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The Wisconsin Engineer

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NO FREE FEEDS

Queensland Paper—"Dave Lewis begs to notify that he has started business on his own hook as an up-to-date restaurant, and hopes that his many friends will damn well stop away and give him a chance."—*Boston Transcript.*

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300 PER CENT OVERLOAD

The frosh was not doing well with his work and his adviser called him into the office to find out the reason. As a preliminary he asked, "Mr. Gruen, how many subjects are you carrying?" "Why, I'm carrying one and dragging three, professor," was the unexpectedly accurate reply.

UNUSUAL SPARROW

The native minister was telling the missionary in charge of his district that a sparrow had built a nest on the roof of his house.

"Is there anything in the nest yet?" asked the missionary.

"Yes," said the Indian brother, proud of his English, "the sparrow has pups."—*The World Outlook.*

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HIGHWAY RELOCATIONS.

By Gordon F. Daggett

Engineer of Surveys, Wisconsin State Highway Commission

Highway Improvement is a National question at the present time. Railroads are overtaxed, and today, as never before, people are turning to the improved highway for a partial solution of the problem of transporting war and commercial supplies. The Federal government is granting financial aid, under certain conditions, to the several states for the improvement of their highways. One condition is, that these improvements shall be of a permanent character, and to accomplish this, the location must be carefully selected.

In the early days, the natives laid out their roads or trails along the water grades, the one idea being to facilitate travel. This automatically secured fairly good grades, by placing the highways in the valleys and on side slopes of hills. As time went on, early settlers came in and began to cultivate land in the valleys. They decided that all good land must be used for agricultural purposes, and the highways as a rule had to give way, being placed on sectional or subdivisional land lines. This was done regardless of grades or other features that would tend to increase the construction or maintenance cost of the highway. Hence highways ran over hill and down dale, disregarding the demands and conveniences of traffice.

Public opinion is and has been undergoing a radical change, in the past few years, on the highway question. Today the question is being considered intelligently from every angle, which results in a greater number of highway relocations being made each year. When the location of a highway is properly considered, sectional or subdivisional land lines must be forgotten.

Relocations are made for one or more of several reasons, which may be listed as follows: (1) to secure better grades; (2) to secure better drainage; (3) to secure better alignment; (4) to eliminate railroad grade crossings; (5) to lower construction costs; (6) to lower maintenance costs; (7) for miscellaneous reasons, such as securing better vision for traffic, eliminating bad snow drifts, obtaining better connections with secondary roads, etc. Taking up each of the above items separately, we find: (1) That a reduction from 15 per cent to 8 per cent will decrease the hauling cost about sixty cents per ton mile. A team of horses can haul nearly twice the load, and cover a greater milage per day, on the lower gradient. (2) Better drainage can generally be secured by avoiding sharp slopes, ravines, bad washes, hollows, and other features tending to impair the drainage of the highway. (3) Better alignment is always to be worked for in the relocation of highways. Sharp turns should be eliminated where possible, especially if such turns come on a grade. (4) It often happens that dangerous grade crossings can be eliminated by a slight change of location. Grade crossings are always dangerous, no matter how well protected, and should be avoided. The railroads will generally support any relocation tending to reduce crossings dangerous to traffic. (5) Heavy rock work can often be avoided by relocating the highway. The initial cost of the improvement should be kept to a minimum consistent with good location. (6) Maintenance costs are always to be considered carefully. When the highway is completed, maintenance costs will tend to increase from year to year. Make them as low as possible by properly locating the highway in the beginning. Snow drifting is to be guarded against by placing the road on the proper slope and in such a position that drifting shall be a minimum. Snow is expensive to remove from a highway. (7) Miscellaneous features will include all points not covered above. Perhaps the most important of these miscellaneous features is the vision for traffic. There is a large percentage of automobile traffic at the present time, and naturally it moves at a higher rate of speed than horse-drawn traffic. Actual tests made by the New York State High-

way Commission with a five-passenger automobile show that the distance required to bring the machine to a stop is as follows:

Speed	Distance
20 mph.	40′
40 mph.	140′

Numerous associations and State organizations have made actual tests for a "safe sight distance" and it has been generally decided that 300 feet is a "safe sight distance" for a speed of 25 miles; 200 feet for 20 miles; and other speeds in proportion, except that the minimum sight distance shall be 100 feet. Summing up the above statements and facts, relocations are made primarily to secure a more economical road as regards construction and maintenance features.

The proper location of any highway involves the making of certain preliminary studies before the final location can be decided upon. Traffic conditions must be investigated. It often happens that the main traffic will be in one direction toward a market center; hence the problem resolves itself into one similar to the railroad problem, namely, in eliminating adverse grades in the direction of the main traffic. The ruling grade, favorable to traffic, should be secured although it may be impossible to secure the same grade in the opposite direction. An estimate should be made of the saving in haulage cost per ton mile that will be effected. The capitalized value of this saving will indicate the amount that can economically be spent upon the improvement.

There are various types of road relocations, the "contour relocation" being perhaps the most widely used. The old system of laying out roads to follow stream lines until the head of the valley is reached and then making the steep hard climb to gain the summit is fast being replaced by the contour grade development. This, briefly stated, consists in making the ascent by a long easy grade line, which develops a sufficient distance to attain the desired elevation.

The term contour relocation is self-explanatory, but a short discussion of methods used in the work may not be amiss.

Contour relocations are those wherein grade and alignment are developed by using the actual contour intervals as they exist on the ground. In a great number of cases, the relocation is

virtually in sight, but oft-times a careful study of the ground is required to find the general direction of such a relocation. The height and approximate length of the hill to be relocated must first be determined. The grade desired is generally controlled by traffic and physical features, such as slope, drainage, materials encountered, etc. A decision having been reached as to the desired grade, the next step is to run out the grade contour. The contour must be actually established in the field by a level party, which generally consists of three or five men. The levelman through his rodman, sets each point on the desired contour at the station points. For instance, if a six per cent grade contour is being laid out, each point on the line will be exactly six feet above or below the last point, depending upon the direction of running, and 100 feet distant therefrom.

Experience shows that the fastest and cheapest lines are obtained where the line is started at the top of the hill and run down. The reason is that less trouble is encountered, and more time saved by reason of the fact that the rodman is better able to judge the required interval.

It oft-times happens that there are two or more possible locations in sight, and engineers should make a reconnaissance of each of the possible routes, and after comparing them, have the survey run on the route that seems to be the most feasible. If, however, more than one route opens a possibility, the survey should be made and plans worked up to such a point that comparative estimates can be drawn.

After completing the grade contour, a location or transit line should be run for the purpose of obtaining the exact location of each point on the line. This transit line need not follow the actual contour, but may consist of reasonably long tangents with offsets to each station point on the contour. If the contour follows along the side of a rather sharp, steep slope, the transit line should follow the actual contour with angle points at each station. Following the transit party is a level party cross-sectioning the line. The cross-sections in some instances are taken with a Locke level, but in general, if the difference in elevation is not too great, sections are taken with an engineer's level. A sufficient number of cross-sections should be taken to enable the engineer properly to make his preliminary studies and esti-

mates. The soil classification should be noted at the time of taking the cross-sections.

Upon completion of the field work, the necessary plans are prepared. These plans should show in detail: (1) the plan and profile of the old road that is being relocated; (2) the proposed relocation; (3) a contour sheet upon which can be developed the necessary studies; (4) the projected location; (5) the final location as selected in the office. The projected location is made by taking into consideration grades, drainage and general alignment.

Sharp curves (which cannot always be avoided) should have a compensated grade, as in railroad design. For instance, one relocation in Richland County has 4000 feet of 7 per cent grade, but in the center of this grade it was necessary to make a "hairpin" curve of a 105 foot radius through a central angle of 185 degrees. The grade was reduced to 4 per cent for a distance of 350 feet on the curve.

