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April 17, 1923.

Memorandum to: H. E. Pride,
L. F. Van Hagen,
F. G. Harmon.

We have informally given permission for the Engineering College Magazines Associated to the J. G. White Engineering Corporation, to reprint the article by Mr. Schwab. This is to be done in a very high class manner, and they are not mentioning J. G. White in any way, except that in the last page they will use their imprint in some way. Right in the front they want to give a reason for publication and state "Reprinted by courtesy of the Engineering College Magazines Associated".

Mr. Henry A. Lardner, Vice President, has asked us about this. He is a Wisconsin graduate, and a reader of the Wisconsin Engineer, where he saw the article first. From our standpoint we believe this contact with Mr. Lardner is very worth while, as I have been trying for some time to get beyond the Advertising Department. It looks as if there might be a few quarter-pages for Wisconsin, Penn State, Sibley and Tech Engineering News. However, there is no desire on our part to make this part of the bargain, as we believe the E.C.M.A. can well afford to grant formal permission to J. G. White to use this in this way. Of course, they are not going ahead any further without permission from Mr. Schwab. In order to get that they will send him the dummy which I have already seen.

If there is any objection to this, we should know here in New York by Friday of this week. As we understand this Executive Committee holds over until May 1st, we are requesting formal authorization from Mr. Pride, to be received this week.

Faithfully yours,

ROY BARNHILL, Inc.,

WBL:AH BY W B Little

March 17
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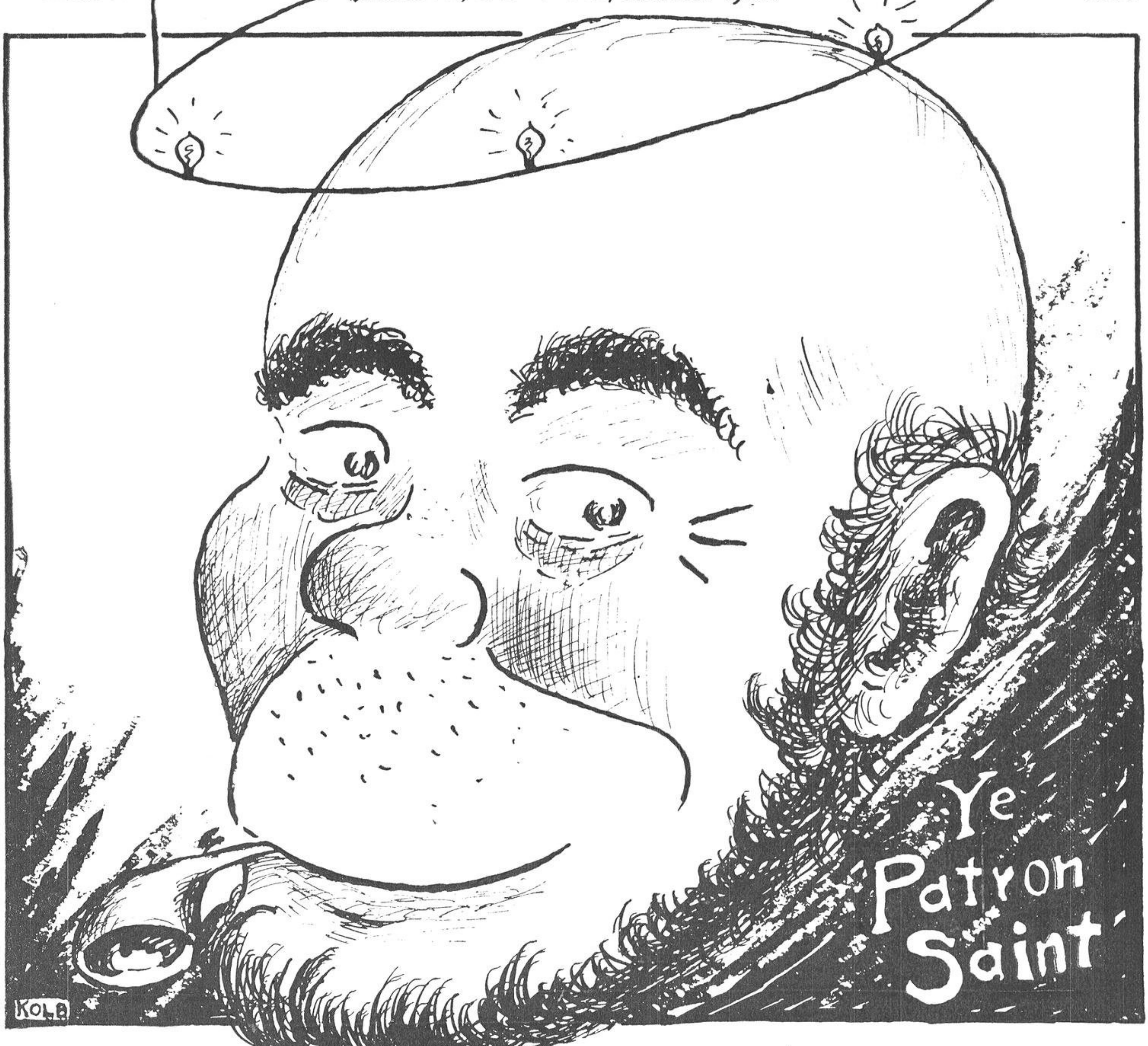

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The Wisconsin Engineer

UNIVERSITY OF WISCONSIN

VOL. XXVI. NO. 6 MADISON, WIS. MARCH, 1922

NOTES ON REPRODUCTION OF ENGINEERING DRAWINGS*

By WALTER C. MACKEY,

Mechanical Drawing Department.

You have often heard the blue print spoken of, and the mention of it brings to your mind a bluish colored paper with a design on it which is of a whitish hue. You know that the blue print is the most common method of getting a copy of an engineering drawing, and perhaps you have even made a few prints. But beyond this do you know anything definite about the process? If your chief should ask you "Is the blue print method the best and cheapest way of duplicating these engineering drawings?", would you be able to make a decision and tell him? Perhaps not. For you, then, this article may be full of information.

The fact is that recently several new methods have come into use for the duplication of engineering drawings, and we all must keep posted to know the worth of the processes for any given "job". The requirements may vary in each case. Thus in some cases, we need only a few copies, in others some thousands may be required. Usually we desire a reproduction to be full or original size, but in other jobs it is required to reduced or enlarge the original copy. It is because of these many requirements that we have such a variety of processes.

This paper, appearing in two installments, will discuss briefly some of the more prominent methods, not with the idea of making the reader proficient in the given art; but rather to familiarize him with the field, and to enable him to make an intensive survey of the individual methods when the situation demands it.

The methods may be roughly tabulated as follows:

I. PHOTO-CHEMICAL METHODS
- Blue Prints
- Van Dyke or Speia prints
- Blue line prints
- Black line prints
- Duplicate tracings

II. PHOTOGRAPHIC METHODS
- Camera
- Photostat, Cameraograph and Rectigraph

III. PHOTO-MECHANICAL METHODS
- Lithograph methods
- Janney and Claude methods
- Ozobrome
- Press prints

IV. MECHANICAL METHODS
- Hectograph
- Mimeograph, etc.

V. BOOK ILLUSTRATIONS.
- Zinc etchings
- Half tones
- Collotype, etc.

I. PHOTO-CHEMICAL METHODS

General Theory: All of the methods in this group require the drawing to be made on a transparent material, as for instance tracing cloth or tracing paper. The copy is laid face down in a printing frame, a piece of chemically prepared paper is put with the sensitized side against the transparency and the sheets are secured in position and exposed to the light. During the exposure, a chemical change takes place on the portions unprotected by the lines of the drawing. The sheet is washed in solutions and the salt which has been formed by the action of the light is precipitated and taken up by the pores in the paper. Where the lines of the drawing are protected by the ink lines, there will, of course, be a different color than on the background or field of the drawing.

Apparatus required A printing frame similar to a photographic printing frame can be used for small work. The back of the frame should be such that the two sheets will be securely held together during the exposure. With small frames this is accomplished by a spring clamp arrangement, and with very large frames a vacuum is produced by a pump and a connection is lead to the back of the frame in such a manner that the atmospheric pressure is acting against a cloth at the back of the frame and this cloth is pressing against the two sheets.

In larger establishments, artificial light is used. In one style printer a light travels vertically on the axis of a glass cylinder, and the sheets are held by a curtain against the outside of the glass cylinder.

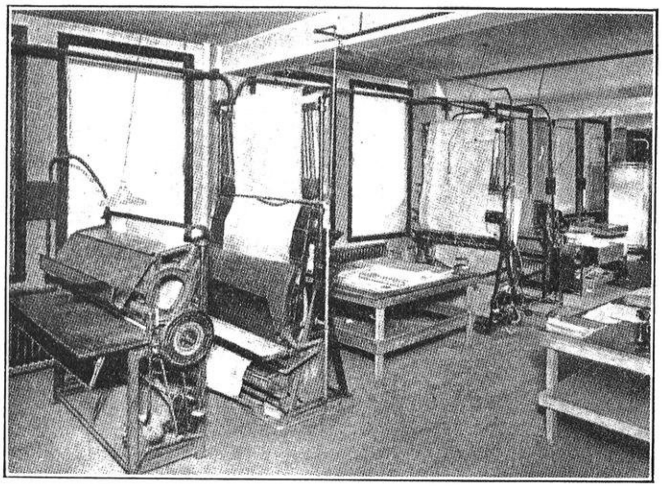
The light traverses the axis of the cylinder, and the exposure is regulated by the speed of the lamp. With this type of machine it is necessary to have washing and drying racks. The wash rack allows water or a chemical solution to flow over the prints, and the drying rack allows the print to dry flat.

Continuous machines are on the market and are used by large concerns and Blue Print Companies. A typical installation is shown in Fig. 1. In this machine the tracing and prepared papers are fed in from the work table in front. Exposure takes place as they pass a series of arc lamps, and then the tracings are separated from the paper and collect in the trough over the work table. The paper passes to the second portion of the machine, in which it is given the correct washings (depending upon the variety of paper being used) and then passes over the upper portion of the machine and is dried by an electric or gas heater. After it is dried it is automatically rolled up by a series of rollers and cloth bands at the back of the machine. The machines in the illustration are placed back to back and all these operations can be easily followed.

BLUE PRINT

Chemistry Involved

If paper is treated with a ferric salt, such as ferric citrate, and exposed to the light, the salt is reduced to a ferrous salt. The ferrous salt with the addition of potassium ferricyanide will give a dark blue insoluble precipitate, while the original ferric salt unacted upon by



Courtesy the Fred Post Co.

Fig. I. VIEW OF BATTERY OF CONTINUOUS BLUE PRINT MACHINES

the light will give only a soluble product. It is upon these chemical reactions that blue printing is founded. A mixture of an iron salt, potassium ferricyanide and a few other additions (for keeping qualities, etc.) is washed on the paper in a dark room and dried. The paper is then put beneath the transparency and exposed to the light. Where the lines do not protect the paper, the iron compound is changed to a ferrous compound, and beneath the lines there is no chemical change. The print is next put into a water bath, in which the action caused by the light is made permanent, that is, the insoluble precipitate settles upon the surface of the paper, and the portions under the lines are made white by the washing away of the salts which have not been changed by the light.

