The Wisconsin engineer. Vol. 28, No. 8 May 1924

Madison, Wisconsin: Wisconsin Engineering Journal Association, [s.d.]

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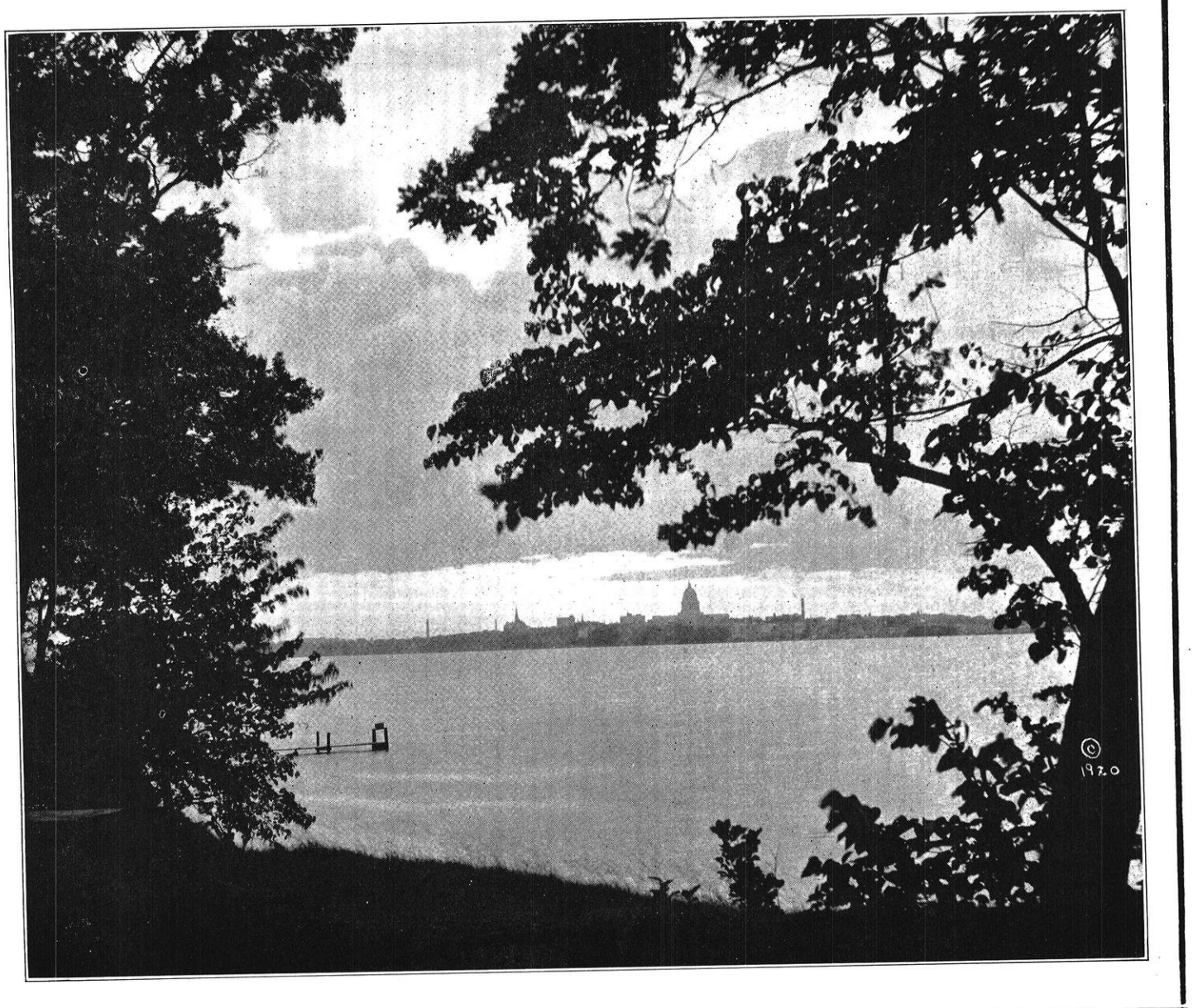
The
WISCONSIN ENGINEER

Published by the Engineering Students of
THE UNIVERSITY OF WISCONSIN

VOL. XXVIII | MADISON, WISCONSIN, MAY, 1924 | NO. 8

Member Engineering College Magazines, Associated



WISCONSIN ENGINEER

The

WISCONSIN ENGINEER

Founded 1896

25c
A Copy

Published monthly from October to May, inclusive by
The Wisconsin Engineering Journal Association
306a Engineering Building, Madison, Wisconsin
Telephone University 177

$1.50
A Year

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VOL. 28 MAY, 1924 NO. 8

 Entered as second class matter Sept. 26, 1910, at the Post office at Madison, Wis., under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized October 21, 1918.

The Wisconsin Engineer

UNIVERSITY OF WISCONSIN

VOL. XXVIII No. 8 MADISON, WIS. MAY, 1924

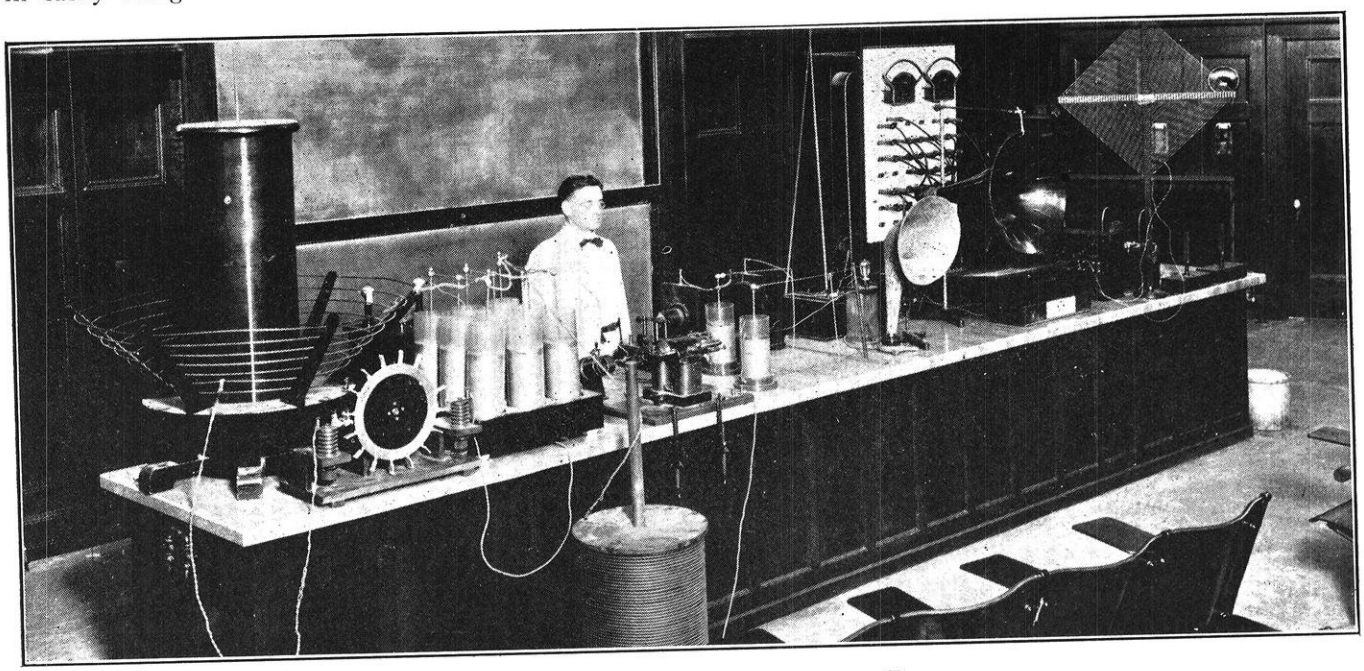
THE ELIMINATION OF STATIC INTERFERENCE

By Earle M. Terry

Associate Professor of Physics, University of Wisconsin

Now that the winter months have passed and the season is rapidly approaching when our radio reception will be marred by the hisses and crashes of static, it is believed that a brief discussion of the principal causes of these disturbances and a description of some of the methods by which they can be partially eliminated may be of timely interest. Static interference is generally divided into three major groups which are known respectively as "hisses", "clicks", and "grinders". These names are more or less self explanatory, and anyone who has had even a limited experience in "listening in" will easily recognize them. The first, which is due to intensity. It reminds one somewhat of the sound when sand with an occasional pebble is thrown against the window in a more or less broken stream. This form often rises to overwhelming intensity during the summer months, and in the early days of trans-oceanic communication frequently caused interruptions for hours at a time.

Experience shows that it is more severe near the tropics than in the temperate or frigid zones, and in a given locality varies from day to day, being worse on warm days than on cool. It also varies throughout the day, being a minimum between sunrise and noon, and



Professor Terry in the Lecture Room

an actual discharge from the antenna to earth, is more pronounced when a series tuning condenser is used, and while it often sadly mars the reception of music, it is not of serious consequence in the reception of telegraphic signals. The second, or click type, has been quite definitely traced to lightning disturbances. While it lasts it is often so strong as to completely obliterate the signal, but because of its short duration, it does not seriously interfere with radio communication. The third, or grinders type, is the most serious of all, and consists of a series of sustained crashes of varying increases to a maximum just before sunset. During the evening and early part of the night it remains practically constant and falls gradually to a minimum at sunrise. The origin of this type of static is not definitely known. In the early days of the art all forms were thought to be traceable to lightning disturbances either between two clouds or a cloud and the earth. In recent years, however, the belief is gaining ground that the grinders type is due to disturbances in regions of the atmosphere far above the clouds, that it has but little connection with the

phenomena of our ordinary meteorology, and that electricity received from the sun plays an important part.

To account for the electrification of the upper strata of our atmosphere the following theory has been proposed by Arrhenius: Because of the intense ultra-violet radiation from the sun, the vapors in its chromosphere must be in a high state of ionization; that is, there must be present vast numbers of electrons and

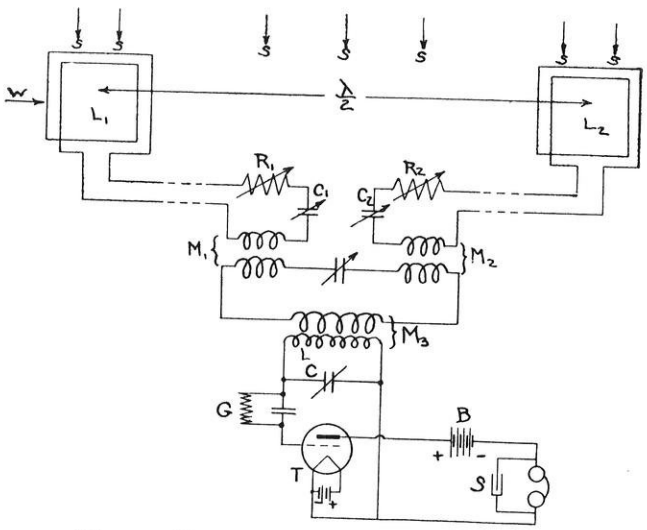


Fig. 1. Weagant Static Eliminator

positive ions. It is well known that small particles act as nuclei for the condensation of vapors, a fact which is particularly true in the case of electrons. This phenomenon was discovered by C. T. R. Wilson, and was used by Sir J. J. Thomson to collect electrons in his early experiments for measuring their charge. Positive ions, because of their much larger size, are less effective than electrons in serving as condensation centers. Now when a beam of light falls upon a body and is either reflected back on its path or is absorbed by the body, the body is acted upon by a force in much the same way as though a jet of water were playing upon it. If the body is a perfect reflector this force is twice as great as for a perfect absorber. This phenomenon was predicted by Maxwell in his electro-magnetic theory of light, and careful measurements have verified the theory. The force thus brought about per unit area is called the "radiation pressure", and is believed to account for the tails of comets. Calculations carried out by Arrhenius show that for a translucent particle which has grown to a diameter equal to that of a given wave length of light, the repelling force of radiation pressure is about 2½ times the gravitational pull of the sun upon it. He further computes that under these circumstances the particle should travel the distance to the earth in about 46 hours bringing its nuclear electron along with it.

