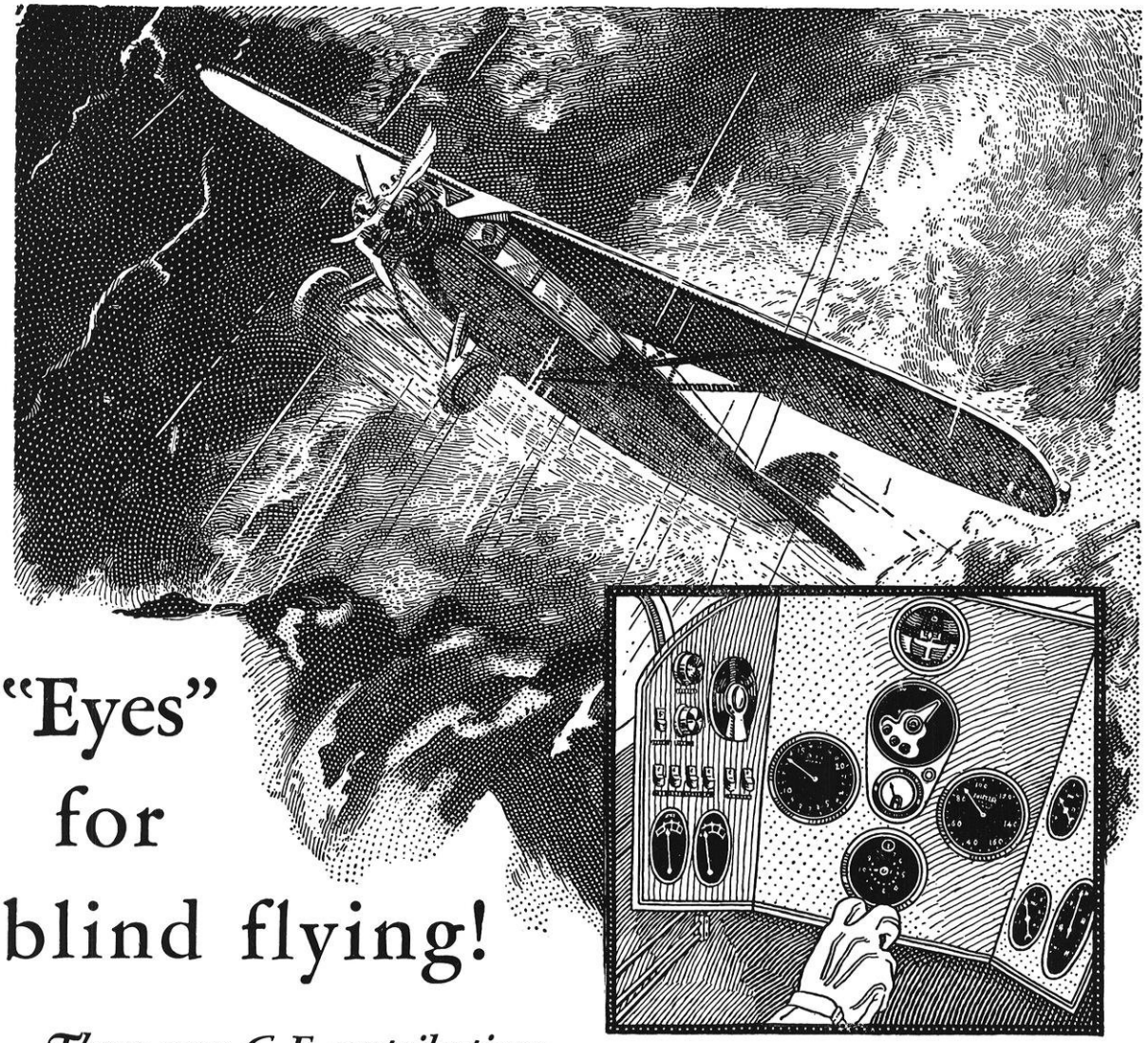
27. PATENT MEDICINES — *Renewal Parts*

It is dangerous to use patented nostrums and medicines recommended by quack doctors and Indian medicine venders. Let the original equipment manufacturer supply your needs for all repair and renewal parts.

In Conclusion

It must be conceded that some cars, robust in appearance and with a ruddy complexion, quietly speed by and are in a good healthy condition. We should be able to see more of such cars on the streets of our cities. On the other hand, a number of cars are occasionally seen which due to old age and neglect are in a run down and dilapidated condition. The most human treatment to administer would be to inoculate them with an overdose of kerosene, apply a torch and let the body be slowly cremated.

A report of the United States Bureau of Education gives the enrollment of students in engineering as follows: 20,210 electrical; 14,073 civil; 11,273 mechanical; 59,87 chemical; 3,256 mining and metallurgy; 2,135 industrial and commercial; 372 petroleum; 211 geological; 101 gas; 99 electrochemical; and 49 railway.



"Eyes" for blind flying!

Three new G-E contributions to the conquest of the air

LINDBERGH, flying blind much of the way, hit Ireland "on the nose" as he winged toward Paris. Now, as an aid to air navigation comes the magneto compass, a product of General Electric research, which gives pilots a navigating instrument of extraordinary accuracy.

Meanwhile, two other General Electric contributions to aviation have been developed—the electric gasoline gauge and the radio echo altimeter. The ordinary altimeter shows only height above sea level. The radio echo altimeter warns the pilot of his actual distance above ground or water by flashing green, yellow, and red lights on the instrument board.

Every year hundreds of college-trained men and women enter the employment of General Electric. Research, similar to that which developed "eyes" for blind flying, is one of the many fields of endeavor in which they play an important part.

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