Practical Hints

By this process, we obtain a negative, that is the background is dark colored and the lines are white. (See Fig. 2 and 3). The disadvantage of this is that we are unable to make changes on the print with ink. Fluids are on the market to alter blue prints, but if a supply house is not handy, the draftsman may make up some by dissolving a strong alkali in water and adding a small amount of gum to give the ink a body. All alkalies will dissolve this dark blue precipitate. To get a dark ground it is customary to over expose the paper and run it through a solution of potassium dichromate before giving it the water bath. A small amount of hydrogen peroxide will serve to keep the white lines clear. The permanency of the print is dependent on the amount of washing.

Cost

Many formula have been given for preparing this paper, but the engineer will do well to buy it from the supply houses. Stocks are made up in a considerable range of printing speed. The cost is lower than any of the other methods in this class, and for a relatively small number of prints, this is the best method to use, both from a view of permanence and cost. With medium stock paper, the price will be around 1½ cents per square foot, while on cloth or heavier stock papers, the prices are proportionally higher. The figures given here are comparative only. Local conditions govern costs to a considerable extent.

VAN DYKE OR SEPIA PRINT

Chemistry

Many other salts other than those of iron are affected and changed by light. Among the most important are Silver, Gold, Uranium, Chromium and Iron. Modern photography is found on the changes in silver compounds. When exposed to the light, there is either an actual break in the metallic and non-metallic portion of the salt, or a weakening of the bond. In the first case we have an image produced by the deposition of finely divided silver or some simpler compound, and in the latter case we have a "latent image" which can be made real by chemical methods of development. Thus in taking a "kodak" picture, we expose the film, take it to a dark room and put it in a developer. In the developer the image appears

Fig. II. NEGATIVE AND POSITIVE

and the chemical action started by the light during the exposure is completed. Next we wash off the developer and then put the film into a fixing bath of "Hypo". This latter bath dissolves all the silver salts which have not been changed, and makes the image permanent.

Various sepia papers are on the market at present, so there are probably also several formulae for the sensitizing solutions, but all of them probably have a silver salt as one of the main ingredients.

Manipulation

The paper is exposed behind the transparency until a brownish outline of the design is formed. It is next washed in water and fixed or toned in a weak hyposulphite solution. The first exposure gives a negative print, but since the stock of the paper is very thin and transparent, a positive print may be obtained by using the first print as a transparency and printing to a second sheet of Van Dyke paper. Better positive prints are obtained when the original tracing is laid against the sensitized side of the Van Dyke paper. This gives a direct contact between the ink lines and the chemical emulsion or sensitized layer, and direct contact between the emulsions of the negative and final positive. To speed up the printing time, the paper is transparentized by a solution which is probably mostly paraffin cut by benzine.

Alterations are effected on negatives by bleaching solutions, or with a solution of potassium cyanide. To blot out part of the drawing use India Ink. Drawings for catalogues are often required that do not have the maze of detail on the shop drawings. The most expedient method to make these is to make a Van Dyke, alter the Van Dyke and then make a white line or positive Van Dyke.

Cost

This type of print is slightly more expensive than the blue print. The paper is more expensive, it prints slower and a chemical toning bath is essential to a good print. It may be obtained on cloth or several grades of paper. A negative print is usually made from each tracing and the tracing is then filed away and the Van Dyke is used for all future prints. When this is done, a thin grade paper is used and the cost will be from 7 to 10 cents per square foot.

BLUE LINE PRINTS

Van Dyke and Blue Print

Because the blue print may not be directly altered, and because the natural tones are reversed, it is sometimes desirable to make a copy in which there is a white ground and blue lines. This is usually done by making a sepia negative, and then using this as a transparency and making a blue print. They are slightly more expensive than the blue print, since the printing speed is less, and will cost around 3 cents per square foot.

A direct blue line paper is on the market which is not highly recommended. It requires chemical baths for developing and fixing and is more expensive than the method given above.

BLACK LINE PRINTS

This process will give a white ground and blue black lines from a similar copy, that is it yields a positive from a positive. It is not used to as great an extent as the processes already given. Much of the paper previously used has been sent in from Germany. It is more expensive, and if allowed to lie around before use, the paper becomes weak and fragile. An American product put out by F. Weber & Sons, N. Y., is less costly and of a higher grade. Blue print paper (slowest grade) requires two to three minutes printing in intense sunlight. This paper requires from six to eight minutes, so that its speed seems to eliminate this where printing is done by artificial light.

Chemistry of Ferro Gallic Process

One black line process is the Ferro-Gallic process. The sensitizing solution contains a ferric salt, an organic acid, gallic acid, and some potassium sulphocyanide. The sunlight reduces the ferric salt to a ferrous salt. The ferrous salt with the organic and gallic acid give a blue coloration, but with the ferric salt there is a heavy black precipitate. Thus where the light acts on the salts, there is a soluble coloration, but where the light has not acted there is a dark precipitate. The result is that the drawing is positive in character, or a black line print. potassium sulphocyanide is added as an idicator for exposure; with the ferric salt there is a red coloration and with the ferrous salt, no change. When properly exposed this paper has the reddish outline of the drawing. A developer of tannic or sulphuric acid is added to the paper so that it is only necessary to give it a water bath to bring out the image and fix the print. It is the chemicals in this sensitizer that makes the paper weak and brittle. It has been noted that as soon as exposure has taken place and the print fixed, this corrosive action is arrested.

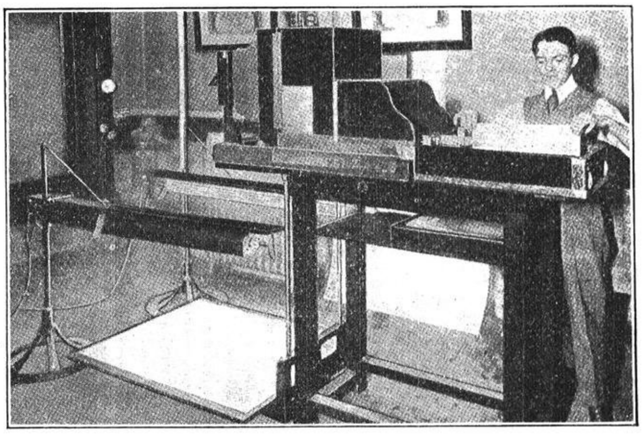


Fig. III. A PHOTOSTAT INSTALLATION.

"DUPLICATE" TRACINGS

During the war there was a call from manufacturing concerns by various governmental departments for copies in duplicate of various of their tracings. The expense incident to this, lead to a development of a photo-chemical and a photo-mechanical method of copying tracings. One of the methods now in use is a tracing cloth that is waterproofed and coated with a light sensitive emulsion. This is used behind a negative, and a positive copy of the original is obtained.

The "See-B" Process

The "See-B" cloth of the American Blue Print Company is representative of this process. The cloth and all

(Continued on page 118).

THE PREVENTION OF EROSION BELOW DAMS

By C. N. Ward,

Professor of Hydraulic Engineering.

How to allow turbulent flood waters to dissipate their enormous energy without destructive effects on dams has long been a troublesome problem of hydraulic engineers. Expensive crib-work and costly maintenance may be avoided, however, if results of the experiments discussed in this article are a criterion. Tests on models have shown that attachment of a hinged raft to the shortened apron of a dam does more than prevent erosion; that it actually fills the danger area high with sediment.

Some interesting experiments conducted with various devices for the prevention of erosion below dams is discussed by Messrs. H. E. Gruner and E. Locher in an article which is reviewed in the Annales Des Ponts Et Chausées.* Engineers in attempting to protect certain dams in Austria discovered a very effective device for the prevention of erosion below dams. A raft built of planks with one edge attached to the bottom of the dam structure by hinges and free to move up or down about the hinges prevented further erosion in each instance in which they were used. These rafts and other devices for the prevention of erosion were investigated by the use of models in a series of experiments conducted at the Technical School of Gratz, Austria.

In the experimental work the dams were located in a wooden channel 16.6 feet long which varied in width from 2.43 feet to 1.97 feet at the downstream end. The rate of flow of water was determined by the use of a weir which discharged into a concrete channel 98.2 feet long and which in turn delivered the flow to the models in the wooden channel. A regulating gate in front of the models controlled the level of the water above the dam. Pitot tubes were used to measure the velocity of the water currents flowing over the models. The principles of hydrodynamics used in determining the proper relations of size of model, velocity of water, size of sand grain in the experiment to those corresponding dimensions in the field are as follows:

Let b, h, v, q, and a be the width, height, velocity of water, rate of flow, and size of sand or of concrete blocks respectively in the model. B, H. Q, and A are the corresponding true dimensions of the full sized structure. Let B = mb, then H = mh. In these experiments (m) was taken as 25. Since head producing flow is a vertical dimension which is proportional to the height (h) of the dam

$$v = C\,(h)^{1/2}, \qquad V = C\,(H)^{1/2}$$

$$V/v = (H)^{1/2}/(h)^{1/2} = (mh)^{1/2}/(h)^{1/2} = (m)^{1/2}$$

The rate of flow equals velocity times area and since areas vary as $(m)^2$

$$Q/q = m^2 m^{1/2} = m^{5}/_{2}$$

The frictional resistance of a grain of sand equals C_1a^3 and the reaction of the water on a grain of sand is $C_2a^2v^2$.* If the sand is not to be entrained by the water

$C_2a^2v^2$ must be smaller than C_1a^3

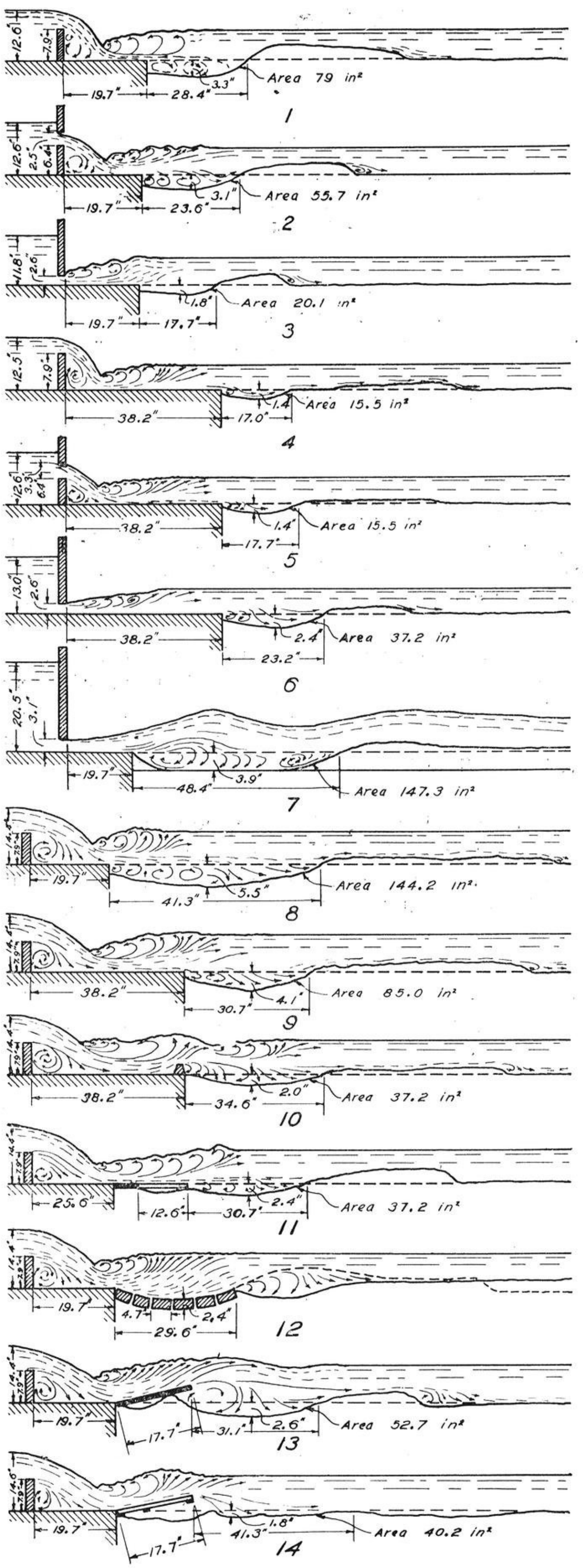
The selection of the velocities to be used on models is very important. When the velocities were taken too large confusion was caused because of excessive inundation and with very low velocities no erosion appeared in a reasonable time. In the experiments flows varying from 1.06 cubic feet per second to 7.1 cubic feet per second were used but the most interesting results were obtained with flows of from 1.77 to 3.54 cubic feet per second. In each experiment erosion was allowed to reach a maximum. This condition of equilibrium was reached usually in from 10 to 15 minutes. The experiments were divided into seven series.