There is good evidence to support the belief that electrons also come to the earth by direct emission from the sun. In this case the supply is not uniform as in the previous one, but is very irregular. Enormous streams of electrons are believed to be sent out from sun spot areas in consequence of the intense thermal gradients, and the strong magnetic fields associated with them. These streams of electrons which are often 10 or more degrees in width sweep across the earth and produce magnetic storms and intense auroras as they pass. The stream-like effect characteristic of the northern lights is probably due to the influence of the earth's magnetic field upon these rapidly moving electrons, for it is well known that an electron, shot at an angle to a magnetic field, spirals around the lines of force. The upper regions of our atmosphere must, therefore, become very highly charged negatively. Huge convection currents must be set up, and when portions having sufficient difference in potential approach each other discharges similar to those in a partially evacuated vessel must take place. Accompanying these discharges are cathode rays or streams of electrons, many of which probably find their way back to the sun to help neutralize the positive charge which must follow periods of great electron emission. Grinding static may arise from the more or less sustained discharges thus produced.

One of the most elaborate attempts to overcome interference of the grinder type was that carried out by Weagant, then Chief Engineer of the Marconi Wireless Telegraph Company of America. His method is based on the supposition that the static sources are over head, so that the waves causing interference will be propagated directly downward. Since the signal waves to be received travel parallel to the earth's surface, it is possible to design receiving systems in which the currents induced by the former shall neutralize each other, while those due to the latter are added. Such an arrangement is shown schematically in Figure 1. The receiving units consisted of two single turn loops, L-1 and L-2, each 400 feet high and 1000 feet long, with their centers placed 5000 feet apart. These were placed in the same plane and the line joining them was in the direction of the Carnarvon station of the English Marconi Company. Leads 6 feet apart carried on 10 foot poles connected the loops to the receiving apparatus which was located midway between them. The loops were each tuned to the wave to be received, and coupled inductively to a third tuned circuit. The receiving circuit, which included an ordinary vacuum tube detector, was loosely coupled to this third circuit.

An electro-magnetic wave consists of an electric and a magnetic field directed at right angles to each other and to the direction of propagation. In case of waves sent out by and ordinary antenna, the electric field is vertical and the magnetic horizontal. A receiving antenna of the overhead type is energized by the electric field of the passing wave while a loop antenna is acted upon by the magnetic field. The electromotive force induced in a loop is a maximum when the plane of the loop passes through the source, and is zero when the direction of the source is perpendicular to its plane. The loop thus possesses a directional selectivity. The loops L-1 and L-2 of Figure 1 were coupled to the

third circuit in such a way that currents flowing in them in the same direction induced in it opposing electro-magnetic forces. Accordingly waves originating directly above or anywhere in the plane passing through the receiving circuit, and perpendicular to the line joining the centers of the loop will not be received. Suppose now a wave were traveling in either direction along the line L-1 L-2 and had a wave length twice the distance between the loops. The magnetic fields in the two loops would always be in opposite directions and the currents they induce in the third circuit would accordingly be added. For wave lengths greater than twice the distance between the loops, the induced currents would still be combined, but the resultant would be less than their arithmetic sum. If the loop separation were only ¼ of a wave length, the induced currents would be 90° out of phase, but even so the resultant would be 40% greater than that from one loop alone.

signals as in their clearness; that is, the ratio of the intensity of the signal to that of the disturbance. Strong signals are worth while only in so far as they improve this ratio. The signal to static ratio for the overhead antenna is so bad that, for weak signals such as those arriving from trans-oceanic stations, it has for some years been obsolete.

The loop or coil antenna while it is much inferior to the over-head antenna as an absorber of electro-magnetic energy has a much better signal to static ratio and has come into very general use. This improvement is probably due in large measure to its directive properties.

Another form of antenna giving a still better signal to static ratio, though it is even less effective as an absorber of electro-magnetic waves consists of insulated wires buried in the earth or suspended a short distance below the surface of water. A wave propagated along the surface of the earth with its electric field vertical

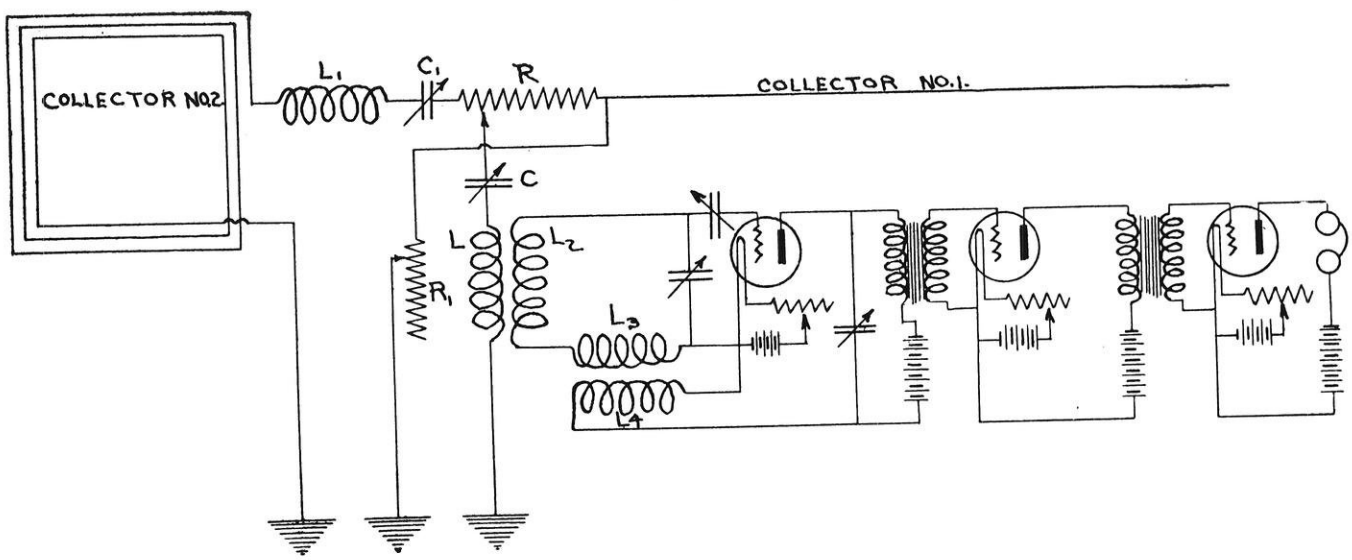


Fig. 2. TAYLOR STATIC ELIMINATOR

This system gave a marked improvement in the ability to receive through static interference, and at the time it was perfected it was widely heralded as having solved the problem of static elimination. Subsequent investigations have shown that static does not all come from above, and the large dimensions of the loops together with the strays picked up by the long connecting lines have prevented it from coming into very general use.

Another method for the elimination of static is one designed by Commander A. H. Taylor, Director of the Naval Aircraft Laboratory, Washington, D. C., in which advantage is taken of the differences in the relative effectiveness of different types of antennas for picking up static and signals. The high overhead antenna is the most effective device known for collecting energy from passing electro-magnetic waves. Unfortunately it is also very sensitive to disturbances. With the refined methods now available for amplification, we are no longer interested so much in the actual strength of is accompanied by conduction currents in the earth producing, at a given point, potential changes having the frequency of the passing currents. These currents are a maximum for waves traveling in the direction of the wire, and zero for those passing at right angles. The buried wire thus also possesses marked directive properties in its reception.

If now a loop and a buried wire are coupled to a third or receiving circuit in such a way that the electromotive forces they induce in it are opposite, then it is possible to so adjust the coupling that all of the disturbance will be neutralized; but since the signal is relatively stronger in the buried wire than in the loop, a portion of it will remain which, by suitable amplification, may be made of any desired strength. Such an arrangement is shown in Figure 2 in which collector No. 1 is the earth wire and No. 2 the loop. The latter is tuned by the inductance L-1 and capacitance C-2. Since the earth wire is practically aperiodic, the loop must include sufficient series resistance at R to render

it nearly aperiodic also. Equality of currents through the two collectors through L is secured by adjusting R-1 which serves as a shunt to earth from collector No. 1.

The originator of this system states that the ratio of improvement of the balanced receiver over the loop alone is about 8.6 to 1, and that it was frequently possible to get 95% copy with it when the static was so severe that signals were not even audible with an unbalanced receiver. Six of these sets, adjusted to different wave lengths were installed at Belmar, New Jersey in April 1919, and were used for all of the Navy's trans-Atlantic reception for the remainder of the war.

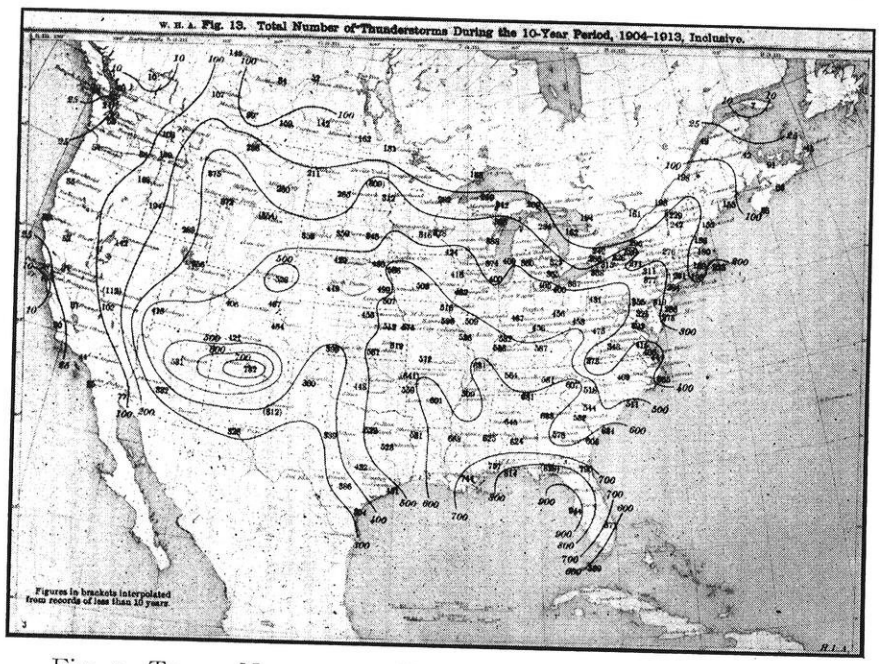


Fig. 3. Total Number of Thunder Storms During Years 1904-1913

One of the most important contributions to the problems of static elimination is the recent discovery that the disturbances do not come from above as Weagant believed, but that, for the most part, they originate in certain fairly well defined land areas. In the U. S. there seems to be two such localities, one in the Gulf states, and the other in Arizona and New Mexico. In Figure 3 is shown a map prepared by the U. S. Weather Bureau in which the total number of

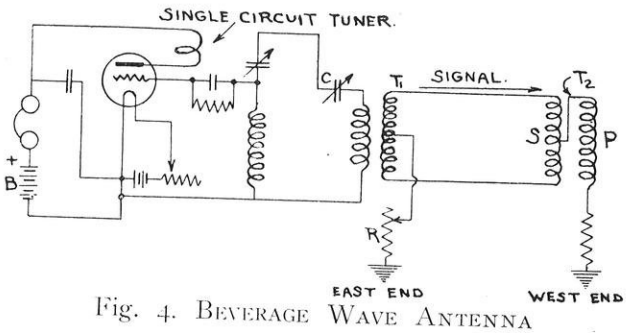


Fig. 4. Beverage Wave Antenna

thunder storms which occurred during the 10 year period from 1904 to 1913 have been recorded, and lines drawn through the areas having equal numbers. It is a very striking fact that the preponderance of static comes from the regions where the thunder storms are most prevalent, and opinion is again swinging back to the idea that they, rather than the high altitude disturbances, are responsible for our difficulties in reception.