The matter of the movement of excavated material is all important. The length of haul must be kept to a minimum. Oftimes a slight shift in the new centerline will save considerable yardage. Such a shift may possibly lengthen the line and increase the amount of right of way required. Even so, it is generally cheaper to buy land than to move material, especially rock. At this point it may be well to call attention to the fact that too few engineers study the project thoroughly enough to make certain that they have the most economical location. The young highway engineer, being inexperienced, is often inclined to feel somewhat touchy on this point, especially when asked the question: "How do you know that the line selected is the best line obtainable?" Men generally are alike in one respect, namely, in the feeling each has that the thing he does is the best that could be done; but this is not sufficient for work of an engineering nature. A thing must be proved, and to prove it, all facts must be at hand for purposes of comparison. Too often the statement is made, or is implied, that an engineer who does not secure the best line on the first trial is not worthy of his title. The converse, however, is true. The best engineer is the one who devotes to his problem all the study that time will permit and delays in making his final selection until he is thoroughly

convinced that the most economical line has been secured. To illustrate this point: On a 4700′ relocation that was recently completed south-west of Richland Center, Wisconsin, five different lines were projected. Three of these lines were almost identical in alignment; but a slight difference in the material distribution, or shift in grade made each new line appear to better advantage than the previous one. The line finally selected involved a study approximating forty hours in the office. Another relocation in Sauk County involved a study of about 70 hours for 1½ miles of highway. Many other examples could be cited, but space does not permit.

The handling and balancing of material is a problem that consists of more than merely establishing a grade line and borrowing or wasting the excess material. An effort must be made to secure the most economical line, using the yardage available from actual cuts. It will be admitted that there are cases where borrow or waste of material is a necessity, but on highway work, this can usually be avoided. A waste dump is unsightly, and a borrow pit is many times a sump hole for drainage. Plans for relocations often show that practically no study of this phase of the subject has been made.

Returning to the road design in question, the last step is to stake out the final projected line in the field. This is done by a transit party, and all the station points, fences, streams, ravines, rock out-crops, soil conditions, buildings and other features of vital interest to the project are again noted in the field book, this time with reference to the final line. The final line is then recross-sectioned for a width sufficient to cover all yardage work. Final estimates together with the necessary plans and profiles for construction can then be prepared.

Right of way should always be definitely arranged for before allowing any construction work to begin: Easements should be secured and filed, thereby eliminating possible troubles when the construction work is in progress.

An engineer who has to buy right of way, must have a world of diplomacy and tact, must know his business, and must always be ready to look at the matter from all standpoints. The majority of property owners are reasonable and easy to deal with if properly approached in the beginning. They will of course,

demand to know why the selected location was chosen, as against some other location, and it is only right that the entire matter should be explained to them in detail. They are the ones primarily affected. Oft-times it is necessary to cut a farm into small irregular shaped parcels of land that can be cultivated only at a loss. In these cases it is cheaper to "pay the owner's price" than law the matter out in the courts. Pay double the value of the land, if by so doing the good will of the party can be retained. It is not best to condemn private property except as a matter of last resort, as it is not only expensive, but always creates and leaves hard feelings with some one.

To reduce future maintenance, the proper location of a road is of prime importance. Plan the road to go around the hills rather than over them. It is next to impossible to carry water down a long steep hill for its entire length, without soon causing damage to the road, while if it is planned to go around or along the side of the hill, the water can easily be transferred from the upper road ditch to the lower one and immediately diverted from the road to its natural channel by the use of the proper culverts.

Contour grades usually involve a side-hill section, being partly in cut and partly on fill. Care must be taken, therefore, to estimate the shrinkage or swell of the material handled. The question of correctly estimating this shrinkage or swell of the material is one that invites more or less discussion. There is only one safe rule to follow, and that is to make the estimates according to experience with the class of material to be handled.

Cut and fill will vary with the local material and conditions, but generally speaking, cuts will have a slope of 1 to 1, and fills, a slope of $1\frac{1}{2}$ to 1. One instance is recalled by the writer, where the banks in a long, deep side-hill cut began to slough off, and there was no apparent cause to be found. The banks were trimmed back twice without success and finally it was decided to cut them back to a $1\frac{3}{4}$ to 1 slope, which solved the problem. The material was loose rock and clay, containing some sand, but no water.

The engineer is required to estimate the cost of an improvement, and to do this, he must be conversant with methods used in the construction work. Highway work is handled similarly to that of railroads, with the exception that the units are smaller,

and the contractor in general cannot afford to introduce high class equipment such as steam shovels, industrial trams, etc. Slip scrapers, wheelers, fresnos, and wagons are used on most road work, the final shaping up of the finished grade being done with a road grader machine. The general practice is to use slip scrapers for moving material up to a distance of 100 feet, wheelers up to about 300 feet, and wagons for greater distances. A good foreman can handle from 12 to 15 teams, and about 20 men, but should not be made responsible for a greater number. Teamsters and laborers require more or less watching, as there is generally a tendency on the part of some to dissipate time, which will soon demoralize an entire crew. A good foreman is worth all that can be paid to him, and most contractors appreciate this fact. He should be a man who is not only conversant with his work, but has some idea of cost records, and if possible he should be a practical if not a technical engineer, especially for the larger and more important pieces of construction.

Engines and motor trucks are in use on some of the larger highway contracts and they are economical if kept in steady, active service. The most efficient and economical service can be obtained from a motor truck by running it from 12 to 16 hours a day, and arranging the loading and unloading facilities so that a minimum of time is lost in delays. Trucks should be overhauled every few days, as the wear and tear on the individual parts is enormous. A motor truck is an expensive luxury unless properly taken care of, in which case it becomes a good investment. Trucks should be used for hauling materials and supplies, and not for furnishing power to run crushers, and other machinery, as has been the case in some instances.

The distribution of the yardage of material can be studied and worked out by any one of several methods. Some prefer to use "rule of thumb" methods which embody estimating the yardage in excavation, and then deciding just how much of it shall be used for this fill and that fill, there being little or no regard paid to length of haul. The mass diagram is the only method of properly deciding upon the yardage distribution, in the opinion of the writer. This diagram is not made by guesswork, but shows graphically the actual problem in its entirety. Definite and economical distribution of the material can be made, and it

stands to reason that better results will be obtained. Contractors will soon learn what a mass diagram is and will appreciate its convenience for their bidding purposes, after using it a few times.

One other point that is worthy of consideration is the guard rail which serves as a protection to traffic. Wisconsin specifies that a wooden guard rail, consisting of a 4″x4″ top rail, a 2″x6″ side rail, and 6″ cedar or white oak posts set on 7′–8″ centers of a total height of 3′ above the center of the road, be constructed at all dangerous points, and on fills, exceeding 4′ in height from the original surface of the ground. After erection, all guard fence is given two coats of white lead and oil, and all joints are thoroughly protected by a covering of sheeting.

Space does not permit of a discussion of types of relocations, but an effort has been made to bring certain salient features to the reader's notice, with a view to decreasing the so-called "horror" of relocations that exists in the ordinary mind.

ECONOMY OF GOOD ROADS

The transportation of freight by motor truck has come to stay. It is claimed that for comparatively short hauls, where the roads are good, the economy of the motor truck far exceeds that of railway transportation.

A recent series of tests made at Cleveland by A. N. Johnson, a highway engineer of Chicago, has established the fact that rough roads require more than twice as much fuel as roads having an even, rigid surface. When these results were applied to Illinois highways, based upon the number of licensed motor vehicles, it was found that the entire $60,000,000 bond issue to build 4,800 miles of paved highway, could be redeemed within ten years in the saving of gasoline alone.

THE FLYING CADET

LIEUT. ROBERT M. CONNELLY, c '17
R. M. A., Air Service, U. S. A.

Critics tell us that the most vivid and spectacular war stories are told by men who have been farthest from the front line and the disagreeable roar of cannon. Likewise, in Uncle Sam's air service, those gentlemen who come under the general heading of "kiwis" (pronounced kee-wees),—hangar care-takers and such like—are most successful at holding an audience spellbound with

their tales of acrobatic flying, tailspins, glides, and Immelmann turns. These imaginative fighters and flyers are looked upon with considerable disfavor by most army men and I do not care to run the risk of being classed with them; but it may interest the old "bunch" to hear about some of the tribulations of the sky-pilot previous to that great day when he receives his commission as a reserve military aviator and once again, after a period of deep humiliation, lifts up his head and looks the world in the eye.

The embryo pilot begins his career as a "flying cadet." This is about four degrees lower than a buck private. He matriculates at a ground school where everything is arranged especially for his entertainment. The curriculum of the school is a neat little thing. Every day, for sixteen hours, there are classes in radio, motors, meteorology, calisthenics, machine gunnery, military law, drill, and a few other things. Eight hours a day are

devoted to sleep. The rest of the time the cadets are free to write letters, attend dances and theatre parties, and engage in other social activities.