The arrangement of the models for Series I is shown in figures 1 through 7. A flow of 1.77 cubic feet per second was used in each of the first six cases illustrated and a higher flow in the last. The discharge was either over the dam through a gate at some intermediate level, or through a sluice gate at the bottom of the dam. With the comparatively short apron shown in figures 1 to 3, the erosion was considerably less with flows through the lower gates.

With the longer aprons used in the tests represented in figures 4, 5, and 6 erosion was less in each case than was experienced under similar conditions of flow with the shorter aprons of figures 1, 2, and 3 except in the test represented by figure 6. With a relatively long apron erosion becomes more serious with the flow discharging through a bottom sluice gate than with the same flow coming from over the dam. The fact that erosion may become serious with the flow through a bottom sluice gate for large rates of discharge even with a relatively long apron is illustrated by figure 7.

In series II with the arrangements shown in figures 8 to 14 the flow was 3.54 cubic feet per second and was in each case discharged over the top of the dams. By comparing figures 8 and 9 it will be noted that the longer apron of figure 9 reduced the erosion very much. By adding a wall on the down-stream edge of the long apron erosion was reduced still more as shown in figure 10. A floating raft (latticed raft) made of planks which were separated from each other, was attached to the end of the apron in the test represented in figure 11. The combined length of apron and raft was equal to the length of the aprons of figures 9 and 10. Erosion resulting from the use of this raft was about the same as was experienced with the long apron and end wall of figure 10. Concrete

*Vol. 42, page 220.
*See Merriman's "Treatise on Hydraulics", 8th Edition, page 323.



THE HINGED RAFT, FIG. 13, *does more than prevent dangerous erosion.*

paving blocks used in figure 12 were found to be effective when the blocks themselves were not entrained in the turbulent water. If a single block became loosened the other blocks were likely to be carried away. Floating rafts somewhat shorter than the one shown in figure 11 were used in the tests represented by figures 13 and 14. In figure 13 the raft used was constructed smooth and solid while that of figure 14 was partially latticed. The smooth raft adjusted itself to different angles of inclination (∝) depending upon the rate of flow over it. The water below the raft was quiet but just downstream a back current developed which carried material eroded further downstream back under the raft and deposited it there. There was no depositing of material under the latticed raft shown in figure 14 and erosion resulting from its use was similar to that realized with the long apron and end wall of figure 10.

In Series III and IV discharges through intermediate gates and through sluice gates at the bottom were given further study while in Series V the coefficients of discharge of various gates were determined. Series VI was devoted to the study of the use of paving blocks in the bed of the stream to prevent erosion. These last three series confirmed the results of the Series I and II and brought forth no new unusual features.

In Series VII the particular object was to determine what length of floating raft was most effective in preventing erosion. While running these tests it was observed that when the water carried sand and gravel the finer grains of sand were deposited through the openings of the latticed raft. Gravel was dropped further downstream while the larger stones were carried down below the raft where back currents picked them up and deposited them under the raft. Shorter rafts were more effective than the longer ones in preventing erosion. The inclination (∝) increased with the rate of flow up to a maximum which in these experiments was 12 degrees. For still greater flows beyond this (∝) decreased. The most effective length of raft to be used in any particular case must be determined experimentally. In designing the latticed raft it is necessary that the openings be made of such a size that gravel will not be wedged in them and the upstream portion of the raft must be smooth so that material will not be deposited against the hinges. A distinct advantage of the floating raft is that it is not subjected to such great strains as a fixed apron is. Its freedom of motion allows it to take a position such that its resistance to the flowing water is a minimum.

The general conclusions to be drawn from these experiments are as follows: For discharges passing over a dam or through a gate at a high level it is particularly necessary that the protective apron be relatively long. Erosion will be less with a given rate of flow when it is passed through a bottom sluice gate than when discharged at some higher level if the apron is short. The floating raft has unquestionable merits as a device for preventing erosion. These experiments show that it has a tendency to produce a condition at the foot of the structure which is just the opposite of erosion.

Reprinted in the Iowa Transit May 1922

THE KIND OF MAN EMPLOYERS ASK FOR

By Leslie F. Van Hagan,
Professor of Railway Engineering

"Does it hurt much to own a Tau Beta Pi key?" The question has been raised by an advertisement which appeared in the February issue of the WISCONSIN ENGINEER, and has caused much discussion on the campus. One phase of the discussion has led to another question: What kind of a man does the employer want?

Most of the young men who are fitting themselves for a career in engineering are genuinely anxious to do the right thing and be the right sort of men; but many of them are at a loss to know what qualities will be demanded of them in business life,—what qualities they should develop in college. Shall they give themselves up to their studies, or shall they go in for "outside activities?" Shall they emulate the shrinking violet or the blatant rooster? Shall they be gentlemen or roughnecks? After graduation, shall they drift from job to job for the sake of experience, or shall they stick to some organization and work up in it? It occurred to the writer that it might interest the men who face these questions to read specifications actually laid down by employers who write to the college asking for men. Many letters from prospective employers pass through his hands, and from such of them as still remain in his possession he has taken those paragraphs that deal with qualifications. They are presented herewith for what they are worth.

"The man I want need not have much outside experience but should have a natural aptitude for making a neat, clear drawing. We want men of health, good temper, and manners." (Railroad).

"We would prefer for each of these positions a young man of about twenty-four years of age, studious and modest. We would consider an application only were we convinced that the applicant had serious intention of making a permanent place for himself in this organization." (Manufacturer).

"I am very anxious to get one or two young men, graduates in engineering, of excellent record in their engineering studies, the idea being that they could set out for a long period of public service. I should like these young men of high character, good health and physique, common sense and fair engineering attainments."

(Corps of Engineers, War Department).

"Will be interested in learning the name and address of some of the young men who will graduate from your university shortly. We have in mind men who have stood very high in their class or at the head of it."

(Tanner).

"There are several positions open in this department for men who have had civil engineering training, and are clear-headed and thoughtful." (Railroad).

"What we like to get are big fellows who have been in the habit of running things in the school and have that peculiar faculty of making themselves well liked and at the same time getting their fellow students to do as they direct." (Cement Co.)

"We have a position open in our engineering department for a civil graduate. We would like to get one who has shown industry and ability in his studies and who is a well developed type physically and mentally."

(Mining Co.)

"As we stated before, what we are most anxious to obtain are men of likeable personality, willingness and earnestness, and with these qualifications with their basis obtained at school we endeavor to develop them to meet our requirements." (Manufacturer).

"We find as a general rule that the man that has been reared on a farm or in a small town adapts himself more readily to camp than the city bred man. It is the old question of stamina and stick-to-it-ness rather than high marks in college." (Power Co.)

"Can you find me a good live engineer, civil or mining, who can start work on May 1st? Prefer a man with some previous experience—although that is not essential—and one who will be willing to stick." (Mining Co.)

One employer—an engineer himself—lays down the following requirements for a certain position: "He must be of good moral character and industrious, and I prefer that he shall have finished the usual civil engineering course." In asking for a man qualified to do general instrument work or act as assistant to another engineer he says, "He should be industrious and accurate in his work, and have had the necessary technical training to develop into a designing and supervising engineer. Of course, I want a man of good habits." And he adds, "I must say that along with ability to do good work I have found the men who get the good will of the clients we have have been men who put up a good personal appearance and are good mixers as we say, even though they may not be quite as technical in the way they go after their work."

"The advancement that a man makes with the company depends almost altogether upon himself, and the company wants that type of man who depends upon himself and who believes in himself." (Manufacturer).

"I find that I could use a graduate civil engineer to very good advantage in my organization. I would pick one who has a record as an average, or better than average, student and who has the gifts of common sense and adaptability. Experience in construction work and handling of men would be a decided advantage."

(Consulting Engineer).

"We pay a good deal of attention to scholarship, say 50 per cent, but the men must be the type who do not have scholastic qualifications only; in other words they should be the men who are interested in extra-curriculum activities, who are gentlemen throughout, and who are extremely hard workers." (Contracting Co.)

"Our organization is constantly in need of young men; I am desirous of securing at least two young fellows who have energy, action, and some weight. It is our policy to build up Superintendents from our respective organizations, so that applicants may look forward to good stiff drilling.

"The only recommendation we ask is *personal willingness* to do something; applicant to be at least 5′ 8″ tall, weigh at least 155 pounds; one who wears out the soles of his shoes and not the seat of his pants. We positively do *not* want "booze fighters" or any individual whose chief ambition is the "damp end of a cigarette." We do not want Tau Beta Pi candidates but ordinary intelligent fellows who can read a blue print, and lay our foundations work from drawings furnished, or to keep men employed as a foreman." (Construction Co.)

"To be perfectly frank, we do not care much what detailed information or training a man gets while in college. What we want is young men whose college education has given them a proper perspective of life, or to quote from an editorial in a recent magazine, we believe:

" 'The real value of a college education in architecture or engineering lies then in the formative molding of *taste* rather than in the teaching of technical processes.'

"If the result of a man's college training has been to develop his analytical ability to give him a *will to win,* and a desire to pay the price of success in his chosen field, we can make a place for him, and we can give him every assurance of final success." (Construction Co.)

It is the intent to let these quotations speak for themselves; but some slight comment may not be amiss. There is, of course, some diversity in the specifications. It is to be expected that there would be, for the positions to be filled differ in character, and the employers themselves differ in matters of taste. No one type of man will meet all requirements; we cannot standardize human beings. Nevertheless, there are certain requirements that run through all specifications: Employers want men of good health, good appearance, good habits, good manners, and good temper; they want men who are morally sound; they want men who are ambitious and industrious; and they want men who are thoughtful, clear-headed, and possessed of common sense.

It is interesting to note the attitude of employers toward scholastic achievement. Most of them prefer men who are at least "above the average" of their class, and many of them specify a *high* scholastic standing.

The desirability for a certain amount of outside activity and a willingness to mix with one's fellows is reflected in the occasional specification that a man shall be a leader among his mates. Where a man is to be taken into a big organization with the prospect before him of becoming an official in that organization, some such requirement is sure to be made.

Perhaps one of the most important requirements is earnestness of purpose. The young man with a definite and worthy object in life is to be envied, for he has a real incentive to make the best of himself and he will naturally tend to develop those qualities that will make his services sought for.

SPECIFICATIONS FOR A MAN*

"To respect my country, my profession, and myself. To be honest and fair with my fellow men as I expect them to be honest and square with me. To be a loyal citizen of the United States of America. To speak of it with praise and act always as a trustworthy custodian of its good name. To be a man whose name carries prestige wherever it goes.