Fortunately for trans-oceanic reception on both sides of the continent these static sources are nearly opposite to the stations to be received and any receiving device possessing highly directive properties may be used to advantage. One of the most successful of these is the so-called "wave antenna" designed by Mr. H. H. Beverage of the Radio Corporation of America. It consists of two long horizontal wires suspended at equal heights, a few feet above the ground extending from the receiver in a direction opposite to the transmitting station. At each end is a clever coil arrangement which permits waves traveling in one direction to act upon the receiver by neutralizing the effects of those going the other way. The action may be understood from Figure 4 in which the two wires joining the transformer T-1 and T-2 constitute the antenna. A signal traveling in the direction of the arrow induces in these wires equal charges which travel toward T-2 with a speed nearly equal to that of light. At T-2 these currents flow in opposite directions through the coil S to its mid-point where they unite and pass through P to earth. Since each flows through half of S their direct effects on it are neutralized. However, they flow simultaneously through P in the same direction, and since S is closely coupled to P they induce in S by ordinary transformer action an electromotive force. The two wires now serve as a transmission line to carry this induced current back to the transformer T-1 where it actuates the receiving circuit shown at the left.

Waves traveling in a direction opposite to the arrow induce charges which arrive simultaneously at T-1 where they flow in opposite directions through the resistance R to ground. They induce in the secondary of T-1 no electromotive force since their magnetic fields in T-1 neutralize each other. The resistance R is made sufficiently large so that their energy is all absorbed in this first surge to earth and there is thus no reflected wave from this end. By making the antenna somewhat longer than the wave length to be received very directive properties are secured.

At Radio Central New York, the powerful station of the Radio Corporation of America, this method of reception has been in use for some time. The wires are 7 miles in length and are suspended 10 feet above the

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THE ENGINEERING LOAN FUND

By F. E. Turneaure

Dean of the College of Engineering

I have been asked to tell the readers of *The Wisconsin Engineer* something about the loan funds which are intended primarily for the use of engineering students. There are three such funds, known as the Engineering Loan Fund, the Archibald W. Case Loan Fund, and the Wisconsin Engineer Loan Fund. The first fund was started in 1901 by a contribution from a Milwaukee friend who did not desire his name to appear. His contributions during two or three successive years amounted to about $500.00, and from other sources small additions were made, so that this fund amounted, in 1916, to $870.00. Since then, further considerable additions have been made, including $150.00 from the Engineers' Minstrel Show in 1916, $90.00 from the Gas Engineering Exposition in 1918, and interest payments of over $300.00. The total in this fund, on October 1, 1923, was $1475.00. During the college year 1922-23, fifteen loans were made from this fund, totalling $750.00; repayment and interest receipts amounted to $990.00. There are only three notes outstanding older than 1919.

The next fund created, and the largest, is that established by Major J. F. Case in 1916. Major Case attended the College of Engineering as a special student in 1886-88, but did not complete his course. He has achieved marked success in civil engineering practice, particularly in connection with foreign enterprises, and is a prominent member of the American Society of Civil Engineers. Recognizing his distinguished success, the University, at the Commencement of 1913, granted him his engineering degree as of the class of 1890. He again became very much interested in the work of the college at the time when his son, Archibald W. Case, of the class of 1915, was a student. Archibald was a young man of very fine character, and would have made a marked success as an engineer, but he had barely begun his professional practice when he met with a fatal accident. It was largely as a memorial to his son that Major Case established the loan fund which bears his son's name. Since his first contribution of $1000.00, in 1916, Major Case has added $2500.00, and interest payments have amounted to $160.00, so that on December 1923, the total fund was $3660.00. During the academic year 1922-23, fifty-three loans were made, amounting to $2854.00, and repayments have been received in the sum of $2256.00 and interest of $133.00. On October 1923, there were 58 loans outstanding, of an average amount $55.00, only two of which are dated prior to 1920, and only thirteen prior to 1921. Major Case has expressed his desire to increase this fund ultimately to a total of $5000.00.

The last loan fund is one of $500.00 contributed by *The Wisconsin Engineer* in October, 1923. Eleven loans have been made from this fund and one repaid.

When money is borrowed, the student signs a note to the University, due one year after date, and carrying 6% interest after due. On the note are printed the words, "This is a debt of honor, and the obligation should be sacredly kept, in the interest of others who, like myself, may be worthy to profit by the fund." Many of the loans are made for a shorter time than one year, and students are urged to repay the loans as soon as practicable so as to help some other chap who needs the money; their response in this matter is certainly very satisfactory. If the student is unable to repay the money when due, the time is freely extended until a year after graduation. We expect, of course, to lose a few loans, but experience so far indicates that the proportion likely to be lost is exceedingly small, and will be more than balanced by interest receipts.

From the figures here given, it will be seen that the loan funds circulate quite rapidly. The experience of 1922-23 indicates that about two-thirds of the entire fund circulate each year. Naturally the amount available is not sufficient to enable large sums to be loaned to any individual. It has been thought that the greatest benefit would be obtained from this money by making relatively small loans to numerous students, rather than large loans to a few; and with this in mind, most of the loans have been made to seniors and juniors who need comparatively small sums of money to carry them through the year. When a student reaches his Junior year with a satisfactory record, I believe that he should finish his course as soon as possible, even though he has to borrow the money to do it. The sooner he gets into practical engineering work, the better; and it will generally be more economical in the end to complete his school course promptly, with the help of borrowed money, than to leave school for a year in order to earn the necessary funds to carry him through. Borrowing a moderate amount of money at this stage of his course is also much better than to spend an excessive amount of time to earn money on the side. Many students are doing poor school work because they are spending too much time in earning money to pay their expenses, a plan which is likely to prove very unprofitable in the end. I wish we might have sufficient funds to enable any Junior or Senior in good standing to borrow as much as $200.00 or $300.00 a year to complete his education.

To freshmen and sophomores, I would give somewhat different advice. While of course there are exceptional cases, students should be rather slow to borrow any considerable sums of money so early in their course, unless they can see their way clear to meet the obligation; and as long as our loan funds are so limited in amount, it seems better to render assistance to students of the upper classes who need financial help to finish

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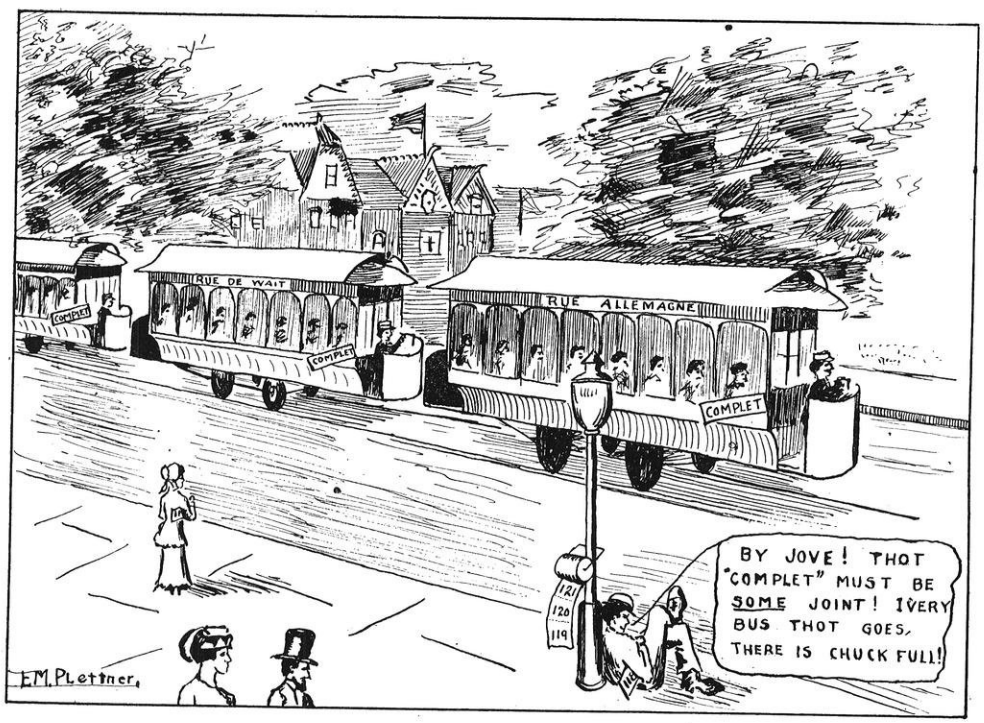
SPARKS FROM AN AMERICAN ENGINEER'S LIFE IN FRANCE

By Norman Lee, e '04

Engineer, Transformer Design Department, Allis-Chalmers Manufacturing Company

After twenty years spent in France, the first thing that struck me upon my recent return to America was that France does not know mass production as we do. Hardly anything is made there in large quantities, with the exception, perhaps, of soap, dentrifice, and the like.

Small scale production is not without its advantages, however; it has developed a flexibility of manufacture that is not often found here. Factories and personnel must be equipped to handle almost everything that comes along, so that all may be grist for the mill. The result is that the French mechanic is a more all-around man than his American brother, and can turn his hand to lathe work, milling machine, shaping, planing, forging, tempering, and fitting — and do all of them well. When they come to the United States, I am told that they usually find their way into the tool room.



The "Rush Hour" in a Busy French City

Another result of small scale production is that the factory equipment, except perhaps in the largest concerns, is very limited. To this day French pattern makers use a buck saw with only a stick and twisted cord to tighten the blade, and the old-fashioned plane with a wooden wedge to hold the knife. The claw hammer is unknown; a flat-peen hammer is used, and nails are pulled with a pair of nippers. But the beautiful work they turn out is surprising, — it is something to be proud of, and a pleasure to look at. The mechanic uses vernier calipers extensively, to the exclusion of our outside calipers, and I must say it is extremely convenient. In one concern, the French Thomson Houston company, the wood turning lathes were far more antiquated in 1917 than the one I had learned on in 1900. They were driven by a sewing machine belt and had only two speeds; to set the rest and tail-stock was quite an operation. But the point is, they do the work.

French engineers have some traits that are not common here. They are almost to a man clever in theory but poor in manual operations. The majority of them despise a hand worker, or even a colleague like myself who is fond of and has some skill in the manual operations. I knew one who religiously avoided the shop. It did not interest him a particle to see the making of his machine; and only when it was on the testing bed, ready to run, would he consent to see it. The engineer is rarely called upon to go out on erecting jobs as the workmen are so good that there is not the necessity for him to know the manual side as there is with our engineers. There are some schools in France that specialize in manual operations, the *Art et Metiers,* for example, but the engineers from these schools are considered an inferior lot by the more technically trained ones, and usually find their way into positions as superintendents.

The American engineer, as a result of these conditions, finds it hard to compete with the French technical engineers. Personally, I do not believe our technical training is equal to that of the French. They are really excellent in mathematics, handling calculus with ease and assurance, and their theory is well developed. I found it necessary to brush up my own technical equipment considerably, as there was practically no outlet for my mechanical skill, and one must be as well trained mentally as they are in order to hold the better-paid office positions. With the average mental standard so high, the exceptional ones are positively wizards.

French Engineers Dislike Manual Operations

The rates of pay are ridiculously low as compared to those in America, and a few figures will no doubt be of interest. An engineer of standing who has been several years on some special line of work receives about 1500 francs a month ($88.00). Out of thirty whom I know who have been several years in practice,

not more than five go beyond this figure, and 2000 francs ($118.00) is an unusual salary. Not one of the thirty owns even a flivver, to my knowledge, — cannot, unless he has independent means. Draftsmen get about 800 francs ($47.00); mechanics, carpenters, plumbers, plasterers, and bricklayers receive from twenty-five to thirty francs a day (1.50 to $1.90). Engineers are relatively much better off than workmen, so there is not the recourse of turning to the manual trades to increase their earnings,—they just have to grin and bear it.