After the ground school the cadet goes to the famous Camp Dick at Dallas, Texas, a wonderful home of discipline run by a certain Col. Stever. The course consists mostly of twenty-five mile hikes around a racetrack, or extensive study in home economics,—better known in army life as K. P. These punishments are dealt out mostly to please the colonel, but partly for such serious misdemeanors as blinking an eye at retreat, or walking past headquarters without genuflecting. It was at Camp Dick that a man was accidentally stabbed twelve times with forks when he absentmindedly reached for the bread with his hand.

After Camp Dick, comes the real sport. The cadet is sent to a flying field to take his elementary training. Now there is one thing I will never forget, and that is my first day at the flying field. It was at Arcadia, Florida. We arrived at the post on Wednesday evening, and at five-thirty the next morning we were marched out on the field for our first flight. There were over a hundred ships, and sixty of these were in the air. When we were half way out to the center of the field, one ship came down and made a bad bounce, or porpoise landing. We heard the motor roar, and the ship went over on its back in the first half of a very unsuccessful loop. There was a terrible crashing sound, and while the "meat wagon," (ambulance), was rushing over to pick up the pieces, we were assigned to a ship and an instructor. I must confess that our enthusiasm for our first flight had waned considerably, and if they had called the war off right then and there, it would have been all right with us. After about three months of this work at the flying field, the lucky survivors were commissioned flying lieutenants. Then came several more advanced courses and the men were ready for overseas duty and the elusive Hun.

Personally, I was sent to the Brooks Field instructors' school, and after several assignments finally landed at Call Field, Texas, where I instructed wild-eyed, would be flyers for nearly six months.

During that time I had some interesting and some sad experiences. On one occasion a fellow said to me: "You fellows

are pretty lucky to be kept on this side as instructors." The next day a worn out ball-and-socket joint came apart in a plane, and Lieutenant Holborn and Cadet Lincoln were instantly killed. Yes, we were lucky to be kept here as flying instructors.

But do not think that all is sad and serious in the flying game. In fact, conditions are very much to the contrary. I almost think that the incomparable views of clouds and scenery fully compensate a flyer for all his work, worry, and risk. Consider, for instance, starting out early in the morning before daylight, when all is inky darkness, gradually climbing up, up through the clouds, and finally coming out above, only to be dazzled by the glare of the bright, beautiful, morning sun, and to look about, as far as the eye can see in any direction, at the wonderful mountains and valleys of pure white fleecy clouds, which tempt you to settle your ship down to rest in this ocean of immaculate softness. And occasionally, as your motor roars along, you pass over an opening in the clouds, and down below you see the dark farm houses on dismal old earth, still smothered up in the black night. And then the sun and the winds get busy, and in less than half an hour the clouds have disappeared. Daylight has come to the earth, and the aviator is brought back out of his dreams to realize that he is still a human being and must return to the earth to "gas up."

Another experience of interest is to make a long cross-country trip and, as your ship carries you over towns and villages, at an altitude of about thirty-five hundred feet, to look lazily over the side and watch the people crowd out into the streets, and see the little white specks which you know to be their upturned faces. You nonchalantly do a few loops or tail-spins to give the people a thrill, and then continue your journey. In the meanwhile you wonder if you will have apple or mince pie for dinner, and the people down in the streets get all the thrill and do all the worrying about your safety.

The more we see and read about aviation, the more we realize that it is a sport which has never been equalled. Besides. we can dream of great commercial possibilities, and can conceive even of transatlantic flights. Nevertheless, although it breaks my heart to give up flying, I cannot help but think that my brother was right when he said: "My motto is, 'Keep one foot on the ground and the other will take care of itself.'"

ENGINEERING RESEARCH IN WAR TIME.*

By Major Oliver B. Zimmerman, m '96, M. E. '00

After the excellent talk we have had, I feel at a loss to start in upon a subject that will take your minds away from the wonderful work of the American troops in France, which has meant so much to the world's well being and the future of civilization and humanity. During the years 1912 to 1915, it was my pleasure and a part of my duty to be in Europe, and I am very glad, indeed, to confirm the judgment of Mr. Carlin in regard to the question of suspicion of nations.

It is practically impossible for Americans who have lived for years thinking really of commercial problems, devoting all of their energies and their entire thoughts and hopes to honest commercial industry and not to war problems—it is very hard, I say, for them to realize that peculiar suspicion which has been created by the military classes of Europe, each nation against the other. For a year after I was over there I heard this problem discussed in Roumania, Russia, Italy, Denmark, Sweden, Switzerland, Holland, Germany, France, and England. It became a peculiar mania with me to see if there was any truth in it. I could not believe it. I would argue with these people in the different nations; but it was there—a suspicion as great perhaps as that between France and Germany,—no one trusted the other.

During these three years, also in the line of my regular duties, it became necessary to converse with the military officers in regard to experimental tests in practically all of these countries. Government trials of machinery adapted primarily to agricultural interests was the function which I was performing; and in all exhibitions of machinery the question was always in regard to its availability for military purposes. Tractors?—How could they be used to perform this or that function from a military point of view? That was the first thought, how to use them to defeat the enemy.

*Talk given by Oliver B. Zimmerman, Major of Engineers, at the New Willard Hotel, Washington, D. C., January 13, 1919, before a Meeting of the Washington Chapter of the American Association of Engineers.

So with that one little thought, I might pass from the very illuminating remarks of your representative to the research work, which followed as a result of our entering the war.

Research work must be viewed from a number of very important standpoints. When we think of the term research work, nearly all of us have in mind purely the problems of a scientist in peace times endeavoring to establish the laws of nature, with indefinite time and the very best facilities of universities at his disposal, with enormous libraries, and plenty of people with whom to converse, finally arriving at some definite law science.

Commercial research is a different problem, research such as our industries set up in laboratories to perform the function of making the greatest amount of money, research which will enable one firm in one particular line to outdistance its competitor and bring in the shekles. If the research shows that it would upset the industry to a certain extent, the word is passed out to squelch it. If it will revert to the benefit of the organization, push it along. Such is commercial research.

Army research has another function. In army research we have to deal with the element of time. Time is the essential element over everything else. To the winds with the money if we can accomplish a result that will be of benefit to the army in a period of time which will save lives, and lives are worth more than money.

It is with this latter viewpoint that I want to deal—the question of research in the Army, research and development to maintain our armies, to give them an advantage over the foe in every way possible; and in that line of work my travels from 1912 to 1915 were of immeasurable advantage to me in aiding the officers with whom I have had to deal, and whom I have had to correct since I have been in Washington.

Chaos, or practical chaos of the question of research was what I met when I came into the Army in May, 1917. There was so little time for thought of research problems which had to be met with. We, as a peace loving nation, with a very small army, an army inadequtely equipped to study out the development of military requirements, had to throw all our energies into the selection of commercial equipment to meet military needs, and it is very hard to convey to you, even in a small way the tremend-

ous problem which this brought about. It was almost inconceivable to know how to manage it. There was one problem it was very evident we had to take up, and that was to supply the Army as fast as possible with commercial equipment, and make the best possible choice of equipment available; then proceed as fast as was possible to readapt that equipment into suitable military equipment.

Now that could not be done immediately. We had to take time, and at the same time start out with a new idea of making absolutely adaptable equipment to meet military needs. This was first the function of the Mechanical and Civil Division of the General Engineer Depot, later organized as a definite Research and Development Division, which carried out the project of developing absolutely military apparatus for the military campaign of 1919 and 1920 if necessary.

There are two attitudes of mind which prevail in the handling of research problems. Not every body can take a calm, cool, unprejudiced attitude toward a research problem. The most common process of research is for a man to conceive an idea and then go ahead and try to prove it. That is not true research. Research should be approached with an attitude of mind which is absolutely open, which has no preconceived ideas, but with the basic element in mind of establishing the truth, irrespective of whom it hits, what it hits, what the results are to industry, or anything else.

Now the armies could not operate without the greatest care being taken in the correct selection of equipment, for if we were to make a choice, and should make a mistake in that choice, as I have often said to my officers, we would have on our hands the responsibility of the blood of our brothers. We must not make a mistake. We have no chance to redeem ourselves if we do make a mistake. Hence, the problem of selection of equipment, the improvement of that equipment, and its betterment should be done without any desire for personal gain or for personal credit, but for the credit of the Army and for the safety of our brothers who were sent to the other side. Supplies, material, equipment, machinery—these several groups of problems had to be arrived at, had to be attacked. No corps of the Army had as much responsibility, in my estimation, as had the Engineers.