"To base my expectations of a reward on a solid foundation of service rendered. To be willing to pay the price of success in honest effort. To look upon my work as an opportunity to be seized with joy and made the most of, and not as painful drudgery to be reluctantly endured.

"To remember that success lies within myself, my own brain, my own ambition, my own courage and determination. To expect difficulties and to force my way through them. To turn hard experience into capital for future use.

"To believe in my profession, heart and soul. To carry an air of optimism in the presence of those I meet. To dispel ill temper with cheerfulness, kill doubts with a strong conviction, and reduce active friction with an agreeable personality.

"To keep my future unmortgaged by debts. To save as well as earn. To cut out expensive amusements until I can afford them. To steer clear of dissipation, and guard my health of body and peace of mind as a precious stock in trade.

"Finally, to take a good grip on the joys of life. To play the game like a man. To fight against nothing so hard as my own weaknesses, and endeavor to grow in strength, a gentleman, a Christian, so that I may be courteous to man, faithful to friends, and true to God"

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*The text of the talk on "Engineering Ethics" given by Prof. D. W. Mead before the Wisconsin Engineering Society.

Found among the papers of Thomas Van Alstyne, a graduate of the Electrical Engineering department of Cornell University, after his death which occurred on the job. —Cornell Civil Engineer, Vol. 23, p. 154.

RECENT RADIO STUDIES OF THE ENGINEERING EXPERIMENT STATION

By L. J. Peters,
Dept. of Electrical Engineering.

One of the great problems confronting the users of radio communication is that of receiving signals through the interference caused by atmospheric electrical disturbances and by radio stations other than the one with which communication is desired. The main distinguishing feature between the signals emitted by one station and those emitted by another which may be used in separating the signals of the various stations, is the wave length of the emitted electric wave. At the receiving station the differences in wave lengths between signals from different stations manifest themselves mainly in a difference in the frequency of the voltages which they induce in the receiving antenna. So the problem of picking out the signals of one station and eliminating those of other stations is the problem of separating currents of different frequencies.

The first of the group of studies on the selective and power abstractive properties of receiving circuits deals with the simplest of receiving circuits consisting of an antenna in series with an inductance and a device for detecting the signals.* The second of the group of studies deals with the relations in magnetically coupled circuits.* The general properties of these two types of circuits have been known for a long time. It was the particular purpose of the studies carried out here to arrive at *exact quantitative notions* of the conditions leading to maximum selectivity both against atmospheric disturbances and against interferent stations, and the conditions leading to maximum power abstraction from the waves emitted by the station with which communication was desired.

One of the truths brought out clearly by the above mentioned studies was the fact that, in order to obtain high selectivity and good power abstracting qualities, the resistance of the receiving circuits must be kept low. The third of this series of studies deals with the properties of circuits containing resistance neutralizers and with the manner in which the three electrode thermionic amplifier or audion tube may be made to function as such a device.* Resistance neutralizers may be designed to reduce the apparent resistance of a circuit to the same value for currents of all frequencies or the neutralization may be made to vary very rapidly with the frequency of the impressed forces. This leads to several unique and valuable properties of circuits containing resistance neutralizers. Resistance neutralization always leads to amplification and causes the impinging waves from the station with which communication is being carried on to deliver more power to the receiving circuits.

It has been known for some time that in the mathematical treatment of oscillating audion circuits that constants of the audion subtract from the resistance terms. However it has not been generally known that the audion could be used to improve the selective and abstractive properties of radio receiving circuits. Hence the contribution of these studies on resistance neutralization was to formulate in a clear *quantitative manner* the action of the neutralizer on the circuits with which it is associated and the action of the audion as a resistance neutralizer.

Along with the studies on resistance neutralization there has been formulated in a quantitative manner the action of the audion as a generator of sustained alternating currents and its action as an amplifier. By an amplifier is meant a device in which the expenditure of a small amount of power controls the flow of a much greater amount of power from a local source. The large amount of power may, if necessary as in the transmission of speech, be an exact magnification of the small amount of actuating power.

During the last few months there has been developed a new type of electric wave filter. Wave filters are devices which pass freely currents of frequencies lying in a certain band of frequencies and pass very poorly currents having frequencies outside this band. Wave filters were first studied in detail by the engineers of the Bell Telephone Co. The wave filters studied and used by the engineers of this company are based upon the properties of artificial lines made up by using lumped capacity and inductance. The wave filters developed here make use of some newly discovered and unique properties of coupled circuits.

The radio studies now being carried out in the Electrical Engineering Department are:

(1) Further studies on coupled circuits and filter networks.

(2) Further studies on the properties of circuits containing a thermionic amplifier.

(3) An experimental determination of the voltage wave form induced in an wireless antenna by atmospheric strays.

(4) Methods of making radio frequency measurements.

*See paper by Edward Bennett, A. I. E. E. Vol. 39, 1920).
*See Doctor's Thesis, H. M. Crothers, 1921).
*See Bachelor's Thesis by L. J. Peters, E. E. Thesis by L. J. Peters and paper as yet unpublished by E. Bennett and L. J. Peters bearing tilte Resistance Neutralization, an application of Thermionic Amplifier Circuits).

STUDENT-FACULTY COMMITTEE OF ENGINEERING COLLEGE HEARS COMPLAINTS

The regular monthly meeting of the Student-Faculty Committee of the College of Engineering, which took place on February 16th, was enlivened by the introduction of several complaints concerning the nature of the final examinations in certain courses and the amount of weight given to the final examination in determining grades in those courses. Special committees were appointed for the purpose of investigating these complaints and presenting those that proved to be well founded to the proper authorities.

THE SIGNIFICANCE OF SCHOLASTIC FAILURE

By Edward Bennett,
Professor of Electrical Engineering.

One of the subscribers to the Engineer takes exception to statements appearing in the advertisements of an organization which employs many engineers. These statements are to the effect that scholastic achievement stands for "knowledge and the ability to think straight," and that there is a close correlation "between a man's proficiency in getting ready for his vocation and his success in that vocation."

This subscriber suggests, in effect, that the Wisconsin engineer write to other employers about the country for comfort for that portion of the group of self-supporting students who are scholastically embarrassed. It would seem that the quest for comfort for this particular student must be unsuccessful, because the whole tone of the letter implies that the writer, though himself inclined to ridicule achievement which takes the scholastic form, yet recognizes that importance is attached to it in the business and engineering world.

A canvass of the kind desired by the subscriber was conducted in 1915-16 by the Joint Committee on Engineering Education of the National Engineering Societies. (A report of this canvass will be found on page 57 of the 1916 Proceedings of the Society for the Promotion of Engineering Education.) This committee mailed to every member of the five national engineering societies a card reading as follows:

"Please prefix numbers to the groups of qualities listed below to show the order of importance that you give them in judging the reasons for engineering success or in sizing up young men for employment or promotion.

"______Character, integrity, responsibility, resourcefulness, initiative.
_______Judgment, common sense, scientific attitude, perspective.
_______Efficiency, thoroughness, accuracy, industry.
_______Understanding of men, executive ability.
_______Knowledge of the fundamentals of engineering science.
_______Technique of practice and of business."

From 5441 replies, the most probable values of the relative importance of these groups of qualities were computed, with the results tabulated below.

	Relative Importance
Character	24
Judgment	19.5
Efficiency	16.5
Understanding of men	15
Knowledge of fundamentals	15
Technique of practice	10
	100

This table may suggest the wise course to scholastically embarrassed students. In the development of the above qualities which contribute to engineering success, the universities have no monopoly on the development of character, judgment, efficiency, understanding of men, or technique of practice. These qualities, to which a weight of 85 parts in 100 has been attached, can be cultivated just as well in some other field of activity. The one qualification of the six which a man can develop to distinctly better advantage within a College of Engineer- than outside is the "knowledge of the fundamentals of engineering science." If a man is scholastically embarrassed, he ought to face the fact that he is failing to get the one distinctive thing which the College of Engineering has to offer. Before attributing his failure entirely to the unquestioned serious handicap entailed by self-support, he ought to recognize that students who are entirely self-supporting frequently stand in the upper third of the class. He ought to consider whether a continued failure to develop along this one line may not hinder or imperil the development of some of the other qualities. For example, the trait classed above as efficiency or thoroughness may be impaired by the formation of the habit of confused or slovenly thinking, in a field for which the man has not the necessary qualifications. Again the continued failure may lead to the development of a grouch, with the consequent lowering in intellectual integrity. Under these conditions the course to pursue ought to be clear. Dishonor does not attach to a single failure in itself, or to a score of failures or to the withdrawal from one activity for which one is not qualified to another for which he has the qualifications. It attaches mainly to the whining come-back under the blows of adversity. To the student who accepts the handicap of self-support with serene indomitable will, there is but one sentiment,—"Here's to his good health! May he live long and prosper!"

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

A miniature thunder and lightning storm, produced by means of a Tesla coil, was shown at a meeting on February 23, of the American Institute of Electrical Engineers which will demonstrate this with other features at an electrical show to be held on April 20, 21, and 22.

Herbert H. Peck, '22, and Donald G. Lehman, '22, demonstrated that if a pressure of 90,000 volts was applied to a large, man-sized bird cage insulated from the ground, an individual's hair would stand on end if he came nearer than four or five feet from the cage. To have touched the cage on the outside would have meant sudden death, but a man on the inside experienced no discomfort.

AIRSHIP LINES IN AMERICA NOW ASSURED

By Clifford A. Tinker,

From "The Nation's Business."

It's a year and a half ago that The Nation's Business, making one of its rare plunges into fiction told the story of the formation of an air transport company to run great dirigibles from coast to coast in less than forty hours.

In another year, if the plans of the men back of a new company do not miscarry, lighter-than-air ships will make their trial across country. The company has been incorporated, capital enlisted, patents acquired and preliminary planning completed. So far the fiction of 1920 has become the fact of 1922.

Pioneering in aerial transportation may sometime be credited to Edward Schildauer, a graduate of the electrical engineering course in 1897, who was jointly responsible for the formation of the huge commercial aerial transportation company described in this article from "The Nation's Business." Mr. Schildauer, as the article says, is best known as the engineer in charge of the designing and installing of all the electrical equipment of the Panama Canal.

The editorial prediction then was:

While the treatment is fanciful every detail is an accomplished fact or is under experimentation. Most of those that are not facts now, will be within five years.

One of the men active in the company's plans is Benedict Crowell, formerly Assistant Secretary of War, head of the American Aviation Mission to Europe and President of the Aero Club of America. Let him tell the company's plans:

"Our aim," said Mr. Crowell, "is to provide rigid airship service to America first, and, as time goes on, link this continent with the rest of the world by aerial routes; a service supplementing existing methods of transportation, one which will traverse space in a minimum of time and supply a means of travel both safe and comfortable.

"Aerial transportation is just as necessary to present day civilization as the railroads were to civilization fifty years ago. In no country in the world is this new method of transportation more necessary than in the United States because of its great expanse of territory and its numerous urban centers of large size. The United States can and should lead the world in the rigid airship field."

Mr. Crowell was one of a party of financial men and engineers who spent in Europe much of the spring and summer of 1921. They went to airship factories and stations in Germany, France, England and Italy. They made flights in British, ex-German and Italian airships, obtained data covering manufacturing and operating costs, not only of airships but of hangars, mooring masts, landing fields, and terminal facilities. They gathered information and engineering data respecting flights over routes in the countries named, passenger accommodations, freight and express handling, fuel and supply statistics, replacement costs, insurance rates, and the laws governing air navigation in Europe.