Low Rents Result in Housing Shortage

The reader may say, "Oh yes, that's all very well, but no doubt he is much better off than he would be here; living in France is so much cheaper than here." It is true that some things are cheaper, but I compared Paris prices with those here, immediately on arriving, and found that butter is no higher than in Paris; meat is, if anything, cheaper here; eggs and vegetables are about the same; milk and bread are about twice the Paris prices for these commodities. As a result, expenditures for food take a large percentage of the income, and drastic economy is the rule. Clothes are much cheaper in France,—about one-third of American prices for garments of the same quality.

Rents are cheap; a five room flat costs about 4500 francs ($265.00) a year, to which must be added a thousand francs ($59.00) for taxes. Only the fortunate few can have a flat, as the population to be housed is vastly in excess of the number of accomodations. Building has not been on a normal scale since 1914. Rents are government controlled and cannot be raised above a certain percentage over the old rates, with the result that new buildings will not return a sufficient income at the allowable rentals to pay for constructing them. Building, under these conditions, is naturally limited, and excessive overcrowding results.

A few words on the conditions of work may be of interest. It is at all times difficult to find a job in Paris. At such times as I have sought a new position, it has taken a three-months active campaign to land it. Moreover, it is extremely distasteful; the man out of work is a nuisance, a pariah, an outcast. Many times I have been treated casually and cavalierly by a mere flunky, who showed his superiority in that he had a job and I had not. Everyone is absolutely obliged to stick to his own line of work. There is no possibility of taking up drafting, for example, to gain a foothold toward something better; if there is not a position open in the applicant's line, he will not be considered for any other post.

The better paid jobs are often unstable and dependent upon general conditions. A decrease in orders or a political crisis may be the reason for losing a position. The fact is that one must be mighty capable to make even a living in Paris. Many of our doughboys whom I talked with desired to remain in France; they sought ways to make a living, but had nothing to offer, from the French point of view, that would put bread into their mouths. My knowledge of English has never been of advantage to me in France, — all that was required was that I speak French so as to be able to do the work.

When one does have a position there are many drawbacks. A year ago, I was with a concern which paid me a thousand francs a month ($60.00). I had a plain deal table to work on, a kitchen chair, no filing cabinets and no conveniences. Since the war there has been an increasing amount of drive and supervision to extract the last ounce out of the employee. For instance, a company will take a stenographer who knows accounting and make her serve in both capacities without a minute's rest during the day. The concern mentioned above had a stenographer at five hundred francs ($30.00) a month. Although she worked overtime continually, three months later she had not received a cent of overtime money. Of course she could take action — and lose her job.

The average French engineer is a pleasant enough fellow to get along with. The nation is, on the whole, superficially polite. You will never even cause a smile by the most outrageous blunders in your French, nor will you ever be corrected. This makes it difficult to learn, as you go on making the same mistakes over and over again. No matter what the political situation between your country and France, they will never take it out on you, and if you are polite yourself you will invariably be accorded courtesy. The engineer has the time-honored privilege of coming late to work; ten to fifteen minutes every day, and a half or even three-quarters of an hour now and then will cause no comment. This is to differentiate him from the time-clock man. The profession is a respected and dignified one.

The Paris Subway, Cheap But Crowded

Paris has a really wonderful subway system. The stations are arch-shaped and finished in white tile. The cement platforms are swept several times a day and are sprinkled to lay the dust. Each station has its name in blue tile letters about a foot high which stand out well against the white background and enable a passenger to know where he is without asking questions. Moreover, in every station there is a large map of Paris, with the complete system laid out in thick red lines, showing all possible transfers. The exact position of each station is indicated by a large red spot on the map, and as a person travels from station to station he can see this red spot change places. The map and the red dot indicating the station position on the system are large enough to be seen from the car window.

The *Nord Sud* line, a later development of the system, is even better. Here the name of the station is in letters at least two feet high, and all along the platform the name is repeated (in rather smaller letters) at intervals on both sides, so that regardless of where the car stops, a person knows where he is. At each end of the platform, the direction in which the trains

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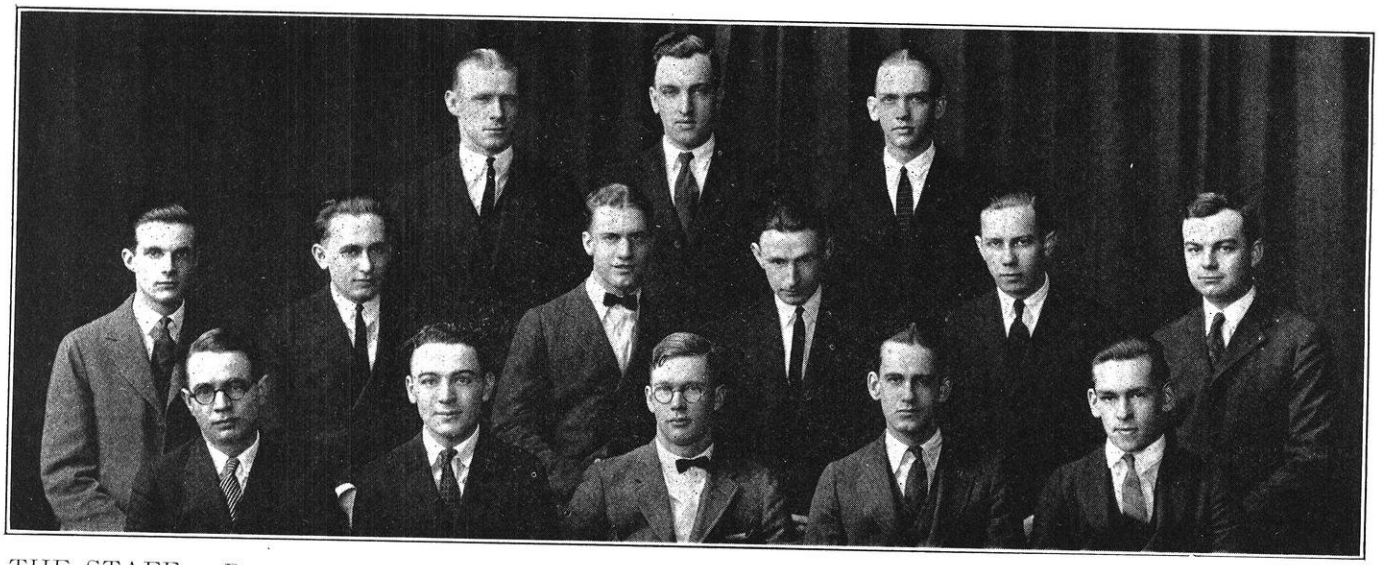
EDITORIALS



THE STAFF —*Row 1: Plettner, Ouwenecl, Richtmann; —Row 2: Von Kass, Lindner, Thieman, Crew, Purvis, Edwards; —Row 3: Sogard, Summers, Holmes, Blanch, Lilja*

THE LINK

This is the ENGINEER'S last opportunity to wish the seniors success, and to express the hope that they will not feel content merely to read the magazine every month, but that they will continue to contribute to its contents whenever they can.

The ENGINEER will mean even more to them now than it has in the past. The alumni section belongs to our graduates. It ranks with the best to be found in the college journals of today. The editorial columns are open to the alumni. Some of the best editorial material that has appeared in this section of the magazine has been contributed by them.

Descriptions of interesting jobs on which they are working are of particular interest to the under-graduates. They are always eager to learn of the work which is being carried on by graduates of their own school.

The ENGINEER wants to be a part of the professional life of the class of 1924. It has never been disappointed in other classes, and it looks forward to greatly strengthened support in this class.

Undoubtedly the greatest advantage to be gained from a college education is the acquisition of a disciplined mind. Just as the athlete must train to become successful in his sport, so must the student acquire an intellectual vigor, a discipline of imagination, in order to succeed in his line of endeavor. —President Hibben of Princeton University.

POLYGON DOES ITS STUFF

Polygon, the student executive body of this college, has established its reputation in the community by its able handling of community affairs this year. It was responsible for the best Engineers' Parade ever held in Madison and for a fine Engineers' Dance. These events have been planned well in advance of date of performance and have been run off with skill and snap and the accomplishments serve to demonstrate that there is a real need for Polygon.

Wenzel Fabera, president, and Hubert Holmes, secretary, have filled their positions in a capable manner and deserve much praise. They have been ably seconded by Breitenbach, Giles, Rick, Plettner, Bars, Gladson, and Boley. And this brings us to another matter: The engineering societies should not fail to make their appointments for next year before school closes this June. Give Polygon a running start for next fall.

"Education will broaden a narrow mind, but there is no cure for the big head."

LAB COURSES

Courses in the college are arranged so that every engineer spends a great deal of his time in a laboratory during the greater part of his university life.

This is as it should be. Too many are apt to depreciate the worth of a lab course. We feel that its importance should rank with the most theoretical course in our college. Although the student may feel that his

(Concluded on Page 170)

Conveyors like this, built with rugged Rex Chain, are aiding in the production of Buick, Dodge Brothers, Ford, Nash, Paige, Studebaker and many other motor cars

This powerful and long-lasting Rex Chabelco Steel Chain is delivering equal satisfaction in conveying materials and in driving rolls, drums, oil-well drills, screens, construction machinery and other equipment

REX CONVEYORS

Saving manual labor is at present one of the most important engineering problems. Though facing a decreased supply of unskilled labor, due to restricted immigration, American industries are being called on to satisfy an increasing demand for their products. Consequently, material handling is an increasingly important phase of engineering work. Forced to produce more units with fewer hands, thousands of plants are solving the problem through a proper use of labor saving equipment in the movement of materials, thereby releasing labor for other tasks, and insuring larger outputs at lower cost.

Similarly, REX Concrete Mixers are saving labor on construction jobs; REX Pavers are building miles of concrete roads; REX Traveling Water Screens are supplying clean condenser water to hundreds of large steam plants; REX Sprocket Chain has a wide application for efficient power transmission.

Such developments require engineering skill and training. Our Engineering Departments are made up of men capable of meeting a wide variety of engineering problems and solving them successfully.

CHAIN-BELT COMPANY

MILWAUKEE, WISCONSIN

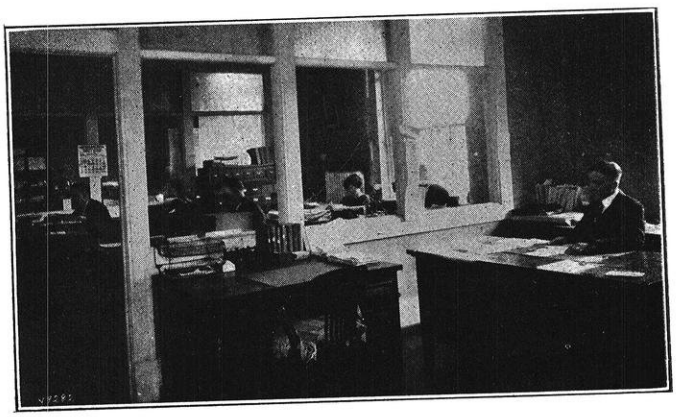
REX MIXERS, REX CHAIN, REX SPROCKETS, REX CONVEYORS, REX TRAVELING WATER SCREENS

Kindly mention The Wisconsin Engineer when you write.

EXTENSION NOTES.

Prospective students in Engineering will be interested in the following extract from the University Extension Directory for High School Seniors:

"If you have not taken the required three half years of High School Algebra, and expect to enter any department of the College of Engineering, you will have to make up that amount in some way or enter a sub-Freshman class in Algebra".



VIEW OF MECHANICAL ENGINEERING OFFICES
University Extension Division

"Advanced High School Algebra, Course 40, is to prepare prospective students to satisfy entrance requirements in Mathematics and insure favorable conditions of progress in engineering studies. It is a correspondence course of 20 assignments and may be completed during the summer. Those who finish it successfully receive a certificate of completion that will excuse them from taking the entrance test and place them in regular class standing."

Mr. M. Demougeot, New Orleans, Louisiana, a student in Architectural Drawing, called on the Mechanical Engineering Department during the early part of April while attending a course in Lumber Salesmanship at the Forest Products Laboratory, Madison, Wisconsin. Mr. Demougeot was formerly engaged in the export of staves to Europe but is now with the Lyons Lumber Company.