And I am very glad, indeed, to feel that our country went to it so willingly, so unselfishly—men gave up good salaries, good positions, sacrificed everything, to do their bit. We have engineers who have left an income of $60,000 a year to come in and work as captains, with an indefinite possibility of promotion. The number of men, especially engineers, who gave up salaries of from $10,000 to $30,000 a year would make your heads swim. And I have not known one who regrets that he wears the Castle on his collar.

Just a few words on the problems with which we have had to deal. When you think of an army operating in the field, you readily realize that unless available equipment possesses the quality of mobility, it is not army equipment. When you think of the vast numbers of hoists, derricks, road making equipment, and machinery which would be easily operated on this side in peace times, and think of that equipment with an army in advance, you can see it would be useless unless it had greater speed to carry it along than it had in normal peace times. An example or two to go with this: In order to make roads in France, in order to build our railroads through France, in order to trim up the shell torn fields, it was necessary to buy steam shovels and equipment of that kind. What Pershing cabled for was something that could be gotten around in a hurry. The result was an automobile that would carry $2\frac{1}{2}$ to 5 tons which could be set up at one point and in eleven minutes could be a mile from there and in operation again. Mobility is the essential element.

Another essential is simplicity. Almost all equipment operated on engineering functions is operated under conditions which are not under stress of time. We have plenty of time in peace. What is the condition of the mobile army equipment in a battle, with everybody excited, shells bursting, men falling? We must have simplicity, so that machinery can be operated in spite of those conditions.

Portability is still another requirement. Nearly all the equipment already available was designed with very little idea of portability. A great deal of the equipment must of necessity be small. As a result we had to cull over a vast quantity of small equipment, gas engines, steam engines, boilers, etc., which were already made up. In the matter of cast iron and cast

gears for example—you cannot pick up a cast iron hoist and run with it a couple of miles. Why not have it built of steel so that two men can manage it, instead of waiting for a truck or for animals to move it from place to place.

Now, we could not go from commercial equipment immediately into all the refinement required for military equipment, because it would upset the industries in trying to quickly produce the necessary quantity to bring this war to a termination in a hurry. It was necessary all the way through not to gum the manufacturing conditions; and I can assure you that I have had letter upon letter from manufacturers thanking us for the way in which this was managed so as to find the least possible delay for the greatest possible amount of suitable equipment for the boys on the other side.

Practically all equipment which is manufactured for peace conditions is not designed with a view of meeting outdoor conditions. In the gasoline engine you have a good example, which is made for indoor service—open crank ends, open bearings, open facilities all the way around for dust and dirt. In Europe it must operate in the rain or the sunshine and in dirt, and unless properly enclosed it would soon be useless. Hence, we have to cause a great deal of our equipment to be remodeled to meet that one condition, and to see to it that wherever a bearing was lubricated, it should be done in such a way that the dust was carried away from rather than to the bearing.

One of the hardest problems to meet in connection with gasoline engines was the question of lubrication and ignition. Those of us who were familiar with the Flanders field knew that the battery ignited machines were of no use in that territory, simply because they would not hold up under the conditions of moisture in France. Hence we had to go to the extreme of putting magnetos on the machines of smaller types, where they were not formerly so devised.

The efficiency of the equipment had to be looked into. The equipment in general was small, and was not designed with any idea of getting high efficiency, with the resultant wastefulness of gasoline, kerosene, coal or wood, and it was necessary to provide for much larger quantities than it was easy for us to furnish.

Then the whole question of standardization was important.

We could not embody into large quantities one hundred types of one machine. We had to get down to standardization for the sake of repairs, and for the sake of keeping these machines in good condition on the other side.

Two other problems had to be severely dealt with, the question of volume, and the question of weight. Our operations in France did not stop when the sun went down. It was necessary to go on twenty-four hours a day, particularly in the railroad lines. To furnish lighting for this we had to send over a great deal of acetylene lighting equipment. Orders came over by tens of thousands to fill that one particular want. Now that class of equipment—five thousand candle power lights for example, occupied considerable space. Our engineers went to work on this problem with an endeavor to redesign that apparatus to reduce its volume. We started out to reduce its weight, decrease its volume, increases its efficiency and if possible reduce the price. If I can state the results correctly on this, the weight was reduced 50%, the volume was reduced 40%, the cost cut down 20%, and the efficiency was increased 30%.

I might get very enthusiastic over some of these problems, but I want to mention a few of the officers who did some excellent work along these lines, most of them with my hearty cooperation and many of them with the full cooperation of the other departments. The Department of Research and Development was not alone in its efforts in matters of improvement. All other departments—Aviation, Quartermasters, Ordnance, and the Navy, as well as the Engineers accomplished some very fine results. These results will speak for themselves. I wish only to mention the names of a few officers of the General Engineer Depot, and later transferred to the Purchase, Storage and Traffic Division.

In the searchlights, it would not be right not to mention the name of Captain Lichtenberg, who carried on as systematic a series of experiments as was ever done by any man I ever knew. He started out, with other officers, with a 60-inch searchlight, way over 6000 pounds in weight and wound up with a searchlight 60-inches in diameter and weighing 550 pounds, less than one-tenth the original weight.

An enormous amount of work was done on standardization—

more recently, of course. Major C. V. Bacon, who handled this, should not be forgotten.

Some of the work Captain E. C. Weisgerber, has done in the way of replacment of chemicals would be very illuminating. I will mention only the photographic chemical "Methl," a product which was made in Germany and sold in this country for $7.00 to $9.00 a pound. After the war the price went up to $149.99 per pound, if I remember correctly, and it was practically impossible to get it at that. He was given the problem of reproducing this, and within seventeen hours he reproduced it at a cost of $3.50 per pound. He also brought out some dental porcelain for the Dental Corps which was, according to the officers of the Medical Department, better than that produced in Germany.

In regard to the development of machinery, Captain Bellony should be mentioned in his very excellent result in making up a pile driver which will take the place of a large amount of very clumsy equipment now in use.

Major Fortney and Captain Doyle were the two men who brought to a conclusion the acetylene light problem.

Major Fortney and Captain Jones worked on the portable derricks, hoists, etc.

Captain Keesler revised and enormously improved the horse drawn equipment of the Army—a very capable man, who gave up the presidency of a concern to come down here and work as a captain.

On chemical testing and improvement of the smaller implements, Captain Belcher should not be forgotten, working as he did under most adverse conditions, which could perhaps have been made better had time been permitted. I want to especially thank him for his efforts in that direction.

Mr. Carl Akeley, one of the greatest hunters, and without doubt one of the greatest animal taxidermists in the world, should be honored, more perhaps than he will ever be. He rolled up his sleeves and worked with us on innumerable problems. If you do not see the Akeley moving picture camera within a few years, it will be because it has been squelched. It is so far ahead of any other moving picture camera that there is a desert between them, and I hope he will get the credit he deserves for it—a man who, although his training does not seem like engineer training,

produced some of the most intricate devices in searchlight control, and a man who discovered several new methods of producing reinforced concrete ships in a hurry.

They were men like these who rolled up their sleves, took off their coats in hot weather and produced results that brought credit to the Engineers. I sincerely hope everyone of them will get his just reward in the way of promotion in the future if it is at all possible. Many of them have been promoted, but I do not think one of these I have mentioned has been given all the credit which belongs to him.

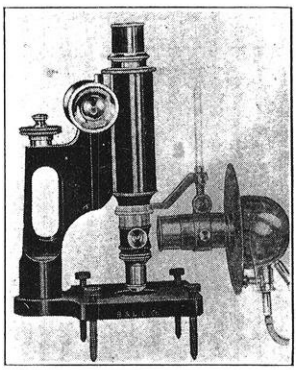
I think perhaps this will give you a brief resume of the work which has been done in the way of research and development in the Army. I trust very much that this work, the organization, its methods and policies will not be dropped like a blanket thrown to the ground, because there is still a great deal to do to maintain our Army with the proper equipment to support the League of Nations. America should not take a back seat and leave such countries as Germany with unlimited facilities to encourage the production of everything with the military point of view in mind. If our Americans were to devote one-tenth of the time that is devoted in any one of the European nations to research and development work, we would still outdistance them in such problems, for the results attained in our short efforts at war were so stupendous as to call forth the sincere astonishment of our allies.