"At the same time," Mr. Crowell explained, "we were carrying on investigations here in the United States. We looked into the helium question, its cost and probable supply; sources of operating revenues, passenger, freight, express and mail; the most feasible routes over which to start our new service to supplement existing traffic facilities; meteorological data and the effect that our climate will have on a yearly operation schedule; and the thousand and one things which develop into real problems to be surmounted in any undertaking of such wide application as in aerial transportation."

In their investigations, the representatives of the Corporation had the co-operation and assistance of Dr. Johann Schuette, of the Schuette-Lanz Airship Company of Germany, and corps of his engineers, also various engineers and associates of other airship authorities of Europe. Dr. Schuette had been in America in the spring of 1920 as had officials of the Zeppelin Company, and the information gained from them was of material service in the first formal step, the organization of the American Investigation Corporation.

"We uncovered enough evidence early in our trip to Europe taken with that previously found," said Mr. Crowell, "to convince us all that the time had arrived for action; that certain conditions abroad, if taken advantage of, would place the United States in the lead in the airship industry, perhaps for all time. Political conditions, reduced rates of exchange, post-war preparations, the non-employment of airship talent, all these were factors in giving airships a set-back in Europe. These factors are to our advantage."

On the return of these investigators from Europe, plans were formulated for the organization of General Air Service which starts business with all the accumulated data acquired by the American Investigation Corporation. The latter corporation has acquired various rights for the construction of German rigids throughout the world, obtained options on certain equipment vital to the industry, including mooring masts, hangars, terminal apparatus, and plans and specifications for rigid airships of various capacities for long-distance routes.

Dr. Schuette is again in this country. This second visit has made possible the incorporation of General Air Service and made more definite its plans. The first line the company hopes to put into operation will be from New York to Chicago, to be extended to Pacific Coast cities as soon as additional ships can be built. The New York-Chicago line will be opened by two ships, each of approximately 4,000,000 cubic feet capacity, these ships to be fabricated in Germany and erected in the United States. They will provide adequate accommodations for 100 passengers and 30 tons of mail and express matter. It is planned to build larger ships for lines to South America and Europe when the facilities for complete construction have been gathered in America.

The men who look so confidently forward to a commercial airship service that shall supplement our land and waterways are hopeful not only of sympathy, but of active support from the authorities both of the Army and Navy. They believe that the Government will permit the use either of the Navy Hangar at Lakehurst, or the one at the Cape May Naval Air Station, and the Army hangar at Scott Field near Chicago so that ships of the new company may be erected while its own housing and terminal facilities are under construction.

Mr. Crowell points out that the General Air Service Ships would be available for training dirigible personnel in peace time and immediately serviceable as auxiliary ships in time of war.

The hope of Federal co-operation does not stop with that. They feel that a contract, mutually advantageous, might be made with the Government, permitting these still unborn dirigibles to be filled with helium. They hold out the suggestion that their ships would be in effect great storage vessels for helium now going to waste or not in use and that their experiments in handling the gas would be of direct service to the Government. The record flight of the helium-filled Navy blimp, the C-7, was added proof of the part this non-inflammable gas is likely to play in the future of air navigation.

"The unit of life today is time not distance. Therefore the vehicle employed in reducing the time required to cover a given distance is of immense importance to the business world. That is where the airship comes in. It is essentially a long-distance craft, and that is why we will have no competition on long-distance traffic—airships are distinctly in a class by themselves. The running time of General Air Service liners will be ten hours from New York to Chicago and only forty hours from New York to the Pacific Coast. Think what this means to business dealing in express shipments where time is a factor."

General Air Service is the culmination of the activities of the American Investigation Corporation, a group of men who associated themselves into a research and investigating organization to study the airship problem as applied to the transportional needs of the hour.

Chronologically, the steps leading up to the formation of General Air Service, are as follows: Early in 1920, Mr. Fred S. Hardesty, Consulting Engineer of Washington, and Mr. Edward Schildhauer, Electrical and Mechanical Engineer, also of Washington, began the systematic investigation of aerial transportation with a view of determining whether it is commercial and economically practicable safe, and offers a field for profitable enterprise.

The two men were especially qualified for the work undertaken. Mr. Hardesty had been for fifteen years the representative before the Government of a number of prominent business and engineering enterprises, including one of the largest transportation systems in the world. Mr. Schildhauer is probably best known as the engineer who designed and installed all of the electrical equipment in connection with the completed Panama Canal, including the huge electrical operating devices for the lock gates, lock machinery, and shop-towage system.

Although conservative engineers, with a "from Missouri" attitude, these two men found their belief in the economic possibilities of rigid airships fully borne out by their investigations; accordingly they sought others to aid in the project, and were particularly fortunate in their choice of associates.

THESES—1921-1922

(Continued from the February Issue.)

C. H. Kirk and W. C. Lallier — Direction Professor Rood
Survey of Hydro-Electric Development in the United States.

C. H. Feltman and G. C. Lord — Direction Professor Rood
Types and Classes of Electric Locomotives.

D. S. Dewire — Direction Professor Rood
Electric Railway Substations.

H. M. Harp — Direction Professor Rood
Economic Survey of Railway Electrification in Wisconsin.

H. R. Lee — Direction Professor Rood
Comparison of Typical Hydro-Electric Developments.

G. R. Olson — Direction Professor Corp
Flow of Water in Channels.

J. S. Baker and R. J. Heins — Direction of Professor Watson
Wind Power.

S. F. Graves, — Direction of Mr. Woy
Sales Methods and Administration.

R. H. Herrick — Direction of Mr. Peters
Wave Filters

Aksel Taranger — Direction of Professor Terry
Investigation of the Magnerton Tube.

C. A. Andree
Properties of Oxide Filter Insulation

E. H. Trebus — Direction of Mr. Woy
Construction of a Hydro-Electric Plant.

Ernest Guillemin — Direction of Professor Terry
A Two Anode Magnerton and its Use with Various Specially Designed Circuits in the Production of Continuous Oscillations.

P. G. Bowman, C. P. Parsons — Direction of Professor Mead
Sturgeon River Water Power Investigation

J. W. Magann — Direction of Professor Crothers
Telephone Modulation.

B. W. Huebner, J. D. Swift — Direction of Professor Larson
Air Filtration into Buildings

Thomas Norberg, Arne Brinck — Direction of Professor Larson
Hot Water Heating by Direct Injection of Steam into Water.

E. E. Henry — Direction of Professor Larson
Boiler Room Economy.

C. L. Erickson
The Effect of Heat Treatment on Impact Tests on Cast and Forged Steel.

ST PATRICK WAS AN ENGINEER

By John Miller,

Universal Portland Cement Co., Duluth, Minn.

St. Patrick was an engineer, and as all good engineers at the University of Wisconsin hold him in fond memory, it seemed only fitting and proper to us, back in 1912, to obtain something which could be kept in the memory of our patron Saint and brother engineer—St. Patrick.

We heard that many years ago the real and original Blarney Stone had been taken from Blarney Castle, Ireland, and brought to America. This stone was at once decided upon as being the very thing we wanted and in the good old spirit of Wisconsin Engineers we determined to get the prize at any cost. Although it looked like a big undertaking to locate the prize stone, it was an easy matter for the band of hopeful and faithful engineers to find it and bring it to its present hiding place in the Engineering Building at the Unversity of Wisconsin.

In 1912, the first year we possessed the Blarney Stone, it was featured in the St. Patrick's Day parade by placing it in an open coach drawn by four white horses and parading it in a stately way all over Madison. After we had honored our Brother Engineer by dedicating the Blarney Stone to his memory, the stone was given over into my keeping and has remained so to this day.

There has been a lapse of several years since this stone has been shown publicly, but there was a reason for keeping it hidden. Soon after that memorable parade in 1912 and before the next parade was staged we heard of a world-wide search for the prize which was ours. Following this search came the war and for these reasons, rather than chance a loss of the only original Blarney Stone it was kept in its hiding place for future Wisconsin Engineers, and now you who are at school are the favored sons.

Take the stone, dear Brother Engineers, keep it in fond memory of St. Patrick and once more raise it to its rightful position among you. Kiss the precious stone and get for yourselves that quality which is so necessary to all engineers who find themselves stalled in the class room or in the field—*Blarney.*

EDITORIALS

"DOES IT HURT TO OWN ONE?" In answer to the communication printed elsewhere in this issue, we wish to state that we do think the ownership of a Phi Beta Kappa or similar key is desirable to one seeking professional success, and for substantiation of our belief it is necessary only to refer to the advertisement in last month's issue headed "Does it Hurt to Own One?" Evidently the "boss" of that big company does believe that key wearers are not as hopeless as campus traditions would like them to be. However, more material on the subject has and will be obtained and published in this and following issues. Concrete facts should be sought, as the communication suggests, but the opinions of readers are acceptable.

"If you can't express yourself, you will have to travel by slow freight." *A. B. Hall.*

ROUGHNECK OR LIZARD? The rising generation of males from the kindergarten to and through college shows a perceptible tendency toward effeminate styles and practices. We are credibly informed that the lounge lizard—that soft-fibred male who crept into our midst only a college generation ago—nowadays infests the beauty parlors, unashamed, and has his hair marcelled. The girls have taken to breeches, and, by the same token, the men are taking to the furbelows.

Students at the University of Chicago, it is reported, are attempting to combat this decadence by swinging back to the hard-boiled standards. A society called the "Five Minute Eggs" has undertaken to set a better style for men. Members are required to chew tobacco and box. The originators of the movement want it to spread to other colleges.

As between the Lizard and the Roughneck, give us the latter. But the ENGINEER has consistently held to the theory that a man could have all the manly virtues without having to cultivate offensive habits of dress, speech, or action.

We do not view the situation with alarm. We remember that the so-called "effeminate" Frenchman, passionately addicted to his corset and his scent, proved himself to be a whale of a fighter. We feel that a sound moral fibre can survive a reasonable amount of social idiocy. Doubtless effeminate habits will weaken masculine virtues if long continued; history furnishes many examples of that. Our hope is that the lizard style will soon run itself out.

"Every man owes some of his time to the upbuilding of the profession to which he belongs."

THE ENGINEERING COLLEGE MAGAZINES ASSOCIATED The frontispiece of this issue of the Wisconsin Engineer carries the statement that the magazine is a member of the Engineering College Magazines, Associated. Elsewhere in this issue is a list of the fifteen college magazines that compose the association. It is a new organization, formed principally for the purpose of making the columns of the engineering college magazines more accessible to advertisers who want to reach college men. Incidentally, the association is proving a powerful influence in stimulating the magazines to improve their appearance and their editorial matter.

Two years ago, two men met at Chicago and worked out a scheme of organization; a year ago, representatives of four or five magazines, among them the Wisconsin Engineer, met at Chicago and launched the new association; this year, about twenty representatives from nine magazines met at Ann Arbor and spent February 24 and 25 in discussing the multitude of problems that were brought forward for solution. The meeting was marked by great interest in what the other fellow is doing, by an evident desire to carry away ideas of value, and by a get-together spirit that promises well for the continuance of the organization.

INTERSECTIONAL COLLEGIATE ATHLETICS Intersectional athletic contests between representative colleges are becoming more and more numerous. Such contests put the schools represented before the public in a very desirable manner; they create good feeling between the schools, broaden the students' interests, and intensify that love for the alma mater known as "school spirit."

Talk to any alumnus of any western college who has been in the east and he will tell you that any contest a western team engages in with an eastern term is worth dollars and cents in the pocket of the graduate or potential graduate of either college.

These intersectional contests are not likely to become sufficiently frequent to interfere with the school work of our athletes; on the other hand, trips of that sort are very much worth while to the men individually.