A number of Engineering students from the Milwaukee Branch made an inspection trip through the new Riverside Pumping Station at Milwaukee on April 23. This station draws water from a point in the lake more than a mile away through a tunnel under the east side of the city and the Milwaukee River. It will be pumped against a head of approximately 285 feet for the high pressure supply of the city.

The following students in the Milwaukee Branch will complete the three year course in Structural Designing on June 17, 1924:

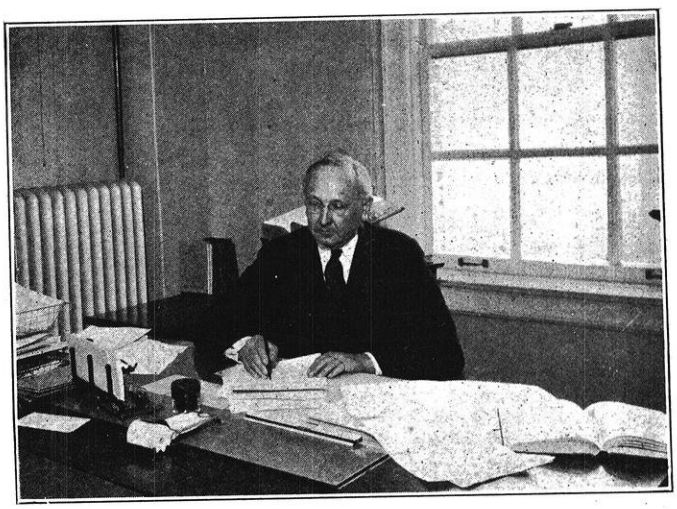
Alcott, Harold T.
Asal, Walter F.
Cahill, Morgan J.
Evanson, Henry B.
Halter, Joseph J.
Hedquist, Harold F.
Hein, Walter E.
Herrmann, G. R.
Keeler, Alfred R.
Koblilusz, Michael
Koss, Anton J.
Leinse, Edwin A.
Lesinski, Leo
Ponschock, Henry J.
Priegel, Aug. B.
Robinson, Harold B.
Skavold, Albert C.
Young, Hobart C.

In addition the following will complete the two-year course in Construction Superintendence at the same time:

Angst, Frank X.
Borkel, John D.
Chadek, Joseph F.
Erbes, Russell G.
Follmer, Clement H.
Hay, Eugene D.
Jacobs, William H.
Johnson, Ellis C.
Miller, James R.
Peters, George T.
Rasmussen, John
Remiker, Frank W.
Schroeder, Paul L.
Sundvall, Voctor D.
Tandberg, Arthur B.

The technical instruction for the courses has been largely given by Professor W. J. Fuller, Mr. Herbert W. Wesle, and Mr. Charles H. Harx of the Milwaukee Staff.

The entrance requirements for these courses will be raised during the coming year. The course in Construction Superintendence will then be completed in one year and the Structural Designing Course in two years.



PROF C. M. JANSKY, IN CHARGE OF ELECTRICAL ENGINEERING COURSES
University Extension Division

ENGINEERING REVIEW

H. C. WOLFE

DEVELOPED WATER POWER

The Geological Survey, Department of the Interior, has just brought up to date its record of developed water power in the United States, which shows that there are now about 3,200 water-power plants of 100 horsepower or more, having a total capacity of installed water wheels of 9,086,958 horsepower, an increase of about 1,160,000 horsepower, or nearly 15 per cent over the total in 1921, which was 7,926,958 horsepower. Of the present total 81 per cent is in public utility plants and 19 per cent in manufacturing plants. The corresponding percentages in 1921 were 78 and 22.

New York, with 1,542,983 horsepower, is still the leading State in developed water power; California, with 1,451,830 horsepower, is a close second; Washington, with 480,356 horsepower, is third; Maine, with 473,188 horsepower, is fourth; and North Carolina, with 431,500 horsepower, is fifth, displacing Montana, which ranked fifth in 1921.

Water-power development in the New England, East North Central, West North Central, and Mountain States has not kept pace with that in the other parts of the United States, as the following table shows.

Developed water power in specified divisions of the United States in 1921 and 1924.

Division	Percentage of total in U. S.		Difference +== increase —== decrease
	1921	1924	
New England	16.5	15.3	—1.2
Middle Atlantic	18.7	19.1	+ .4
East North Central	9.3	9.1	— .2
West North Central	5.6	5.1	— .5
South Atlantic	13.6	14.3	+ .7
East South Central	3.1	3.8	+ .7
West South Central	.2	.2	0
Mountain	10.4	9.7	— .7
Pacific	22.6	23.5	+ .9

DIESEL NON-STOP RECORD

A continuous run of 202 days, under actual working conditions, is reported by the Worthington Pump and Machinery Corporation for a Worthington Snow Diesel engine. The engine is a standard 562 hp., 4 cycle, air-injection type operating at 225 r. p. m., and is used by the City of Horton, Kansas, for city lighting and power purposes, driving an alternating current generator in parallel with another unit. The engine has three cylinders, each 22½ inches by 22½ inches, and of the square type. The pistons are oil cooled. Lubrication is forcibly fed to all parts of the engine.

In small municipal plants loads naturally vary considerably, from heavy to light. The Snow engine met all the conditions. The high efficiency of the Diesel engine is already well known; but that it is able to operate continuously, without stop is not so well known.

REMARKABLE SAFETY RECORDS FOR ENGLISH RAILWAYS

Only two deaths resulted from accident on the railways of England in 1923, according to the Railway Gazette of London. These occured together at Diggle, on July 5, when two passengers were killed. Since the beginning of the present century there have been two years—1901 and 1908—without a single fatality to passengers, and the next best years were 1907 and 1917, with one fatal accident in each. During three of the years since 1900 there were but two fatalities, and during seven other years there were three deaths in each year. In only three years have more than five people been killed and in 23 years the number of deaths has reached a total of but 73.

BILL FOR MINES DEPARTMENT

Senate Bill 937, introduced by Senator Shortridge, proposes that there shall be an executive department, known as the Department of Mines, and a Secretary of Mines, appointed by the President, at a salary of $12,000, and whose tenure of office shall be like that of the heads of other executive departments—the Cabinet. On many occasions Senator Shortridge has addressed mining conventions in the West favoring the establishment of such a department. He will seek an early consideration by the Senate Committee on Mines and Mining.

In 1922, the value of agriculture crops, reports the Department of Agriculture, was $14,310,000,000 and the appropriations made to that Department, $48,149,559. In the same year the mineral output, according to the Geological Survey, was $4,652,000,000, while the combined appropriations for the Geological Survey and the Bureau of Mines amounted to only $3,088,640.

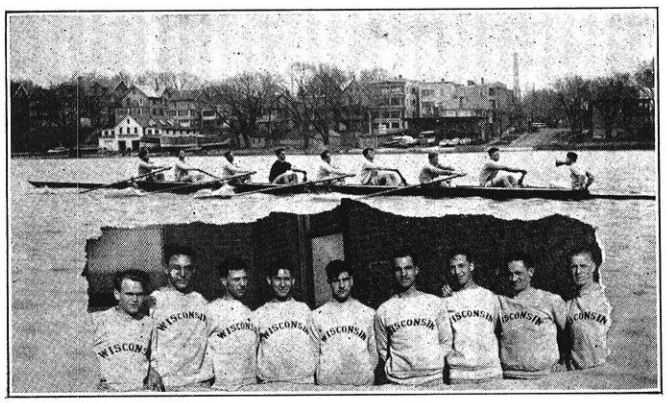
(Continued on Page 170)

ATHLETICS

G. H. ABENDROTH

CREW

At last "Dad" Vail's unceasing efforts have met with reward, and Wisconsin's colors will again be carried to the Hudson. Not since 1914 have we had the opportunity to try our midwestern brawn against that of our eastern and western brothers. Last year's crew, rowing against the championship Washington aggregation, using a shell that weighed 150 pounds more than



ON FOR POUGHKEEPSIE — 14:10 OR BUST!
Kitchen (coxswain), Schuetz (Capt.), Johnson, Jax, Teckemeyer, Bentson, Jones, Sly, Plettner

Washington's, finished five lengths behind them in the three mile race on Mendota. The Washington coach said at the time, "Give those boys a shell like ours, and it would be nip and tuck." He also said that the Wisconsin stroke, H. E. Johnson, was the best man on the water.

This year we have a new shell (weighing 265 pounds as compared with the 400 or more of the old); we have the four starboard men of last year's crew, and we *are* going East! Too much cannot be expected of the boys this year, because of the fact that Dad Vail had to break in three starboard men of last year's Junior crew as port men for the Varsity this year, and such transitions take time. However, the boys are working better every day — getting the "rhythm, the catch, and powerful finish" that is characteristic of a real crew, and they are not going to finish last at Poughkeepsie!

The present personnel of the Varsity is as follows: H. Johnson (stroke), Teckemeyer (7), Captain Schuetz (6), Jax (5), Bentson (4), Sly (3), Jones (2), Plettner (1), Kitchen (coxswain). The college of Engineering is well represented, Johnson, Teckemeyer, Bentson, and Plettner being the disciples of St. Pat. on the first crew, and Rhode, Wallagher, and Schuman the "wearers of the colors" on the second.

As yet no home races have been scheduled for the Varsity, but the University of Manitoba may be met here. The Junior crew will meet the St. Johns Military Academy here on Venetian day, May 31. They also race Culver on June 7 on Lake Maxinkuckee. The present Junior crew is composed of Tessier, Esser, Grunitz, Schuman, Rhode, Wallagher, Holmes, and Van Wagener, with Coulter as coxswain.

Teckemeyer and Sly will be the only men of this year's Varsity who will be eligible for competition next year. Johnson, though returning for another year of college work, has already rowed the limiting three seasons with the crew, and will not be allowed to compete. Capt. Schuetz, and "Deac" Jones have also rowed three seasons with the Varsity; Bentson has put in two. Plettner, Jax, Teckemeyer, and Sly are all members of last year's Junior crew. Needless to say that the trip to Poughkeepsie this year will be a fitting reward to these men, practically all of whom have put in four years of the hardest kind of work.

Expectations for next year are unusually bright. "Dad" has the most likely looking bunch of freshmen that he has had in many moons. Many of them have had experience with Duluth, St. Johns, or Culver, and are of the long, rangy type that make the best kind of "spruce benders". The trip East will keep them coming —and many more like them. Let us hope for the day when the boys will be hailed as the champions of the nation!

BASEBALL

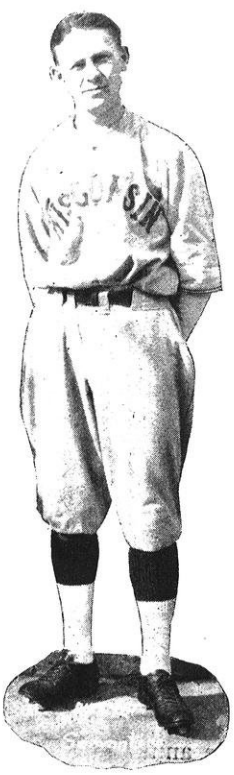
The baseball team, after weeks of practice in the gym annex, received its first opportunity to "knock 'em out of the lot" against Butler on the annual spring trip. Butler proved itself as competent in baseball as it is in basketball and defeated Wisconsin to the tune of 10 to 2. After taking a beating from Butler the team moved farther South to Mississippi.

The Mississippi University nine welcomed us just as Butler had previously done, and the Badgers found themselves on the short end of a 5 to 2 count. However, the Wisconsin team became accustomed to the Southern climate after their first defeat and returned Mississippi's welcome by taking the boys from the sunny South into Camp. After a few days rest due to rain, the Badgers found themselves facing Mississippi A & M, a team which had always given them plenty

of trouble. Our team with one victory to its credit decided to add another, and, even though the A & M boys tried hard, the final results showed them credited with three scores against Wisconsin's four.