THE PERFECT DAY

When you've started the day with a bunch of pep
  And a zest for the old ham and —;
When you've swung to work with a springy step
  As the tasks of the day you've planned;
When you've pitched right in and raised merry hob
  With the work that you found to do,
With a brain so clear that the meanest job
  Was easy as pie for you—
Then the feeling you have as you hit the hay
  Is a feeling of great content.
And *that* is the end of a perfect day,
  Of a day that has been well spent. —*Baers' Facts.*

USEFULNESS OF THE METALLURGICAL MICROSCOPE TO THE ENGINEER

E. D. Fahlberg, ch '18
Inst. in Chemical Engineering



METALLURGICAL MICROSCOPE

The rapid strides in the use of the metallurgical microscope in engineering practice may well be imagined if we consider that as recently as 1890, the famous physicist Sorby was believed to be crazy when he suggested its use for the examination of a metal failure to fix the cause of a railroad accident.

Like the application of any other new instrument to a particular use, it has passed three stages:

First,—a stage of scorn

Second—a stage of amused tolerance

Third,—a stage of general acceptance

and now, to quote Mr. K. F. Smith,* "We are rushing to the semi-final stage of fanatical application by people who are not qualified to interpret the results obtained by its use."

It cannot be too thoroughly emphasized that microscopic testing methods do not transcend all other testing methods. The microscope is rather to be regarded as an important auxiliary. The results obtained from it, if properly interpreted, will furnish a more accurate indication of the mechanical and physical properties of metals than any other method not involving destruction of the entire test piece. Chemical analysis, however valuable, is not nearly as sound a criterion. An example of this is given in figures 1 and 2. The carbon content in both specimens is identical. The other constituents influencing the mechanical properties of steel are practically the same in both; but the tensile strength and ductility measured by percent reduction over 2 inches of the steel in figure 1 exceeds that in figure 2 by 19

*Jour. of the American Society of Naval Engineers, Vol. 29, p. 83.

per cent and 80 per cent respectively. No chemical means has yet been devised which can distinguish between steels of identical composition but different physical properties.

The comparatively recent method of "magnetic analysis" is only accurate in so far as direct comparisons can be made, that is, a comparison of the article under observation with a standard specimen of identical composition. There are also as many

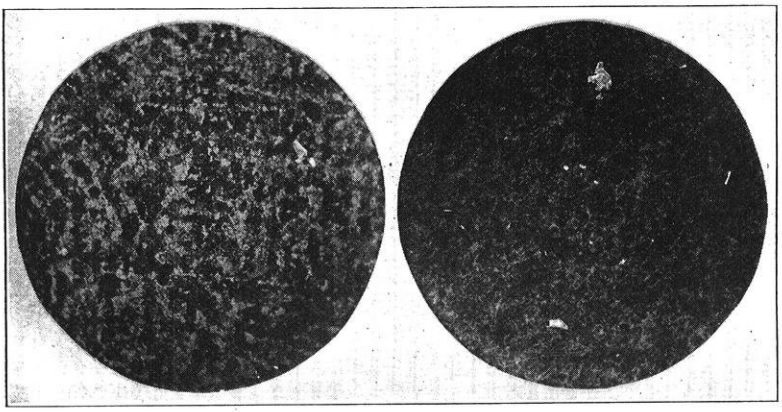


FIGURE 1—*x 50*

0.45 Carbon Steel. Tensile strength 94,600 lb. per sq. in. Elongation over 2-in., 22.5%.

FIGURE 2—*x 50*

0.45 Carbon Steel. Tensile strength 79,000 lb. per sq. in. Elongation over 2-in., 12%.

cases where such tests would fail, as completely as chemical analysis, to indicate where the trouble lay.

For instance, a manufacturer of reamers found that his product was running "soft." This fact was immediately brought to the attention of the hardener. The hardener was a socalled "practical man" who attempted to mend matters by more rapid quenching which resulted in a great many cracked reamers. His efforts proving of no avail he placed the blame on the steel saying that its composition was not as it should be. Check analysis of the steel used proved this theory untenable and the hardener lost his job. Subsequently microscopic examination revealed that while the inner portion of the steel was of specified carbon content the outer skin had become decarburized, and as decarburized steel develops little or no hardness on quenching the

source of the former hardener's difficulties was discovered. Magnetic testing would have been almost as futile as chemical analysis because the source of the difficulty could not have been located.

Another example may be cited to further illustrate the general usefulness of the microscope. Last fall a request came to visit a near by ordnance plant. A government inspector had located a seam on the machined surface of a gun tube. The

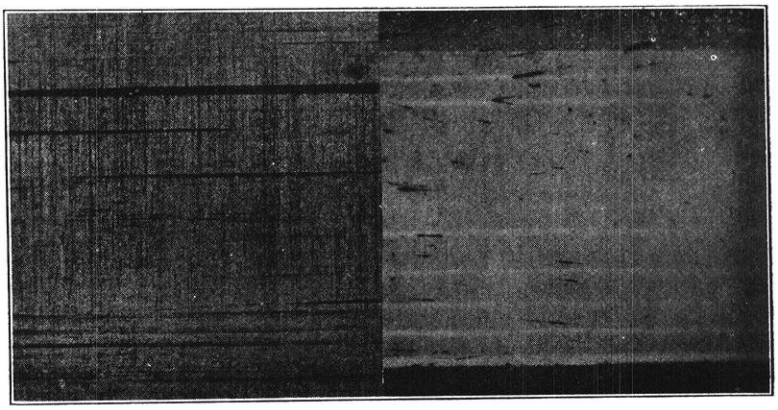


FIGURE 3

Slag streaks in Steel (Fay).

FIGURE 4

Phosphorus streaks in Steel (Fay).

problem for solution was to ascertain if the seam was a harmless slag inclusion or a treacherous phosphide segregation.

The rifled gun tube represented a value equivalent to $3,000, moreover it was urgently needed to fill an order then waiting. But, on the other hand, should the flaw be serious and should the gun afterwards burst in action it would surely cause a damage far greater in dollars, not to mention the probable attendant loss in human lives.

On investigation with the microscope, the seam was proved to be a comparatively harmless slag inclusion, by reason of its etching dark (See figure 3) whereas if it had etched light (See figure 4) the evidence would have been just as conclusive that a phosphorus segregation existed. The gun tube thus passed final inspection and is today in service in our Navy.

THE WORKING TOOLS OF OUR PROFESSION.*

By W. G. Swart

Man is said to have achieved and maintained supremacy through his ability to use tools, bending even the blind forces of Nature to his own uses. If "tools" be held to include mental as well as physcal aids then this is strikingly true and no man has greater power today than the trained engineer.

It would be superfluous to attempt to illustrate this before a body of engineers, or to catalogue the obvious equipment without which we could not be here. Step into any well equipped machine shop. The lathes, planers, drills and shapers are as standard as are our mathematics, chemistry, physics and geology. But special problems have often come to the machinist which required either a special knowledge of his standard equipment or the construction and use of special tools. It is of this special knowledge, or these special tools of our Engineering profession that I am speaking more particularly this evening, and strictly and wholly in a technical sense. But the word "technical" comes from the Greek, and in one of its strongest uses means "having to do with the useful arts." We are apt to use the word commonly in a narrower sense, perhaps a heritage from our legal brethren who speak of technical with the meaning of petty or limited but the broader use gives us an opportunity to include not only our working tools but also our purpose, design, control and result. In this sense a technical man is one with the right to grasp and apply to his own uses anything anywhere in the wide expanse of knowledge, and this is the sort of technical men we should at least aim to be. We have had placed in our keeping not the keys to a city, but the freedom of the universe. Anything we can reach and wield becomes our tool or weapon.

THE MOTHER TONGUE

By far the most important implement in any American engineer's equipment is the English language. No man is ready for good work who cannot use his Mother Tongue both in writing and speaking with ease, fluency and certainty. The ragged,

*From *The Bent of Tau Beta Pi.*

shabby, rambling, slovenly English of the daily press, of the sensational magazine, of the news stand novel, will not answer for the successful engineer. His English must be as precise as his measurements. Few men have any natural gift for such writing. To most of us it means write and re-write, cut, condense, consult and substitute. But this pays. Could you but see the reports coming daily into the offices of every large mining concern, written often by competent men who are yet unable to say in plain English what they mean, you would not wonder that I place this at the head of the list. If it be true that to write clearly a man must think clearly, then there are many muddy intellects among engineers.