It is true that some trips, such as that of the crew to Poughkeepsie, must be made at a financial loss. But Wisconsin would gain a hundred fold by such an *investment*.

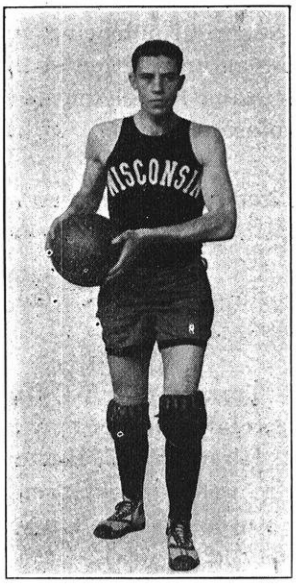
Chicago will again play Princeton on the gridiron, and Iowa is to play Yale. Illinois is soon to tackle California. Other events will be heard from. The public demands intersectional contests, and students want them. When will Wisconsin have them? H. A. P.

ATHLETICS

H. A. Phillips

RUSSEL IRISH IS STAR

When Gus Tebell badly injured his leg at a critical point in the conference race, Dr. Meanwell had to find a man who could fill the standing guard position, and he seems to have chosen a good one in Russ Irish, sophomore mechanical engineering student. Russ has been doing well in practice all during the winter, and was deserving of the assignment.



Russel Irish

Irish got his first real call in the Illinois game here at Madison. Tebell, with his knee in a metal brace, seemed unable to stick with Carney, and Russ "went in." With the exception of the first five minutes, when Tebell was in, Irish played the entire game, and his guarding was so effective that Carney, probably the greatest player in the conference, was able to secure only one basket. On other occasions in games with Iowa, Northwestern, and Illinois, Irish showed his worth.

Irish is a town man, and also plays football, his work subbing at end showing real class at times last fall. With a year's experience behind him, he should look mighty well in both sports next year.

BALL TEAM PRACTICES

Coach Guy Lowman, of the baseball team, has had his charges working regularly for the last month in the gymnasium annex, and although the first game will not be played until April, prospects for a good team are bright. Captain Paddock, Hoffman, and Christianson will be the mainstays of the pitching staff. In the outfield Rollie Williams and Elliot will be available. Ceaser and Tebell are possibilities for outfield positions. In the infield, Jack Williams will probably hold down the first sack, while the others are somewhat in doubt. Comebacker looks like a good bet, as does Foy. Barry has the edge on the catcher's job.

FINKLE BREAKS LEG

The Wisconsin track team suffered a severe setback in its aspirations for championship honors this year when George Finkle, junior electrical, broke his leg while running a two-mile race in the dual meet at Notre Dame, February 18. Finkle was running nicely in the two-mile run, when, on the curve, he suddenly fell, after turning his foot. A fracture had occurred in both bones of the leg, just above the ankle. Thanks to the X-ray, it is hoped that the set will heal correctly, and George may even be able to finish his work for the semester.

Finkle was expected to be a strong point winner this year. He was running the two mile in considerably better time than last year at this time, and it will be remembered he copped first honors in the conference cross-country run at Bloomington, last fall. He deserves all assistance and cheer he may be given, as in addition to his work in the Engineering College, and his work on the track team, he was practically supporting himself by outside work.

SKI MEET SUCCESSFUL

The Badger Ski Club was the host to over forty ski riders on Saturday afternoon, February 18, when the Mid-Western, Wisconsin state, and Minnesota-Wisonsin championships were decided. Snow was imported for this meet at a cost of about two hundred dollars, and the slide covered as well as possible. It was the first time the slide has been used since its erection, last year, and there were only a few jumps over a hundred feet.

Ragnar Omtvedt was winner of the Mid-Western event, and the Wisconsin team defeated the University of Minnesota by a score of 656½ to 545½.

The meet was a success in every way. Over three thousand spectators watched it. With a better winter next year, the slide ought to prove a mighty popular place. The members of the Wisconsin team were Sverre Strom, Tom Norberg, Axel Taranger, and Oscar Christianson, the first four being engineers.

KNOLLIN BREAKS HURDLE RECORD

Five annex records were broken and one equalled in the annual University of Wisconsin relay carnival events held in the gymnasium February 25.

Al Knollin, Wisconsin track captain, knocked a fifth of a second off the annex mark in the 45-yard low hurdles when he covered the distance in 5 2-5 seconds. Knollin also equalled the annex mark of 5 2-5 in the 40-yard high hurdles.

ALUMNI NOTES

E. D. BADER

WISCONSIN ENGINEERING SOCIETY MEETS

A joint meeting of the Wisconsin Engineering Society and the Madison Technical club was held in Madison on February 24 and 25. At a banquet of the two organizations held February 24, Prof. Daniel W. Mead, of the college of engineering, addressed the members on "Professional Ethics", in which he emphasized the fact that the basis of true professional ethics is in a genuine square deal for all concerned. Prof. Earle M. Terry, of the department of physics, explained the operation of radio telephone apparatus, and demonstrated with a concert transmitted by radio telephony to the banquet room from the university radio station. A novel feature introduced was the playing of a xylophone and a victrola together at the station.

Jerry Donahue, c '07, consulting engineer of Sheboygan, was elected president of the Wisconsin Engineering Society at the closing meeting of their convention, Saturday, February 25. Professors L. S. Smith and C. I. Corp, of the college of engineering were elected secretary-treasurer and trustee, respectively.

William Balderston, c '19, has been granted a patent for a new battery design which is said to be cheaper to manufacture and maintain than anything that has been developed heretofore. The battery makes use of individual dry cells instead of an assembly of cells and is for use in railway signals, farm lanterns, etc. Balderston is connected with the French Battery and Carbon Company, to whom he has assigned the patent.

Harry D. Keerl, c '04, formerly with Keerl and Conklin, sanitary and hydraulic engineers, Mason City, Iowa, announces the opening of an office at 422 McKnight Building, Minneapolis, Minn., where he will continue to specialize in land drainage and flood control.

William J. Camlin, c '18, has applied for a transfer from the junior to the senior branch of the American Society of Civil Engineers. He is designing and sales engineer for the Building Products Company, Columbus, Ohio.

Edward Schildauer, e '97, advises us that his present address is the Commercial National Bank Building, Washington, D. C. Mr. Schildauer is consulting engineer for the American Investigations Corporation.

THE ENGINEER is indebted to Mr. J. H. Wood for a more detailed account of the unfortunate accident in which **H. C. Prochazka** was killed. The article in the ENGINEER for January was incorrect as to the place and the manner in which the accident occurred. At the time of his death Prochazka was employed by the Universal Oil Products Company at Alton, Ill., builders of apparatus for the extraction of more gasoline from the residue remaining after the completion of the first process. This process, which is patented, requires a high pressure condensing apparatus, and it was while testing an installation of this apparatus at the plant of the Roxana Petroleum Company, Roxana, Ill., that the explosion occurred, killing Prochazka almost instantly.

Mr. Wood writes, "All who know Prochazka recognized in him a true friend, and a man of the highest principles and character."

Two veterans of the Wisconsin Highway Commission, both of them U. W. Alumni, have recently received promotions.

The advancement of **M. W. Torkelson,** c '04, from bridge engineer to engineer-secretary, makes him assistant to Chief Engineer A. R. Hirst. **W. C. Buetow,** c '08, is to fill the position left by Mr. Torkelson, as bridge engineer. Mr. Buetow's previous position was that of engineer in charge of day labor work.

They will take up their new work immediately. Mr. Torkelson has been with the department since 1912. He has had charge of bridge construction in the state since that time.

Halmer Peterson, e '21, is with the A. T. & T. Co., at Cleveland, Ohio.

Maurice Shapiro, e '21, is living in Milwaukee.

H. Ford, c '21, has accepted work in California, leaving Feb. 25.

John Mertes, ch '19, is the superintendent of the city gas plant in Fond du Lac, Wisconsin.

Herman Lachmund, m '09, has changed his mailing address from Bremerton, Washington to Sauk City, Wisconsin.

Sverre L. Rolland, who completed the requirements for the civil engineering course in February, is temporarily with the Better Sox Knitting Mills of Ft. Atkinson, Wis., preparing some plans for some new buildings.

Lewis E. Moore, m '00, CE '06, has opened an office for consulting practice in Boston. He will specialize in structural design.

Clifford E. Ives, m '19, has established the Ives Engineering Service at 1261 Monadnock Block, Chicago.

(Concluded on page 117).

CAMPUS NOTES

J. W. SMART

BIRDS WHO ARE NOT ALLOWED TO KISS THE BLARNEY STONE

The buzzard who disgorges his wad of gum into the bubbler.

The laughing jackass who cachinates vociferously in the hall during class periods.

The peacock who has his hair marcelled.

The lyrebird who says he will return that report by ten p. m. and doesn't do it.

The parrakeet who disturbs the reading room with his chatter.

The bulbul who sings in the drawing room.

The coot who breaks up the furniture.

The cock pheasant who does aesthetic dancing in a cheese cloth nightie.

YOU HAVE TO BE A GOOD SPELLER TO USE THE DICTIONARY

You know Professor Withey's famous definition of "cement", which is as follows: "Portland cement is the product obtained by finely pulverizing clinker produced by calcining to incipient fusion an intimate and properly proportioned mixture of argillaceous and calcareous materials, with no addition subsequent to calcination excepting water and calcined or uncalcined gypsum." A group of students stood waiting to write the final in mechanics, and sez one of them, with anguish in his voice, "Even after you learn what the words mean you can't remember how to spell them."

Prof. R. S. McCaffery served a steak dinner to the members of the Kiwanis club in the mining building, Monday, Feb. 6. After dinner the club was entertained with Chinese songs by C. K. Tsao, Chinese mandolin music by Y. H. Lee, Armenian songs of K. L. Hussissian, and a selection by a student Philippine orchestra.

A junior in the electrical lab shorted a power line with a screw driver. As he stood looking ruefully at the remains of the tool, Mr. Singer rushed up and shouted, "Say, do you realize that you've let five cents' worth of screw driver go up in smoke,"

METER MEN'S SCHOOL

Sixty-eight men attended the school for electric meter men, which was held during the week of January 23 to 27. They came from many states, and represented Westinghouse, General Electric, Sangamo, Pavey, Packard, and Weston companies. The course was enlivened by a dinner, at which Professor W. F. Steve talked about "Snowflakes", and by lectures by C. B. Hayden, engineer for the Railroad Commission, Professor E. M. Terry and Professor C. M. Jansky.

George J. Barker, an instructor in Mining and Metallurgy, is carrying on research in the leaching of zinc ores and the production of electrolytic zinc from the leach solution. The experiments show a high leaching recovery, and indicate that it may be possible to treat the Wisconsin zinc ores by methods similar to those in operation in the western states and at a lower cost.

Whether or not a student should be allowed to have an automobile while attending the University seems to be a moot point; but we are unanimous in the opinion that the nitwit who parks his car at a dangerous curve on the Hill ought to be tied to his own radiator and shoved over the ski jump.

And while we are on the subject of student autos, we might explain why Professor Pat Hyland doesn't bring that sporty Jackson of his to school. Of course you've seen it. It's that bus that was designed for a circus magnate. Pat *did* take it to the E. B. one day, and parked it with the sedate cars of other faculty members behind the building. When he came out at noon he found on the seat a note from the university policeman advising him that the spot was reserved for faculty cars,—that student must park behind Bascom Hall.