After breaking even in the South, the Badgers started back for home. Armour Tech fell before a bombardment of hits and when the smoke cleared away we found that 14 of our men had crossed the plate to Armour's 6. The final game of the trip was played against Chicago, our first conference opponent. The week's stay in the South had given Capt. Aschenbauner and his Badgers keen batting eyes, and as a result Chicago's scalp was added to our string of victories.

The trip showed that Lowman had developed a ball team which is sure to win a goodly number of its games. The team looks better than any produced at Wisconsin during the last few years. The pitching department is credited with real stars in the persons of Christenson, Johnson, and Luther; with Eddie Aschenbrenner behind the plate, these men should each turn in a few victories. Aschenbrenner, who is one of the best catchers of the Big Ten, has a good second in Lamboley, a sophomore in engineering. The infield positions are being taken care of by Slim, Cllingson, Goss, Tangen, and Steen or Radke. All are showing major league class in fielding, and any opponent will find a hard time getting the ball through them. Servatius, a veteran from last year's team, spends quite a bit of his time in the engineering building when he isn't playing baseball. He is a junior in mining engineering, and he should be an expert in pilfering bases because of his experience in hitting the dirt even though he has probably only done the trick with a pick and shovel. A good man is the inevitable result of practical training.



SERVATIUS
Our representative on the baseball team

The Badgers showed themselves a strong nine against Illinois, although they lost when the Suckers clustered a few hits and packed the game away in the sixth inning. The score 4-1 predicts that if the Wisconsin team comes through in the hitting department, it will find itself in the upper ring of conference teams. With 12 conference games on the schedule, the team will have enough opportunity to break fences both at home and abroad. Illinois will be met again at Urbana and with a little luck and heavier stick work the Badgers should come out ahead of their strongest rivals for conference honors.

TRACK

Camp Randall is a busy place betwen four and six every afternoon in the week. Coach Jones has his men working out daily to prepare them for a successful outdoor track season. In the last indoor results of the year Wisconsin teams placed better than they had in the indoor conference meet, where they had to be content with position just above the cellar. The half mile relay team composed of Harry McAndrews, Bert Hilberts, Kenneths, and Herbert Flueck took first place at the Ohio state relays and the same team with G. Smith substituted for McAndrews placed second in the mile relay. McAndrews added to his laurels by taking first in the 100 yard dash. The four mile relay teams took second place at the Kansas relays. Besides running in the Ohio State and Kansas relays, the team also competed in the Drake relays at Des Moines.

Although the track team has scheduled only three outdoor conference meets, which include Minnesota, a quadrangular meet against Ohio, Chicago, and Northwestern, and the big conference get together, the outdoor season should be more successful than the indoor. 2¾ points were the result of Wisconsin's best efforts at the indoor conference meet, a mark which should not be very difficult to beat. The track team may schedule a meet with Marquette to decide Badger state supremacy.

The outdoor track team should be made stronger by the addition of Elmer Krieger who pole vaulted himself through a "con" in mechanics. Capt. Bill Hammann, who twice placed second in the pentathalon at Illinois relays, and several other engineers will conclude their service as track men on the varsity at the close of the present outdoor track season. Let's hope that their last efforts will place Wisconsin near the top.

SWIMMING

Joe Steinauer can take a rest after a rather hectic swimming season, but he should start getting his swimmers and plungers ready for next year's eligibility committee. Although the gym team was practically represented by a two man squad consisting of Schmidt and Stevens, the eligibility committee did their best to beat this record and picked Joe's swimming team as the goat. As a result, Capt. Czerwonky found himself the only sure point winner on the squad. At the conference meet, which Wisconsin at the beginning of the season had a good chance of winning, the team came out fifth best. Czerwonky, who besides being captain of the swimming team is an engineer, scored all our points, taking firsts in both the back and breast stroke events. Simpkins and Koch who also went down to Chicago failed to place in the dives.

After beating all his competitors in the west, Czerwonky went east to defend his title of national intercollegiate breast stroke champion. At this meet he had to be satisfied with second place, being beaten by a very small margin. Czerwonky will make a big effort to represent Wisconsin on the 1924 Olympic team.

DAYLIGHT ILLUMINATION.

The angle of refraction being equal to the angle of incident, it is a simple matter to determine the correct angles to use in manufacturing glass which will give good illumination. But for proper industrial plant illumination, there is more to be considered than mere deflection of light. The direct beam of light must be eliminated in order to prevent sun glare, which is objectionable on account of its causing heavy shadows and strong contrasts which decrease the efficiency of employees and necessitate the use of shades which in turn reduce the light to such an extent that daylight illumination any distance from the light source is not sufficient. Therefore, in order to produce a glass which when used in the windows of industrial plants will produce as near to ideal illumination as possible, we must first eliminate the direct rays of the sun by deflecting the light to the ceiling and side walls which re-deflect it back to a distance 25 to 50 feet from the window throughout the entire working area. To accomplish this we have scientifically designed a type of glass which is named "Factrolite."

Factrolite consists of 30 ribs to the inch, running at right angles, forming 900 pyramidical prisms or 3,600 light deflecting surfaces which completely disintegrate the direct beam of light from the sun. Furthermore, the depressions in the surface of Factrolite are so slight that the accumulation of dirt and dust is minimized and can be perfectly cleaned with an ordinary dry scrubbing brush. Incidentally, the cleaning of windows is most important for keeping up production and increasing the efficiency of any industrial plant and should be given more consideration in plant management.

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

MISSISSIPPI WIRE GLASS CO.,
220 Fifth Avenue,
St. Louis. New York. Chicago.

No. 1.

CAMPUS NOTES

L. C. CREW

THE ENGINEER'S DANCE

The sons of St. Pat were unusually blest on the occasion of their annual revertation to the "Realms of the Light Fantastic" (or fanatic, as you will) by being presented with the very best of beautiful May evenings. The trip across the lake to Esther Beach was a pleasure, and the presentations of the Benson and Emmanuel Orchestra were in a class by themselves. The affair was so enticing that many of our "shyster" friends from across the campus disguised themselves as engineers and took part. No disturbances arose, however, although it is said that one golf enthusiast did succeed in passing the line of sentinels. Polygon is to be congratulated for the success, financially as well as socially, of the venture this year.

The Board of Regents have appointed the following Fellows for the year 1924-25: Arni Helgason, electrical engineering, and Everett C. Schuman, civil engineering. Paul J. Barenscher was appointed a scholar in electrical engineering.

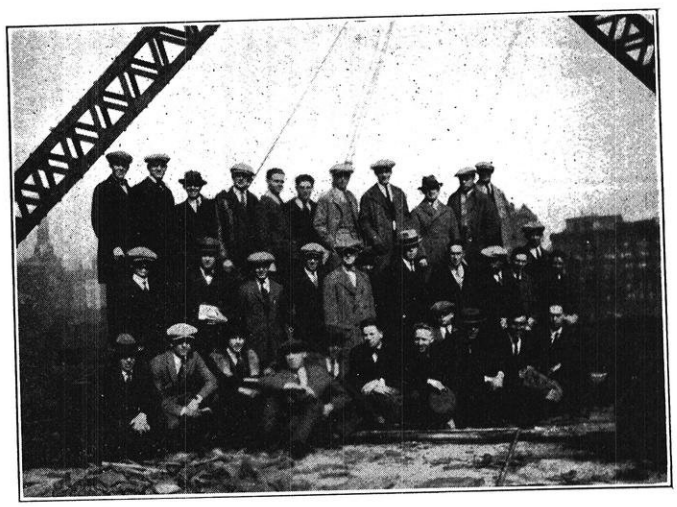
TAU BETA PI ELECTION

Tau Beta Pi, honorary engineering fraternity, announces the election of Louis C. Alk, Reginald R. Benedict, Harry W. Grosjean, Waldemar J. Landwehr, Frederick K. Leisch, Clement P. Lindner, Alfred T. Muelenbruch, George E. Megow, Edgar J. Plautz, William E. Schubert, Millard B. Smith, Erwin R. Summers, Harry C. Thayer, and Melvin A. Thomas.

CIVILS INSPECTION TRIP

About 50 Junior Civils spent March 7, 8, and 9 in Chicago on the annual inspection trip. On Monday evening the Northwestern terminal was inspected and the afternoon was divided between the new Union Station and the Underwriters laboratories. The following morning the boys learned how to throw mud and shake a paint brush at the Terra Cotta plant. The afternoon was spent at the Universal Portland Cement plant at Buffington, Indiana. There are some who claim to have learned how Portland cement is made in spite of the clouds of dust and the noise of the machinery. On Wednesday the steel plant at Gary was visited. This was the last inspection of the trip, the entire day being spent in the plant. The inspection was very thorough even though one unfortunate member of the party claims that he counted only 1599 of the 1600 acres. Professors Withey and Van Hagan and instructors Wiepking and Stivers were in charge.

About 20 of the party remained the following two days to make the Roads and Pavements inspection with Professor "Lenny" Smith. This party inspected the Barrett Company's plant Thursday morning. After the inspection the Barrett Company entertained at a dinner at the Great Northern hotel. Short talks were



JUNIOR CIVILS ON TOP OF CHICAGO'S NEW UNION STATION

given by the officials. The remainder of the afternoon was spent at the Chicago Paving laboratory on North Shore Drive. Friday morning various pavements and roads were inspected. The party was entertained at the Morrison Hotel by the Texaco people, following which talks were given by Mr. Nicholson of the Texaco Company and Messrs. Hittle and Hill of the City Engineering Department. The party disbanded in the afternoon.

PROFESSOR JESSE B. KOMMERS is the author of a new Bulletin of the University of Wisconsin (Engineering Series 1252, Vol. IX, No. 3) entitled *Comparative Tests of New Billet Steel and Rerolled Steel Reinforcing Bars.* In his conclusions, Prof. Kommers expresses the following opinion: "The new billet bars, while not meeting rigidly all the ordinary requirements for such steel, yet may be considered as reasonably satisfactory. The rerolled bars, on the other hand, while of satisfactory strength, must be considered as very unreliable for work under conditions subjecting them to cold bending."

(Concluded on Page 170)

ALUMNI NOTES

F. D. BLANCH

CIVILS

Allan Baker, ex-c '25, is a draftsman in the map department of the Southern California Edison Co., at 609 Fay Bldg., Los Angles, Calif.

Byron Bird, c '15, formerly professor of structural engineering at A. and M. C., College Station, Texas, gives his present address at 1602 Second Ave. N., Fort Dodge, Iowa.

E. L. Grant, c '17, writes that he is going west but what for he doesn't say. His new address is 401 S. Black St., Bozeman, Montana.

Alfred H. Gruppe, c '22, is reported to have left the service of the street railway company of Milwaukee and is to be with the Milwaukee County Highway Commission.

Gustave E. Kahn, c '04, is in the general contracting business in Milwaukee.

J. E. Mackie, c '23, who is in the City Engineer's office in Long Beach, Calif., has changed his address to 1515 E. Eighth St.

James A. Schad, C. E. '16, is located at 1641 Lunt Ave., Apt. 2, Chicago, Ill.

G. R. Schneider, c '22, is resident engineer at the Alexander Dam, Merrill, Wisconsin.

W. J. Seder, c '21, gives his address as 39 Hawthorne Ave., Crafton, Penn.

H. W. Tabor, c '16 gives his address as Camp 63, Big Creek, Calif.

W. C. Thiel, c '22, has moved to 3032 E. Fifth St., Long Beach, Calif.

Arnold Zander, c '23, is undertaking the location of fifty miles of railway in the northern part of Wisconsin.

CHEMICALS

Frank B. Golley, ch '22, was married on April 26 at 8 o'clock in St. Andrew's Church, Louisville, Ky., to Katharine Howard Baird, Wisconsin '22, daughter of Captain and Mrs. Lewis C. Baird. They will be at home at 2900 Hazelwood, Detroit, Mich.

MINERS

W. H. Loerpabel, min. '15, gives his address as Apartado 85, Parral, Chihauhau, Mexico.

Frank Pardee, min. '15, is with the Michigan State Department of Conservation, Lansing, Michigan.