And so, too, it is essential to speak well. Not as an orator; not with the prophetic tongue of the pulpit nor the skilled intricacy of the bar; but with the directness and simplicity and honesty which science herself should have taught us. A time comes in the life of almost every engineer when he must stand before non-technical men and explain the faith that is in him. No stammering, hesitating seeker for words goes to New York and puts his deal through. It is the keen and alert user of vigorous, clean, concise and precise English who does that. Facts are facts; statistics are statistics; maps are maps; tonnage is tonnage; and so on; but unless these things be properly clothed and properly presented they utterly fail of their purpose.

DIPLOMACY AND LOYALTY

Next to the use of the Mother Tongue I think I should set down tact and diplomacy. I do not put them first because, while I never knew a man lacking command of language to become a high class engineer, I do know men who have thrown tact and diplomacy to the winds and yet through possession of a strong personality have forced success out of seeming impossibility. To most of us, however, tact and diplomacy are tools of greater promise than are mere energy and insistence. They are the qualities too that can be cultivated and enlarged, and that yield most unexpected and delightful returns. You have heard no doubt that "soft words butter no parsnips" but elsewhere it is said that "a soft answer turneth away wrath." A good deal depends on whether your preference is for parsnips or wrath.

Diplomacy does not ordinarily drop, like mercy, as a gentle rain, upon you unsought, but is only acquired by patience and understanding, by care and intelligence, by forbearance and humility, all of long standing. Yet it is worth while, for no man, once having had these wonderful tools in hand, but avoids afterward the necessity of wielding the bludgeon or the pitch-fork.

Perhaps the next working tool for the successful man is called loyalty. Loyalty according to the Century Dictionary, means fidelity in duty, service or love. Loyalty to our employers, to our country, to our friends, to our families, to our work, to the progress of the race, and finally to our ideals, are all embraced in the construction of this implement, and it is an implement that never yet failed any man, but casting it aside has ruined more than one promising career.

Another beautiful piece of machinery is called industry. It is the habit of work. The distinguishing mark of the trained engineer is not only the ability but the desire to work, and the building of desire into habit. Dr. William Hanna Thompson in his treatise on Brain and Personality brings out strongly the basic fact that the brain tires only when forced to activity by the will. We all know how easy it is to shirk and procrastinate, but perhaps we do not all realize that this is a matter of will alone, and that when we drift instead of act we are deliberately dulling the edge of one of our most serviceable tools. There is what we may term an attachment to this particular tool. Let us call it the habit of acquisition. Its meaning and use is this: No piece of information, on any subject whatever, is valueless to the real engineer. The idle watching of steam from the kitchen kettle led Watt to the steam engine. The fall of an apple led Newton to the laws of matter. None of us knows when nor from whence he may receive the mental impression and stimulus that shall give a new idea to the world. What one can do is to cultivate this habit of mental acquisition not only because of its material possibilities, but because of its influence on the mind itself. The storing of material in an orderly fashion in the brain as a matter of habit does not tax the brain, as one might suppose, but is a stimulus and aid to the memory, which becomes ever stronger with use. More might, and perhaps should, be said about mem-

ory as one of an engineer's tools. Memory is more than a mere tool. It is more than the best of tools. Let us say that Memory is the handle that fits all the tools and without which they are but indifferent aids.

HABIT OF MIND

There is something that cannot be bought, that cannot be borrowed nor stolen, that cannot be found in books, that cannot be taught (except self-taught) and is yet very necessary, and is likewise a brain tool. Let us call it the habit of the open mind. It means the spirit of fairness, the attempt always to judge rightly and honestly both men and things, the avoiding of prejudice, of hasty decision, of self-interest; the weighing of evidence and the considerate treatment of men and the ideas originating in the minds of men whose training has differed from our own. No arbitrary, biased engineer ever rises far in his profession, because back of all things stands Truth and no such man brings himself to pull aside the heavy draperies of prejudice and error, so that he many look directly upon Truth.

CULTURE

Turn now for a few moments to another class of tools. No workman spends all his waking hours at his bench. We are all men of various sides and angles, interests and necessities. We are social animals. Can we add to our working equipment, along these lines too, and does it pay? There is but one answer possible. The technical man must live among his fellow men, work for and with them, play their games and speak their language. The better his equipment the greater his influence and the surer his position. What this comes to is that a great group of tools lies ready at hand which no one of us can afford to neglect. It takes practice and hard work to become skillful with any tool, and these are not exceptions, but the ability to use any of them well gives a sense of security and power that cannot be exaggerated and rounds out a man both mentally and spiritually. These tools are what we may call the culture group. They include history, literature, art, music, travel and the social graces. They may even be made to include recreation, hobbies and sports. It ought not to be necessary, but unfortunately it is, to remind ourselves that we engineers readily become narrow in thought

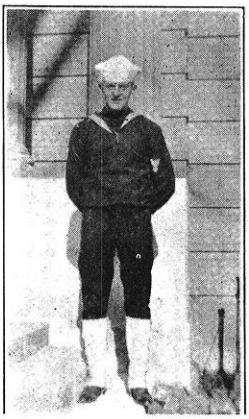
and action when the broader human interests are neglected. There is, however, a danger we must and do recognize, in carrying these things too far—in using *only* these garden tools where possibly we ought to be using a steam shovel.

There is still a further group of tools at hand which are as necessary as the garden tools just mentioned, and without the same danger of misuse. I refer now to such interests as politics, social improvement efforts and work for the good of the community or of our fellow man. Every engineer, like every doctor and lawyer, must expect to do more or less work without hope of reward. Usually our work is not like theirs—done for those too poor to pay—but rather done for those who are unlearned or for the common good. Perhaps it is not fair to call these obligations (for that is what they really are) tools, yet every man who has tried knows that the use of these things has helped carve for himself one more and higher foothold on the climb toward efficiency and power. I call them tools, therefore, and class them among the working tools of our profession.

How are we to classify such things as personal appearance, personal habits, adaptability to surroundings, cheerfulness, care of the health, honesty, carefulness, the forming of acquaintances (for acquaintance is a professional man's capital) the exchange of information, with all to gain and little to lose, morality, cleanliness, fraternalism, religion? Are all these things tools ready for our use? Are they worth using? Do they make us better engineers? Better men? I need not answer these questions for you. You can answer them every one from your own experience no matter how limited. Answering them in detail is like taking an inventory: sorting out, repairing, adjusting and renewing our equipment, and putting it in readiness for use. Taking such an inventory at intervals awakens our minds to the fact that these tools are always ready to our hands and it ought also to remind us that we gain strength and skill not simply from their possession, but from their active use.

EDITORIAL

AN APPRECIATION



FINLEY LELAND FISBECK has completed the requirements of the civil engineering course and has left for Yellow Creek, N. C., where he will be employed by the Knoxville Power Company on construction work. William J. Rheingans will assume the duties of manager of THE WISCONSIN ENGINEER for the remainder of the school year.

The Board of Directors takes this opportunity to record its appreciation of the disinterested services rendered by Mr. Fisbeck to this magazine. At the opening of the school year, last October, THE ENGINEER found itself without either editor or manager. Both of the men who had been selected for the places in the spring were in service. The country was at war and the outlook was uncertain; there was a question as to whether the magazine could continue publication. It was finally decided to keep going if possible, and Fisbeck agreed to undertake the work.

Many difficulties had to be overcome. The staff was small and most of the members were under military discipline. The flu descended upon us. At one time Fisbeck and most of his assistants were under quarantine and unable to see merchants in regard to advertising. But in spite of difficulties the magazine went right along and has had a prosperous year, thanks largely to the energy and business ability displayed by its manager.

The best wishes of every one connected with the magazine follow Fisbeck in his new work. His success at Wisconsin promises well for his success in his professional career.