Mr. R. B. Anderson, who has been engaged as instructor in the Mechanics Department, was graduated from the University of Michigan in February, having specialized in structures. His home is in Texas, and it was at Trinity College of that state that he took his preliminary work.

WHAT IS A PRODUCE SWAMP?

The question in the Hydraulics quiz read, "What causes produce swamps?" One man aswered. "Produce swamps are caused by the collecting of the right amount of water which has not too much mineral matter in it, such as alkalines."

Prof. C. I. Corp has been elected vice-president of the Madison Technical Club. Prof. D. W. Mead is the retiring president. Prof. Van Hagan is a member of the board of directors.

Daily engineering college news now finds its way to the Cardinal columns through the "stories" of Earl Bader, whose name has recently appeared on the Cardinal masthead as engineering reporter.

Prof. Rood, who was appointed by Gov. Blaine in

August to serve until January, 1922, as a member of the University Retirement Association, has been directed by the Association to continue to serve until 1925.

Gleaned from a report in E. E. 140: "The voltage set up in the water-dropper generator never exceeds its maximum value at any time during the experiment."

We knew they would get that treacherous piece of apparatus tamed in due time.

After the recent Kornhauser fire we learned from the Madison Capital Times that "traffic on the Mifflin Street side of the Square was held up for several hours during the fire. The cars could not be permitted to cross the hose stretching over the tracks".

We'd be willing to wager that the street car we last patronized could jump all the fire hose in town if given the chance.

How did the Mag make the big Blarney Stone "scoop?"

We give all credit to Walter, of the cement lab, who told of Mr. Miller's recent visit, giving his address. Mr. Miller's letter was in part as follows:

"For six years I have been an occasional visitor to Madison and each time it has been a pleasure for me to visit the Engineering Building. During these visits I have always looked to see if the Blarney Stone was still in its hiding place, for I was its official keeper, and each time found it undisturbed. On my last visit in January 1922, I showed the stone to Mr. Laflash, who was surprised to see that I knew of things in his laboratory of which he did not know.

"Walter will give you the stone, which is hidden ---- ----------------------------------.* The stone, on March 17, 1922, will have been the property of Wisconsin engineers for ten years. If you have a parade this year, feature the stone and renew the interest in it that prevailed in 1912."

*Censored because of the world wide search of which Mr. Miller speaks in his article, "St. Patrick was an Engineer."

The coming Engineers' parade, which promises to be even better and bigger than last year's moving exhibition, is in charge of "Hap" Phillips, with "Mac" McCaffery as assistant. Earl Bader acted as managing editor for the special green-paged Engineers' Cardinal.

Prof. L. F. Van Hagan represented The Wisconsin Engineer at a meeting of the Engineer College Magazines, Associated which was held at Ann Arbor, Mich., February 25. Prof. Van Hagan is a member of the executive committee of the association.

"Sherm" Green, busniess manager of the 1923 Badger, carries his arm in a sling as a result of trying to force his way through a window in his own office, which is on the second floor of the Union Building. Instead of getting the window open he took an 18-foot fall.

THE OLD SLIPSTICK

By Stuart O. Fiedler,
Sophomore Chemical.

(With condolences to Kipling—who never owned one.)

You may talk about your Burroughs or your logs,
Of your "cast out nines," or other sure-fire trick,
But what keeps the rough-neck plumber from the dogs
Is the dingus sometimes called "the Old Slipstick."
He doesn't bust a spring; he won't forget
To carry one; or make a three a two,
But squares 'em, cubes 'em, runs them out to three,
And you *know* that he's not lying when he's through.

So here's *to* you, good old slipstick in your hard-boiled leather case,
With your "improved frameless runner," and your long, lop-sided face.
Your old slide's getting warped a bit, and Gosh! but it runs tight,
But when it comes to figures,—why you always get them right.

With tangents or proportionality
He's a rarin' tearin' bloomin' little cuss.
And when he gets to work,—why, Holy Gee!
He dopes out anything, 'cept Calculus.
He never gets tired out; he never kicks
About scabbing or a piling on the work,
But slips and slides and does his little tricks,
He saves a lot on pencils; he won't shirk.

So here's *to* you, good old Polyphase, Duplex, and Log-log too,
We always make a goat of you when we've got work to do.
We use, abuse you, sometimes lose you,—you don't seem to mind;
But grind out logarithmic sines whenever we're inclined.

He isn't up on English or on Greek,
His names are all the classics that he has,
But he'll put in days of overtime a week,
On stuff that gives the human brain the razz.
He's an exponent of pure democracy;
He serves alike the student or the Dean.
He's an holy wizard with the rule of three,
And he's twice as good as asp'rin for the bean.

So here's to you good old slipstick in your hard-boiled leather case.
We just can't live without you; of friends you are the Ace.
And here's to you, battered Polyphase, and to your makers too,
And to your makers too,
We're sure as sin to call you in when we've got work to do.
When we've got work to do.

Prof. Crothers (in radio class): "Now, Goetz, what do you understand by 'decrement' "?

Goetz: "I don't know, but I know you use a watt-meter in it."

The Engineering Society of Wisconsin, at its recent meeting, voted to contribute $50 to the fund that is being raised to place a tablet to mark the first municipal plant electric lighting plant in the United States,—the plant at Appleton, Wisconsin, which was put into operation in 1882.

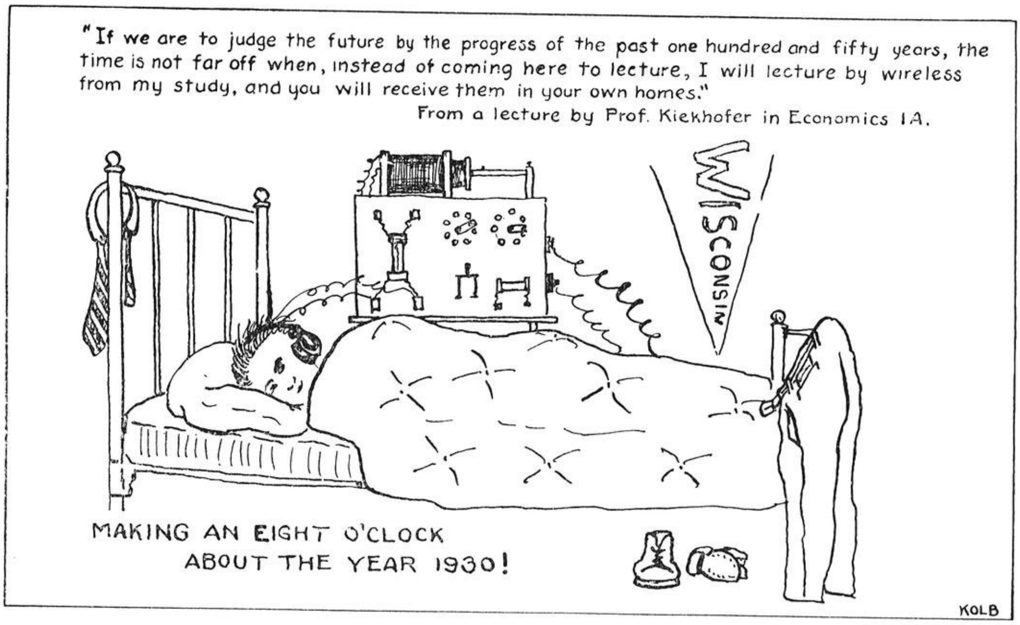
A HINT

When you come to the libe, by the rules please abide,
Don't talk to the chap at your side;
He has work of his own, just let him alone,
And that nice little visit postpone;
For I and my buddy both came here to study;
We study, but speak not a word.
You can bet your hat we won't relish your chat;
You had better be seen and not heard.

A. Nonymous.

MAKING NOAH WEBSTER TURN OVER

The junior civils have been furnishing each other entertainment with their guesses at the meaning of words in the course in engineering English. At each meeting of the class, each student hands to the instructor a list of seven words, together with their meanings, which he has encountered during the week. From these lists the instructor chooses ten words which he writes on the board. The students are required to write the meaning of the words, and the papers are corrected in class. Following is one such list and the definitions selected from various papers:



WHY NOT NINE O'CLOCKS, TOO?

Intransigeant—the act of consigning anything; death.

Epitome—a monument for the dead; dome shaped; a tomb; utmost.

Myriad—a beautiful woman; a fairy.

Bizarre—gathering of people.

Emissary—place where a government official from a country discharges his duties.

Fetid—lacking ambition; celebrated; to pay respect.

Miasma—balcony; a scene of splendor.

Impasse—military pose; one of quiet nature; an edict; out of date.

Prolific—inclined toward; wonderful; standing out in relief.

Admonition—crime; well disposed.

A student wrote in the conclusion of a lab report, "The curves do not show up very well in this experiment. There seems to be a dark horse somewhere in the data." The report came back with the instructor's comment: "Couldn't locate the *horse*, but found considerable *bull*."

ENGINEERING COLLEGE MAGAZINES ASSOCIATED

Rose Technic.	Iowa Engineer.
Sibley Journal	Michigan Technic.
Virginia Journal.	Colorado Engineer.
Wisconsin Engineer.	Nebraska Blue Print.
Illinois Technograph	Minnesota Techno-Log.
Tech Engineering News.	Kansas State Engineer.
Cornell Civil Engineer.	Princeton News Letter.
Iowa Transit.	

(Continued from page 114).

The service will specialize in automatic and special machinery. Mr. Ives wishes to be remembered to all the members of the engineering faculty.

Wm. F. Kachel, ME '08, was at th University on Feb. 18 to assist in making a test on a new type of steel grating manufactured by the Wisconsin Iron and Steel works, of which company Mr. Kachel is sales manager.

H. F. "Mike" Mielenz, c '17, was in Madison for the week-end of Feb. 25 to attend the convention of the Engineering Society of Wisconsin. Mike lives at the Y. M. C. A. in Beloit and is assistant to the chief engineer in that city.

NOTES ON THE REPRODUCTION OF ENGINEERING DRAWINGS

(Continued from page 101).

solutions for printing are prepared by the manufacturer. A negative is first made on Van Dyke or other sepia paper, and then this is used as a negative over the prepared tracing. Exposure is complete when there is a bluish image, and the cloth is then put into a water bath and then transferred to a bath containing a developer. In this second bath the image becomes more distinct and a bluish scum is formed over the whole sheet. This scum is gently wiped off, and beneath it there is a clear black image of the original. If the rubbing is too severe to remove this scum, the whole emulsion may be wiped from the cloth. When the print is dry it is further waterproofed by brushing it with a clear liquid with is probably of a nitro-cellulosic nature. The final product is an exact copy of the original in dark clear lines, equal in printing qualities to a new tracing and surpassing in reproductive qualities an old, torn and mussy tracing.

Cost, Etc.

The prepared cloth is from $2.10 to $4.25 a yard, depending upon the width. The finished duplicate would then cost somewhat more than these figures, depending upon the shape and size of the drawing and the labor involved at the particular shop in which the print is made. In most cases it is very much cheaper than making a new tracing by hand. Alterations may be made by blocking out the portion not to be copied, and by erasures or additions to the finished print before laquering.

II. PHOTOGRAPHIC METHODS

A camera is a great adjunct to a modern drafting room. Its utility will manifest itself with its use. For the reduction of large drawings to a report size (8½" x 11") and the hasty copying of complicated machine parts for correspondence use, it will prove an economy. An 8" x 10" glass plate is worth around 75 cents and a print is around 20 cents. With glossy paper and a little care and experience, very creditable reproductions can be turned out. Development can be done at the commercial photographers and duplicates may be made by any of the Photo-Chemical methods.