ELECTRICALS

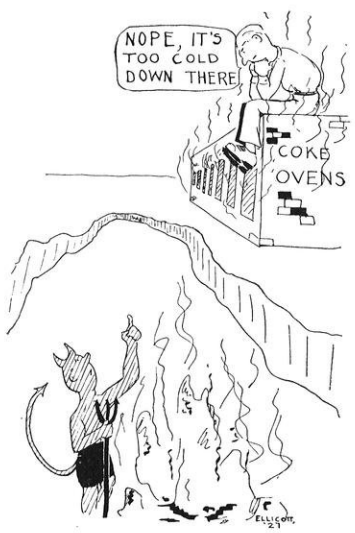
R. W. Brewer, e '21, has been transferred from the Milwaukee to the Chicago office of the Louis Allis Co. His address is 332 South Michigan Ave.

Marion Cooper, e '08, who is with the General Electric Co., recently had an article in the General Electric Review entitled "Standardization of Lamp Voltages".

H. L. Heller, e '06, may be reached at 512 Bradford Ave., Milwaukee.

E. O. Koerner, e '23, may be reached at 1321 Maryland Ave., Sheboygan, Wisconsin.

Mr. A. G. Neumann, e '23, 1616 Wells Street, Milwaukee, Wis., announces the birth of a daughter, Miss Marilyn May, on April 28, 1924.



HOT STUFF "FRITZ"

"Fritz" Nolte, e '23, writes: "This is a warning of another change of address. I'm down in the "coke region"—so-called—where you see small imitations of Hades in long lines—coke ovens. I should never be cold here." His new address is 618 Morell Ave., Connellsville, Pa.

A. J. Pinney, e '17, is an engineer with the National Lamp Works, 1495 Fillmore Ave., Buffalo, N. Y.

Charles Poe, e '17, telephone engineer, has moved to Room 962, 195 Broadway, New York, City.

L. P. Richmond, e '23, has changed his address to 244 Union St., Schenectady, N. Y.

Edward Sipp, e '15, is an electrical engineer with the U. S. Air Service. His address is 1043 Superior Ave., Dayton, Ohio.

M. E. Skinner, e '14, who has been associated with the Duquesne Light Company, Pittsburgh, Pa., for the past two years, has been named commercial manager of the newly established commercial department of the company, which embraces power sales, contract illuminating, street lighting, domestic service, and public relations. Since graduation Mr. Skinner has taken active part in A. I. E. E. work, serving at present as chairman of the National Membership Committee and secretary of the Pittsburg section. He has contributed a number of articles to the Technical Press, including several papers presented before the A. I. E. E. on transformer design.

E. W. Vorlop, e' 17, is an engineer with the Electric Star Battery Co., Kansas City, Mo.

Felix Zuelow, e '23, has changed his address to 308 Summit Ave., Schenectady, N. Y.

MECHANICALS

E. S. Burnett, m '05, was married on March 25 to Miss Marion Eveline,, of Spokane, Washington. Their address is 1628 Westmoreland Place, Fort Worth, Texas.

Harlin Geisse, m '17, is an engineer with the U. S. Navy.

Homer J. Steel m '23, who is with the Newport News Shipbuilding and Dry Dock Co., writes, "I spent five months in the freight car drafting room and then transferred to the main office where I have been in the machinery technical division on ship work for the last four months. I went on dock trial, endurance trial, and sea trial of the reconditioned shipping board liner Republic, which goes into trans-Atlantic service this month."

Kindly mention The Wisconsin Engineer when you write.

CAMPUS NOTES

(Concluded from Page 167)

CHEMICALS GO ABROAD

The annual Chemical Engineer's trips were taken immediately after the spring recess. The seniors under the direction of Professors Watts and Hougen visited the plants in Chicago and its vicinity while the juniors under Professor Kowalke visited the Milwaukee plants. Each of the trips lasted three days.

The seniors visited some of the largest plants of their kind in the world. The Standard Oil refinery at Whiting, Indiana, makes more gasoline than any other refinery in the world, while the South Chicago plant of the Illinois Steel Co. has the largest blast furnaces in the world and is now constructing one with 800 tons daily capacity. Other plants visited were the Corn Products Refining Co., the Carter White Lead Co., where some Dutch-Boy White Lead is made, the Grasseli Chemical Co., the U. S. S. Lead Refinery and the Western Electric Co.

The Juniors visited the Pfister and Vogel Company's tannery, Hummel and Downing, paper and carton manufacturers, the U. S. Glue and Gelatin Co., The Newport Co., the Federal Rubber Co., the George H. Smith Steel Casting Co., and the Milwaukee Coke and Gas Co.

If during the Summer you Mendellsohn up to an altar with a girl draped on your arm, or if for any other reason you do not return in September, write the Wisconsin Engineer. Your friends will be interested in knowing where you are and what is happening to you.

GETTING OUT A PAPER

Getting out a paper is no picnic.

If we print jokes, folks say we are silly.

If we don't they say we are too serious.

If we publish original matter they say we lack variety.

If we publish things from other papers, we are too lazy to write.

If we stay on the job, we ought to be out rustling news.

If we are rustling news, we are not attending to the business in our own department.

If we don't print contributions, we don't show proper appreciation.

If we do print them, the paper is filled with junk.

Like as not some fellows will say we swiped this from the exchange.---- We did..

EDITORIALS

(Concluded from Page 162)

lectures and text comprise all the knowledge he must get in his profession, and that the accompaning lab course is merely illustrative; nothing could be farther from the truth.

It is an engineer's business to solve problems, and we don't mean by that the substitution for B and x and z-bar in a hand-book formula. We mean practical work—which is exactly what we do in the laboratory,—the only means in our college career which we have of getting acquainted with standard apparatus, conventional modes of construction or operation, and the practical working of real machines, with their inherit faults and compromised efficiencies. The stress an employer places on previous experience in considering the qualifications of a prospective employee does not seem exaggerated when we see some of the mistakes that are made daily in the laboratory by supposedly excellent students.

The minimum amount of work which a man must do to "get by" in a laboratory course is surprisingly little, due to the unfortunate fact that scarcity of room and apparatus compels groups of students to perform experiments together. The availability of old reports written in years past also materially reduces the work which the laboratory students must do.

There are always a few students in a group who are active enough to direct the actions of the rest. Unlike them are some who have no interest in their work, and who usually copy the reports. They lose the better part of their technical training—the part which offers opportunity for initiative and practical thinking.

The most frequent criticism of the college trained engineer is that he is "too theoretical". He cannot tie the differential equation to the monkey wrench. But the student who *can* visualize some unexpected phenomenon in the operation of an engine in terms of a theoretical expression in his text, and then tell his observations clearly and concisely will be a winner. We're for him!

A wise man will desire no more than what he can get justly, use soberly, distribute cheerfully, and leave contentedly. —Benjamin Franklin.

ENGINEERING REVIEW

(Continued from Page 164)

As illustrating the size of the mineral industry and its relations to the great problems of national safety, trade, and transportation, it may be mentioned that in 1920 American mine products, raw and manufactured, provided 69% of all tonnage carried in carload lots by Class 1 railways. Excluding all shipments of bituminous coal, the mining industry still provided in its raw materials twice as much tonnage as agriculture, two and one-half times as much as non-mining miscellaneous commodities, three times as much as forestry, and approximately twelve times as much as the animal industry.

Mining and Metallurgy

RECOVERING POTASH AS A BY-PRODUCT IN THE BLAST FURNACE INDUSTRY

During the war active steps were taken at a number of cement manufacturing plants to recover the potash that escapes from the kilns, and the cement industry then became an important source of potash in this

country. A survey was made by the United States Department of Agriculture and it was estimated that the total potash escaping from all cement plants of this country amounted to about 87,000 tons annually. Since these estimates were made, installations have been placed in a number of plants for the recovery of this potash, and in every case the quantity that was found to escape from the kilns closely agreed with the estimates that had been made during the course of the survey.

When the survey of the cement industry was completed a corresponding study was undertaken of the potash that escapes from the blast furnaces of the country. The loss from the blast furnaces of the country has been estimated at about 84,000 tons annually. The results of this study have been published in Department Bulletin No. 1226, and the methods used in the study, and the possibility of recovering the potash from blast furnaces are discussed. A copy of the bulletin may be secured, as long as the supply lasts, from the United States Department of Agriculture, Washington, D. C.

SUPER SYNCHRONOUS MOTOR

The name "super synchronous" has been given to a certain type of motor, not because the motor operates above synchronous speed, but because it has the ability to develop super torque in starting. There has been a demand for a long time for some type of synchronous motor that would develop during the starting cycle a torque as great or greater than that of an induction motor of the wound-rotor, external-resistance type. The first applications of synchronous motors, where considerable starting torque was required, were accomplished by the use of friction clutches. A type of synchronous motor has also been developed, which in its design is quite closely an induction motor but having somewhat larger air gap and a secondary containing a large amount of copper and wound with reference to the voltage at collector rings required for excitation. Such a motor involves the use of external resistance and changing the connections of a secondary from a polyphase starting net work to a singlephase synchronous field winding. It also inherently has lower efficiency, due to the higher core losses and the greater exciting energy required.

Journal of the A. I. E. E.

THE ELIMINATION OF STATIC INTERFERENCE

(Concluded from Page 158)

earth. Being an untuned antenna, it is possible to couple to it more than one tuned receiving circuit, thus permitting multiplex reception. This single pair of wires with its separate receiving circuits whose outputs are connected through land wires to the uptown offices of the company have handled all the business of the station for some time. The company reports very little interference with traffic even during the worst seasons of the year.

THE ENGINEERING LOAN FUND

(Continued from Page 159)

their work promptly. A young man is, in my opinion, very foolish who begins his work at the University without sufficient money in sight to pay at least from half to three-quarters of his expenses for the first year. If he can see his way clear for one year, then he should by all means get the year's work, and then the second year as soon as the way is clear for that. Undoubtedly there are many individual exceptions to this general plan, and it is a very fine thing for persons of means to help bright young men through their entire college course. This, however, must be largely an individual matter, based on personal knowledge and interest.

We need much more money. Twenty thousand dollars could be used with great profit to deserving

students, who would thereby be enabled to complete their courses more promptly and more satisfactorily, and who would most gladly repay the loan from their earnings during their first year or two after graduation. We hope to interest other friends of the University to give us an opportunity to set some of their good money revolving at high speed for the benefit of engineering students.

SPARKS FROM AN AMERICAN ENGINEER'S LIFE IN FRANCE

(Continued from Page 161)

go is outlined in tile over the arch, so that there is small risk of taking the wrong direction.

The rates are extremely low. Before nine in the morning, a return ticket good for two trips costs thirty-five centimes or two cents, the return being available at any time. After this hour only one-way tickets are sold. These cost thirty centimes each. This is a much lower fare than the street cars and omnibuses, and the result has been an abominable overcrowding. As an Englishman once remarked, "It shows up the sardine packer as a space waster." To take care of the multitudes, many of the seats have been removed to make more standing room. Of course there is always the first-class, with more and better upholstered seats, but one is likely to pay the fifty centimes only for the privilege of standing in better society. The right of transfer is free and unlimited; one could ride the entire day for a single fare.

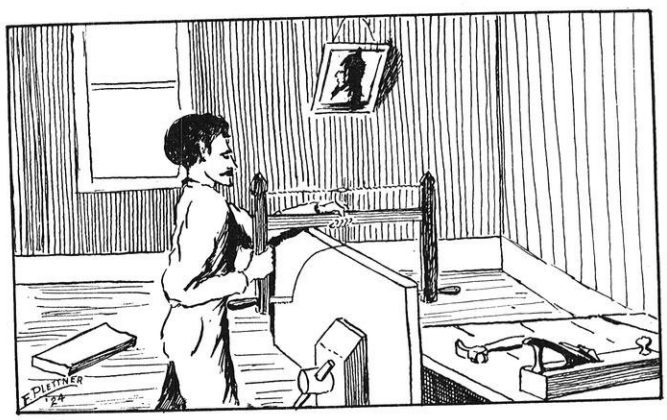
It is fortunate for the population that this service is so good, for it provides the only way I know of getting to a place on time. One can always get on if willing to push, and the schedule is frequent. Moreover, it is not subject to street delays.