L. F. V.

HIGH PRICES AND BUSINESS

An announcement has just been made of the formation of "The Industrial Board of the Department of Commerce" by the United States government. This board is to supercede the War Industries Board, and is the beginning of an attempt to bring prices and thus business back to normal again. With the sudden termination of the war, wages and the prices of most of the essential commodities have been left stranded at the high water mark of war time conditions. There is of course a feeling that in the future these will drop, and as a result business for the time being has taken a tremendous slump. War deferred construction has not been resumed, factories are shutting down or slowing up due to a decreased market, the business of the railroads has fallen off alarmingly, and municipalities and the states are postponing needed improvements until prices and wages shall come back to normal. As a result of this business stagnation the law of supply and demand becomes almost inoperative, and unemployment is increasing rapidly. It is this situation which the new board is to attempt to remedy.

The plan for the remedying of this condition is at present somewhat vague and uncertain, but it will perhaps be worked out better as time goes on. The first thing that has been done has been to call together representatives of the big industries producing raw materials, such as iron, steel, cement, copper, etc., and to have these representatives set stabilized prices which will be low enough to stimulate buying so that industry and labor can go to work again. It is hoped that then, when business activity has been resumed, the law of supply and demand will within a reasonable time bring conditions back to normal.

These things are important to engineers, and particularly to the men who are to graduate next June, because of the fact that the demand for their services bears a direct relation to the business activity at the time. G. B. W.

PUSH AND PULL

Ever and again we hear the criticism against the rising man, "He has a pull." It is, in our judgment, usually the criticism of the lazy man. To be sure, in some cases, pull may play a part, but usually it is a well earned pull, and due to the push and

energy of the one having it. It is a result of going after results, not waiting for them to happen. It comes to those who deserve it; to those who never let opportunity knock even once, but have the door already open for her. Such men make their "pull" by their own "push." W. A. K.

WHAT NEXT?

The value of an ore deposit depends not only on the quality and quantity of the ore, but upon its accessibility. This is well brought out by the story of a noted mining engineer who was employed by an investor to examine what was said to be a very rich gold mine. His report read: "The mine is exactly as represented. The ore body is fully as large as claimed, and the very rich samples shown you are fairly representative of the quality of the ore. However, it you expect to develop this mine you will need a pack train of bald eagles to bring out the ore."

The Aerial Age for March 17th carries a full page advertisement advocating the use of the aeroplane for mining transportation.

SUMMER WORK

The time is fast approaching when those men who are intending to come back to college next year must begin to plan upon what they are to do with their summer vacation. Those men having summer shop credit to obtain should not put this off until the summer between their junior and senior year, because a thousand and one things might interfere then, and as a result they would not be able to receive their "sheepskin" in June with the rest of their class. Jobs are not going to be nearly so easy to get this next summer as they were last, and those jobs that will be open will perhaps not have such desirable features, both from the point of view of experience and remuneration, so it behooves one to act early. It is needless to say that, if a man can afford it, it is better to get a job where a great amount of experience in line with his future work can be had. Such jobs often mean living far away from home, and a smaller check at the end of the week, but the things which have been gained thereby will be appreciated when one starts out after commencement to look for the bottom rung in the ladder of success.

G. B. W.

ALUMNI NOTES

By ETHAN W. SCHMIDT

F. S. Halladay

F. S. HALLADAY, c '13, Chief Engineer of the Green Bay & Western R. R., finds time to indulge in fancy cattle on the side. He takes particular pride in his sheep as may be noted from the accompanying snapshot. It is rumored that he plans to import a pedigreed hydraulic ram for breeding purposes.

GREGOR S. AFFLECK, ch 18, ensign, Engineering Bureau, U. S. N. R. F. has just been released from active duty, and has a position with the Union Dye and Chemical Corporation, at Kingsport, Tenn. Mr. Affleck was a visitor at the University March 24th.

PROFESSOR BEEBE, who has been engaged in doing experimental work on the problem of submarine detection at Hampton Roads, has decided to resume has former position with the Western Electric Co.

EARL S. BURNETT, m '05, salesman with the Normalair Company of Winston-Salem, N. C., was a visitor during March.

SGT. J. A. COLEMAN, '20, after four months service with the 331 F. A., Black Hawk Division, in France, has been discharged. Joe will be with us next quarter.

SAM EBY, c '17, is a pilot in the flying service with rank of 2nd lieut. He is at Love Field, Texas.

MAJOR JACK H. FRIEND, e '03, of the 114th Engineers, has been appointed to serve the Peace Conference as engineer. He has been in France since September 1, 1918, and his regiment was cited for its work in the Argone fight.

CAPT. H. L. GARNER, who was recently discharged from military service, has been made secretary and treasurer of the Anchor Savings, Building, and Loan Association, a new Madison company. Garner was elected alderman at the April election.

W. S. HARLEY, m '07, secretary-treasurer of the Harley-Davidson Motor Co., visited the college, on March 24, with a party that included Mr. Duncan Watson, a prominent electrical engineer of London.

A. G. HOPPE, m '17, has been honorably discharged from service. He has just returned from France where he was engaged as Machine Gun Instructor.

H. G. HYMEN, c '19, who, after a course of training at Boston and Key West, received a commission as pilot in the naval aviation, has recently been discharged. He plans to return to the University next quarter.

N. M. ISABELLA, c '14, is assistant division engineer with the Wisconsin Highway Commission, located at Grand Rapids.

PROF. F. W. IVES, m '09, of the Department of Agricultural Engineering, Ohio U., has been elected secretary-treasurer of the American Society of Agricultural Engineers.

C. W. JEHLE, ch '17, is naval inspector of ordnance, assigned to the Allis-Chalmers plant at Milwaukee.

CARL F. KOTTLER, e '18, and ARTHUR G. PERGANDE, e '18, both recently released from service, have accepted positions with the Mechanical Appliance Co. of Milwaukee, Wis. They are to be connected with the Sales Engineering Department.

CAPT. BEN H. LAMPERT, c '13, of the 507 Engineers Service Bn. has returned from overseas.

MARCUS LINK, m '19, who has been stationed in Georgia for the last two months, has been released from service and is to continue his course at the University during the third quarter.

LIEUT. L. R. MANN, e '20, visited the University on Saint Patrick's day. After receiving a commission in the Coast Artillery, Lieut. Mann was assigned to the 54th regiment, C. A., and with it saw six months service overseas. He is planning to re-enter the College of Engineering.

WALTER A. PEIRCE, who has been in private practice with offices in Watertown, Wisconsin, has been appointed City Engineer of Delevan.

LIEUT. L. C. ROVE, m '18, was commissioned in the aviation after training at the ground school, Cornell University, Hazelhurst Field, Mineola, L. I., Eberts Field, Lonoke, Arkansas, and Rockwell Field, San Diego, Cal. He received his discharge a few weeks ago, and is now Mechanical Engineer in the ship yard at Everett, Washington.

E. E. SANDS, c '00, C. E. '06, has resigned his position as city engineer of Houston, Texas, to enter private practice. He will specialize in port and terminal development. His headquarters will be in New York City.

CAPT. W. H. SACKET has returned to Madison after service in the C. A. C. in France.

W. A. ROYCE, e '16, is with the Cerro de Pasco Copper Corporation at Lima, Peru.

J. A. SCHAD, e '16, was commissioned 2nd lieut. in the Photographic Map Making Section, Signal Corps. He spent 6 weeks in the Eastman plant at Rochester, N. Y. and 9 weeks in advanced work at Cornell. He went across the water in October, 1918, as map interpreter. He was discharged recently and visited Madison, March 15.

F. E. SCHMITT, c '00, associate editor of the Engineering News Record, was in Madison on March 22. He brought with him some interesting ideas in regard to educational matters which were discussed in conference with various faculty members.

JOE SCHWADA is with the Emergency Fleet Corporation in the shipyards at Jacksonville, Fla. He expects to return to Madison in May.

CAPT. ALEX C. SLADKY, m '11, an inspector of ordnance manufacturing was in Madison recently in the interest of the National Enameling and Stamping Co. Capt. Sladky formerly held a position as Department Superintendent with this firm.

E. R. STIVERS, C. E. '15, is engaged in valuation work with the Interstate Commerce Commission at Chattanooga.

KAN SU, c '16, is now in the office of the chief engineer of the C. M. & St. P. Ry. at Chicago.

CAPT. HELMER SWENHOLT, g '09, until recently in command of the 14th Co., Transportation Corps in France has been selected for service with the Peace Conference. A daughter was born to him at Madison on March 5.