Line Drgs. from Photographs

By printing on an unsalted paper (that is, one with no sizing in the emulsion), drawing in the characteristic lines and then bleaching the photograph, a fine perspective drawing may be obtained. The bleaching is done with Mercuric Chloride dissolved in alcohol, and the image may be conjured back again with hyposulphite of sodium.

Blue prints can be faded with a solution of ammonia or washing soda. If a zinc etching is to be made from the drawing, however, it will not be necessary to completely bleach the print since blue is non actinic in the photographing process of making the zinc etching.

PHOTOSTATS

The photostat is a photographic copying machine. A copy is made on a "bromide" paper (a paper containing some silver bromide as sensitizer) instead of a glass plate, and consequently the first copy is a negative. The process is often continued no further than this negative stage. By rephotographing the negative, a positive may be obtained. The apparatus is complete within itself, having compartment for the storage of bromide paper, trays for developing and fixing the print, and a stand for the copy to be photographed.

Details of Operation

The details are shown in Fig. 4. The copy is placed on the copy board at the front of the machine, and is illuminated by a set of mercury vapor lamps. The machine is focused by noting indices on the vertical and horizontal members of the support. During exposure, the light passes from the copy through a prism and lens and to the bromide paper. The prism is necessary so that the picture will not be reversed left for right, as is the case with the glass negative when viewed from the emulsion side. After exposure by moving various levers, the paper is cut from the roll, a new sheet placed in position and the exposed sheet fed into the developing and fixing tanks toward the back of the machine. After it has been fixed for about a minute, it is removed from the machine and thoroughly washed. A complete permanent copy may be made from an original in a book or other similar copy within two minutes.

Costs

The machines come in various sizes and range from $800.00 for the 11½" x 15" to $1150.00 for the 18" x 22". The usual prices for 9" x 14" prints is 35 to 40 cents, though the manufacturers claim that all costs of materials are about 5 cents a square foot. In case very large drawings are to be made, they can be made in sec- *!tions and later pieced together. This is possible since the lens on the machine is highly corrected fro rectilinear distortion. The distortion would be noticed in the common studio camera.

Use of This and Similar Machines

The machine is used extensively in large concerns and is finding increased favor. There are two other similar machines on the market, named the cameraograph and rectigraph, and all of the machines have their own distinctive patented features. Where there are a great number of copies to be made from the same copy, it is usual to make a negative, and copy all the others from this. When the number of prints is greater than three or four dozen, the photostat is expensive, and is replaced by press prints. The press prints are ink copies of the original and are obtained by a photographic method. The method will be described in detail under photo-mechanical methods. Their cost varies considerably, depending on size, number wanted, stock of paper, etc.

Samples of the methods of reproduction given in this first part of the article are to be seen on the bulletin boards of the Drawing department on the fourth floor of the engineering building.

(To be Concluded in April Issue).

Benjamin G. Lamme

VISITORS at the Chicago World's Fair, in 1893, saw the first extensive use of alternating current ever undertaken, when Westinghouse lighted the entire grounds with this type of current. This achievement marked the beginning of the commercial development of alternating current for power purposes, and brought the induction motor into a prominence which it has never since relinquished. Great and rapid have been the developments since that day, but the most impressive aspect of this progress is not to be found in the spectacular evidences that are visible to everyone, but rather, in the vision and fundamental soundness and determination that have been quietly at work blazing and clearing the trails which the electrical art has followed.

There is, for instance, the synchronous converter. This machine is the most efficient and economical means for changing alternating to direct current, which the operation of most street railway systems and many other processes require. Without it, the development of alternating current to its present universal usefulness would have been tremendously retarded.

The synchronous converter, in its present perfection, is but one of the great contributions to electrical progress that have been made by Benjamin G. Lamme, Chief Engineer of the Westinghouse Electric & Manufacturing Company. Mr. Lamme, in 1891 when he was Chief Designer, conceived and developed the converter, which, first used commercially in connection with the great Niagara power plan, has since come to be indispensible to large producers of power.

When a man has played so vital a part in electrical progress that his knowledge and vision have contributed to practically every forward engineering step, it is perhaps misleading to attempt to identify him particularly with any one development. His work on the induction motor, the turbo generator, the single-phase railway motor, and the synchronous converter is but typical of the constructive ability which Mr. Lamme has brought to bear on practically every phase of electrical development.

A man of foresight, visioning the alternatives in a problem as well as its hoped-for results. A man whose mind combines great power of analysis with the gift of imagination. A prolific technical writer, whose style is unequalled in clearness and simplicity of expression. Few engineers so thoroughly predetermine the results they actually achieve. Few men capitalize their experiences so completely. And few indeed have at once his thorough technical equipment, his commercial understanding, and his broad human interests.

An institution which has builded its success largely on engineering achievement pays Benjamin G. Lamme affectionate loyalty and respect. The young engineer on his first job, as well as the most seasoned co-worker, finds in him understanding, sympathy, wise counsel, and a conscience; to all of which his associates, in preparing this article, are proud to bear witness.

Westinghouse

WESTINGHOUSE ELECTRIC

COMMUNICATION

Editor of the Wisconsin Engineer:

I read with more than a little interest the various references made to ϕBK in the "Engineer" which came out today. It must be all very fine to wear the key on your watch chain, and have folks talk about what a wonderful scholar you are, but the question still lurks in my mind, "Is the boss going to take one look of your key and hand you out a big job on first sight?" I don't think so, at least I wouldn't if I were "boss." Doesn't it seem a bit as though the few wearers of the key are just trying to justify themselves before the multitude for being a bunch of one sided individuals who can see nothing in life but a shelf of books, a bunch of formulae or a few ghostly, fleeting theories? How about it? Let's have your opinion on the matter. I've tried to look at the matter in a thoroughly unbiased way, but I can't get away from the notion that these "honorary" men are trying to kid themselves into thinking that they are going to take the rest of the world by the tail and beat their brains out on a brick wall.

What is going to become of the runt who is trying to work himself through school and has to try to console himself by the fact that "working his way is more than half his education anyway." Are the folks going to dub him "dumb-bell" when at the end of the semester his advisor hands him his grades consisting of a fair, a con, a flunk, and a good in a measley shop course that most any fool could have gotten anyway. Is he going to ever have a chance to get above the ordinary grind when such grades are dished out to him because his eyes will naturally fall shut at twelve o'clock or so, and he has to go to bed with one or two lessons still unprepared, with no chance to get them in the morning, having to get up with the birds (or before) and go to work.

This is not the aimless tirade of a "calamity howler." It is the substance of a few questions in the mind of an anonymous engineer who has found himself in a more or less embarrassing condition, financially and scholastically.

If the "Wisconsin Engineer" wants to do something to help those of us who are in somewhat similar circumstances, I would suggest that you send out some questions to the employers in various lines about the country and try to find out from them just exactly how much stress they place upon grades alone, and how much they would consider a man worth who just "got by" in his studies, but made an honest effort to work his way through school.—*Anonymous.*

AN ANSWER

Yes, "Anonymous"-without-a-Tau-Bete-key-and-having-to-work-his-way", you have a chance "to get the world by the tail" providing you have the necessary and desirable personal qualifications. Good scholarship is only one of the elements for success; character and dependability rank equally high. How do your gears mesh with those of your associates in business? Can you pull harmoniously in double or multiple harness or do you kick over the traces. You are working under a big handicap because you must earn your way as you go. Hence if you make a fair to good record in college you have done all that can reasonably be expected of you. Employers have places for men like you and they also give you the same chance to rise as the fellow who had only his lessons to get. *I Sym Pathize.* (A Department Head).

O. L. Kowalke

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Dr. Kenerson, of Brown University, and chairman of the A. S. M. E. committee on college relations, was a guest of the student section of A. S. M. E. at a dinner given at the city Y. M. C. A., March 1.

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.

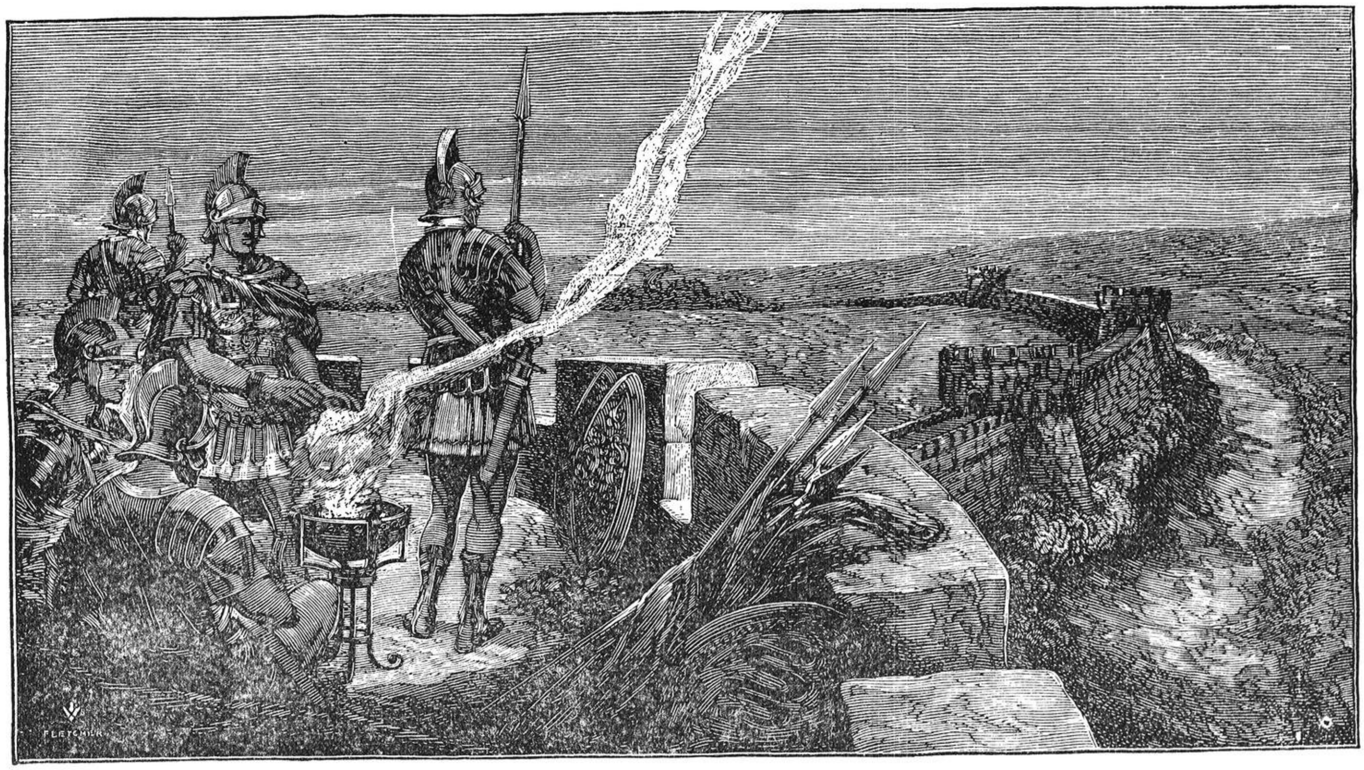
If you are interested in the distribution of light through Factrolite, we will send you a copy of Laboratory Report—"Factrolited."

MISSISSIPPI WIRE GLASS CO.,

220 Fifth Avenue,

St. Louis. New York. Chicago.

No. 1.

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Pavers: 7, 10, 14, 21, 32 cu. ft. capacities mixed concrete, steam and gasoline. Write for catalog P 22
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