This brings me to the surface tram system, which has advantages and disadvantages. Only a certain number of passengers are accepted, after which the load is *complet.* In rush hours one waits for tram after tram as they come up *complet,* and the peak load is, perforce, distributed over half or three-quarters of an hour. A would-be passenger detaches from the lamp post at the car stop a numbered slip of paper which entitles him to his turn. When the bus or tram comes up, if there are any places vacant, the conductor begins calling out numbers sufficiently below the lowest one so that he plays safe. When the proper number is determined, the person holding it gets the seat. The system is rigorously enforced, not only by the tram authorities, but by the public as well; any attempt to get on after the load is *complet* means the stoppage of the bus and howls from the passengers for the offender to *descend.* Incidentally, when I first arrived in Paris with little knowledge of French, I thought I should never understand this system with its differently colored tickets indicating different series, the conductor calling out numbers with the utmost rapidity and skipping by fives if he be too far behind the current number, certain passengers pushing forward, others with late numbers falling back out of the way, though to my mind they were in excellent position to crowd on, American style. It is certainly fair, though it is a calamity to miss a bus, for the waits are long; many a taxi driver has obtained a fare because the tram was *complet.*

Government Controlled Utilities Give Poor Service

The telephone system, as well as the post office and telegraph, is a government monopoly. The service is truly awful in all three branches. Telephones are extremely dear, a thousand francs ($60.00), and the subscriber must buy his own instrument. The result is a great variety of instruments, many of which are almost unusable. It may take half an hour to get a *communication,* and more than once I have given up in despair and gone to see my man whom I could not get on the wire.

The post office and telegraph are equally bad. One may stand in line half an hour to register a letter. Such a thing as carbon paper for copies is unknown; everything is written out long-hand, — twice if a copy is needed. To get an international money order is a woeful undertaking; there is endless writing, and finally the order is cut out to the value indicating numbers on the side with an ordinary pair of scissors. The employees are nonchalant and inattentive. A crowd may be kept waiting at the only desk that transacts a particular class of business while the clerk is counting his stamps or is in discussion with another. They are civil service employees, and independent of the public for their positions; they have little fear of losing their jobs, so one can do nothing about their independent



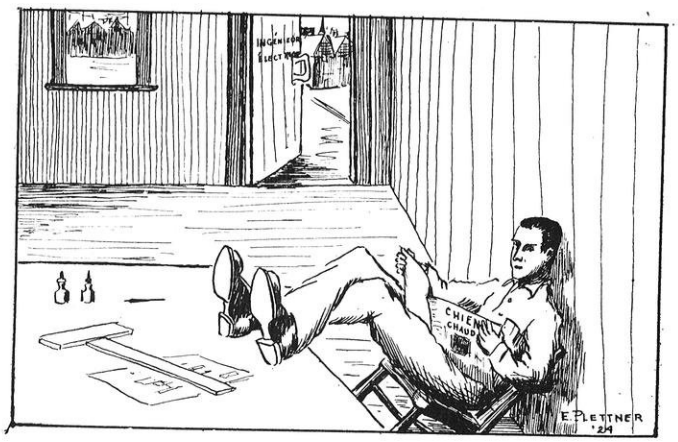
THE FRENCH PATTERN MAKER AT WORK

attitude. Indeed, if one speaks too roughly to a telephone operator, the service is cut off for forty-eight hours as a punishment.

The poor service of these three government owned utilities works a hardship on French business. Every concern has to put up with the inefficient methods, and in the aggregate, a tremendous amount of time is lost and any amount of vexation caused.

As the telephone is so expensive, only the more prosperous firms can afford to have one. There are literally thousands of businesses in Paris which have no telephone. Capital is made of the possession of a telephone

by business concerns, which put on their letterheads, "Telephone such and such number", in such a way as to give the impression, "You see, we are of some importance, as we have a telephone." Naturally, with such a telegraph service, telegrams are not used to any extent for business purposes, and I was astounded on



THE FRENCH ENGINEER'S OFFICE

arriving in the United States to see the enormous use made of telegrams, and the ease and facility of it here. I am a convinced opponent of government monopolies.

Business Without Banks

Banks have come into fairly wide use only in the last few years, and today there are hundreds of businesses which have no banking account and are doing everything on a cash basis. French banks are not convenient. If you want to cash a check, a flunky gives you a brass check to indicate your turn and motions you to wait. Finally you are called, and pass your check in at one window, where it is examined, painfully recorded, and passed through to the next cage, where you finally get your money. My first year in Paris was on a letter of credit, and I used to cash money on it at Credit Lyonnais, one of the largest French banks. It invariably took from twenty minutes to half an hour, plus a fair-sized tip to the flunky who was allowed to bring the money for that reason. One day I discovered that Thos. Cook and Sons' banking department (an English establishment) would cash, and thereafter it was a matter of five minutes and no tip. Needless to say, I now patronize an English bank.

Just as many concerns function without a banking account, so there are thousands without a typewriter. All the correspondence is written long-hand and copied in a letter press. In many cases there is neither telephone, typewriter, nor banking account in the business. The consequence is that a typewritten letter — like the possession of a telephone — carries some prestige, and is a mark of the prosperity of the house.

In my experience, there is no more immutable thing than French character. They are set in their ways, and the person who wants to do business with them must do it their way. The American "big stick" method, "I'll show these Frenchies how to do things, slap on a big advertising campaign and get things going" doesn't work. In business, I have found them remarkably honest. I have run a small works for four years and my losses on 150,000 francs work of business have amounted to 125 francs; of that, 120 francs was due to the failure of a concern, and five francs to a man who once "stung" me for a sample. This is an extremely small percentage.

There is no honorable failure in France. Every business failure is considered a disgrace, and will be held against a person as long as he lives. There is no outlawing of debts, to my knowledge; time cannot erase a financial obligation. I often think they would like to be able to collect from the grandchildren of the debtor. This will explain some of the extraordinary bitterness against the Germans for their failure to make reparation, the occupation of the Ruhr, and the general hard feeling toward Russia, where a lot of French money has been invested.

The Thrift Idea Overdone

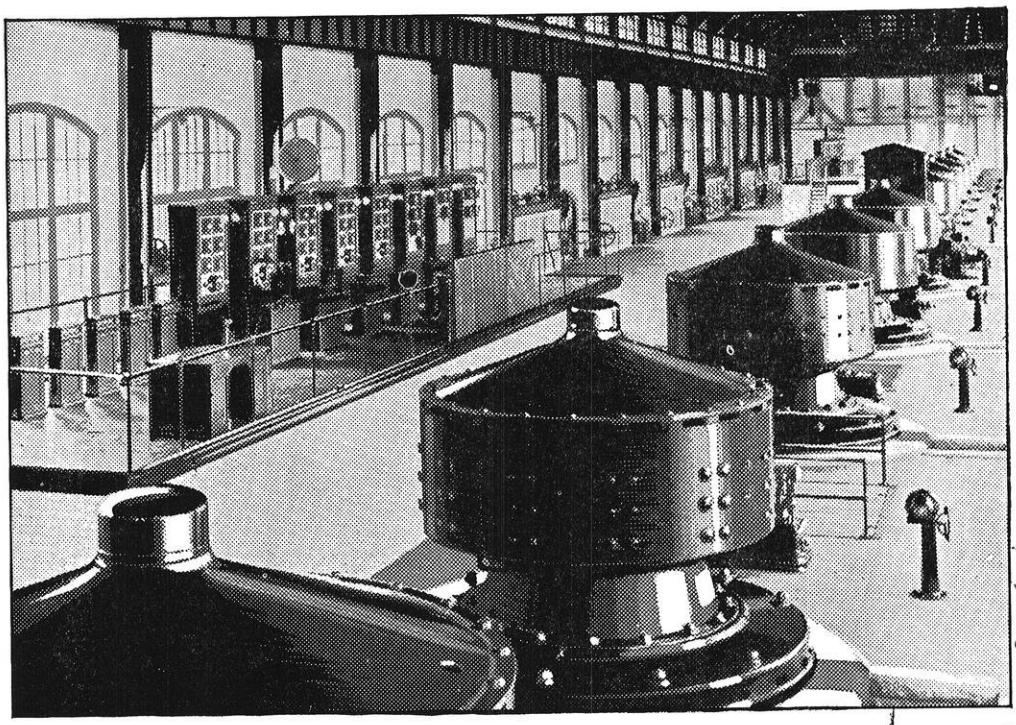
The French are noted for their "thrift". To me, this is too dignified a term, for it is really avarice and a desire to amass. I know a woman with 50,000 francs a year income, and very comfortably situated, who goes around to a friend's house to telephone in order to save a nickel, and who will ask the baker if he cannot spread the cream intended for ten *pates* over a dozen. This is by no means an isolated case. Touch a Frenchman's pocket and you have made an enemy for life. As Balzac says, "A marshall may have saved France, but the highest praise his tailor will give him is that he paid spot cash."

Americans in France usually fall into two catagories: First, those on a pleasure trip, or living on a private income; and second, representatives of American business concerns who are paid on an American basis. These last positions are exceptional, and more so because the unfavorable exchange has closed out many American branches.

Mine is an exceptional case, — that of an American engineer competing on terms of equality with Frenchmen and being employed by French organizations. I have never seen an American workman in a French organization, which speaks volumes about the pay. But there are certain advantages, and I have remained in France from choice. There are many endearing things about French life: It is so different; there is the possibility of conducting one's business in a foreign language, and above all, the beautiful personal liberty. The French are free enough, in all conscience, but the foreigner even more so. No prohibition, very little "conventionality", no prudishness.

It will be seen that there is a fairly even mixture of good and bad in both countries, according to my experience, but having been so long accustomed to French life, I have grown to love it, and hope to return at no very distant date. Money is not everything. The French saying is particularly applicable in my case,— *"Chaque homme a deux pays, le sien et puis la France."*

Harnessing Niagara Falls for the First Time



What Engineering Owes to Faith

THE pioneer harnessing of Niagara Falls in 1892, like all great engineering feats, was the result of the co-operation of many able and constructive minds. There were no "older engineers" on this work, with younger assistants, as is now common, because there were no "older" engineers then. All of them were young men in a young business, optimistic, enthusiastic and willing to take long chances.

The original Niagara installation represented progress based largely on faith because there were many features of construction proposed at that time which Westinghouse Engineers refused to accept, and which time has shown to be utterly impracticable.

Thus, in effecting a compromise, the three fundamental features of *heating, insulation* and *regulation* of the 25-cycle machines as built, were vastly different from the original designs. Time verified their judgment, the ten original generators operating successfully for more than a quarter of a century.

Looking back, it is gratifying that those young men served engineering so courageously, because truly it was an undertaking that taxed their faith to the limit.

Westinghouse

ACHIEVEMENT & OPPORTUNITY

WESTINGHOUSE ELECTRIC

Kindly mention The Wisconsin Engineer when you write.

HENRY CAVENDISH
1731-1810
English chemist and physicist, of whom Biot said, "He was the richest of the learned and the most learned of the rich. His last great achievement was his famous experiment to determine the density of the earth.

He first made water from gases

Henry Cavendish, an eccentric millionaire recluse, who devoted his life to research, was the discoverer of the H and the O in H_2O. In fact he first told the Royal Society of the existence of hydrogen.

He found what water was by making it himself, and so became one of the first of the synthetic chemists.

Cavendish concluded that the atmosphere contained elements then unknown. His conclusion has been verified by the discovery of argon and other gases.

The Research Laboratories of the General Electric Company have found a use for argon in developing lamps hundreds of times brighter than the guttering candles which lighted Cavendish's laboratory.

In this age of electricity the General Electric Company has blazed the trail of electrical progress. You will find its monogram on the giant generators used by lighting companies; and even on the lamps and little motors that mean so much in the home. It is a symbol of useful service.

GENERAL ELECTRIC