JOHN M. WOOD, m '17, has moved from Milwaukee to 980 Seyburn Ave., Detroit, Michigan.

T. UTEGAARD, 2nd Lieut., 58th C. A. C. who was in an artillery school in France when the Armistice was signed, has been discharged and has returned to Madison where his wife is living.

CAMPUS NOTES

By WILLARD B. BELLACK

Goodness Gracious Sakes Alive!

That's about as strong as we dare to put it with all the co-eds around.

Third quarter brought even more than there were before and we are taking up a collection to put mirrors in the halls. Lace curtains on the windows will come next.

Didn't get around to the old building during vacation did you? You missed it. That is the time when you can see Faculty as it really is. Van Hagan in his flannel shirt, his coat off, sitting with his Elsie (L. C.) Smith in the office; "Pat" Hyland down at the end of the hall, with the inevitable cigar, which had long ago refused to burn, drawing pictures of great engineering works; Jimmy Watson, with his feet on the desk, dreaming of the coming generation; and Gus Larson, as prim and proper as usual, at the regular grind in 224.

A comprehensive engineering association that will include in its membership the 200,000 technical men of the country and that will provide an effective means for making the weight of engineering opinion felt in public affairs, is now well on its way to realization, according to C. E. Drayer, Secretary of the American Association of Engineers, who was one of the speakers at a meeting of Madison engineers, held Thursday evening in the auditorium of the Engineering Building.

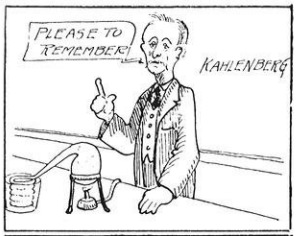
Mr. Drayer was preceeded by Mr. John E. Ericson, City Engineer of Chicago for the past 22 years, who pointed out some of the unsatisfactory conditions that now handicap the technical men of the country in their efforts to advance both their own interests and those of their profession, and compared the unsuccessful efforts of technical men, acting as individuals, to obtain

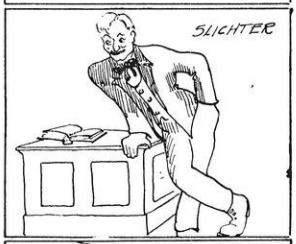
proper remuneration for their services with the success of organized labor in the same direction. "Whether we like it or not," he said, "the day of the individual is past. Great results, nowadays, come only from the co-operation of many men. The engineer, in spite of his prejudices, cannot hope to be an exception to the rule."

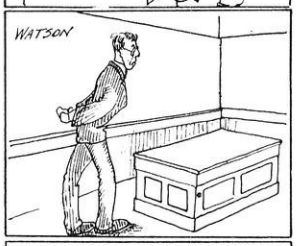
Mr. Drayer emphasized the need for more publicity regarding engineering matters. "In the past," he said, "we have gone on the principle that our works would speak for themselves. But we have been disillusioned. The world is too busy looking after its own affairs to pay any attention to us. We have been overlooked even in places where our expert knowledge was vital to the community." As an example of the influence that engineers may wield in civic affairs, if they make the effort, he cited the experience of the Engineering Society of Cleveland, which was able, in two years, to win so much public confidence that the city officials never thought of initiating any public improvement without first submitting the matter to the society for approval.

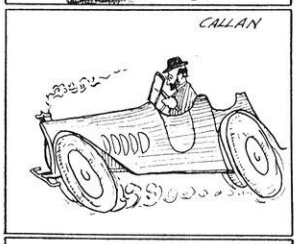
MR. W. CHISHOLM, instructor in pattern-making, has resigned to accept a position with the Federal Board for Vocational Education as Placement Officer. His work will be in connection with the rehabilitation of wounded soldiers. He will have general charge of the work in Michigan, Illinois, and Wisconsin with headquarters at Chicago.

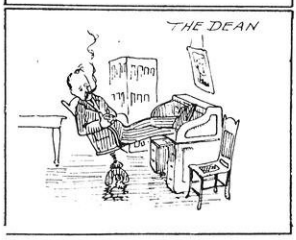
The Engineer's Mixer which was held in the Engineering Building on the evening of March 7 was certainly a great success. Things were started by a puzzle contest which ended with apples and doughnuts. After that everyone crowded into the auditorium for the main part of the program. The Glee Club rendered a number of very fine selections, Prof. Pyre read several short poems in a most pleasing manner, Prof. Phillips gave a very interesting address, but the quartette walked away with the brown derby when they harmonized the virtues and vices of the faculty assisted by cartoons on the stereopticon. The committee certainly deserves a great deal of credit for the way in which the affair went off, and it is hoped that another function of similar nature will come in the near future.











THE FACULTY

W. G. Mantonya

You all know Louey Kahlenberg—he teaches chemistry,
He gives his lectures twice a week—the Freshmen get it free
He tells about an atom and a Fahrenheit degree,
And he says you'll go to heaven if you know your Chemistry.

Professor Slichter is the man that takes your math in hand,
To make you feel that you're at home he works to beat the band
He calls you Sam and other names that you can understand,
And if your math is very poor he sees that you get canned.

Professor Goddard teaches shop, his course is surely great,
The co-eds now are taking shop, its funny to relate,
Just drop around there any time, there is no use to wait,
Its a handy place to meet a girl, and make a little date.

You've all seen Prof. McCaffery, he's the mining engineer—
And in the metallurgic game he hasn't got a peer—
He points you out a furnace and he points you out a tuyere,
And he says that in Milwaukee all the foundrys use Boch beer.

Now Jimmy Watson is the Prof. who dishes up E. E.
His ohms and volts and A. C. dope are all a mystery,
And when he starts to drive it through our domes of ivory,
We do what Annie Laurie did and lay right down and dee.

Professor Callan bought himself a rebuilt automobile,
Its got some extra tires and a nice round steering wheel,
The springs, they rock you up and down just like a rubber heel.
But it eats more gas per mile than a man could buy or steal.

Professor Hyland is the man that gives machine design,
He looks our drawings over and he says we're doing fine,
He tells us all how good we are and hands us out a line,
And when the quarter grades go in he gives us fifty-nine.

They say that Lennie Smith is getting famous on the hill,
He gives his "City Planning" course to every Jack and Jill.
Two hours a week, to take the course, is all you have to kill,
And you never have to work at all, just go there and sit still.

The man that makes us all be good is Fredrick E. Turneaure,
If you collect a bunch of cons you'll have to see him sure.
He says, "Young man, pack up your things, you never can endure,
Cause you see your grades were all between a failure and a poor."

The Faculty are certainly diplomatic. The bulletin board announces that the Senior Inspection trip will start with the inspection of Pabst Brewery.

PROFESSOR CALLAN spent his spring vacation in the East. Looks like he has more interest in that Peerless than the average fellow has in his girl.

The other day one poor lonesome frosh was heard warbling in melancholy tones,—

"Nobody knows how green I am,
Nobody seems to give a d—."

Don't worry, little dear, we'll be a-caring when the lake goes wet.

The Women's Page is not present in this issue due to the resignation of the Editor. Anyone want a job?

PROF. OLIVER P. WATTS, associate professor of chemical engineering, has been asked to appear next June at the observance of the thirtieth anniversary of Bowdoin college, Maine, of which he is a graduate. He is one of seven still living out of his class of 40.

Say, ye frosh, isn't it wonderful how Slichter's Analysis turns into Slichter's Conglomeration when the blue books are passed around?

Columbus had nothing on an inquisitive frosh who t'other day, between the leaves of a book in our own Libe, discovered the drawing lesson of James Binck, 1871. Outside of the fact that James was S. O. L. on his drawing, we might consider the astounding truth that one of our valuable volumes has been unopened for the sum and total of forty-eight years. The old Board of Regents was right when they said that co-education would ruin our University.

Further tests of the radio station in the Physics building gave an audibility of about 800 at Great Lakes, using the telephone, and 2,000 using the telegraph. The output of the telephone set has since been almost doubled, and will soon be tried again.

HAD TO BE GOOD

An Irish politician made a trip abroad and upon his return was quizzed by a friend:

"Did you have a fine time, Mike?"
"Of course I did."
"Did you visit the theatres in Paris?"
"Oh yis, I saw all the plays."
"And did you go to the cafes?"
"Sure, I was in all of them."
"Well tell me Mike, and did you see any pommes de terre?"
"Hell no! I had me wife with me all the time."