The Wisconsin engineer. Vol. 23, No. 5 February 1919

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

https://digital.library.wisc.edu/1711.dl/7P3DBZ6M5SIJV8I

W. Kates.

The Wisconsin Engineer

VOL. XXIII FEBRUARY, 1919 NO. 5

Volume 23 Founded 1890 Number 5

The Wisconsin Engineer

$1.00 a Year 15c a Copy

Subscriptions, payable before February 1, $1.00 a year in United States, Porto Rico, Hawaii, the Philippines, Cuba, or Mexico; $1.25 in Canada; and $1.50 in other countries. Entered as second class matter Sept. 26, 1910, at the post office at Madison, Wis., under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized October 21, 1918.

Published monthly from October to May, inclusive by
THE WISCONSIN ENGINEERING JOURNAL ASSOCIATION,
306a Engineering Building, Madison, Wisconsin
Telephone University 177

ATTRACTED BY HIS KIND

General Pershing loves to tell this story. It happened when he was on the Mexican border. A regiment was marching by when it met a small, towheaded, ragged Irish boy clinging with all his might with both hands around a moth-eaten, dilapidated jackass which he had been riding and which had become restless owing to the noise of the drum corps. It was all the boy could do to hold the beast.

A joker in the ranks cried out to the boy as he swung by: "Say, kid, what are you holding your little brother so tight for?"

"Because," came the instant Irish reply from the kid, "He sees you guys and I'm afraid he mout enlist."

CONTENTS

COMPARISON

"It's just as wrong to gamble when you win as when you lose."

"Yassuh," asserted Mr. Erastus Pinkley. "De immorality is jes' as great, but de inconvenience ain't."—*Washington Star*.

The Wisconsin Engineer

VOL. XXIII FEBRUARY, 1919 NO. 5

FUTURE AIRPLANE DEVELOPMENT—SOME TECHNICAL SUGGESTIONS

DANA P. OGDEN, e '17
Engineer of Tests, Naval Aircraft Factory, Philadelphia

Probably the most urgent question confronting those who have been connected with aircraft production in this country during the past two years is: "How many planes will be built and flown in the near future?"

There are many factors that will govern. Some are definite and are concerned with perfectly well known generic principles, while others are less easily defined and can form the basis only of speculation rather than of a conscious estimation of the probable future. The business of manufacturing airplanes, to be commercially and practically successful in the long run, must be put on such a basis that both the design and the manufacturing methods coincide with established engineering principles. Such considerations as the sensations experienced by the average person while flying; the public attitude toward the safety of airplane flights, both for those in the machine and on the ground; the attitude of the Government toward aviation; and the general prosperity of the country are all factors which may influence future airplane construction, but which are difficult to pre-determine. This article is concerned only with definite technical considerations incident to the manufacture of airplanes.

In the fall of 1917, the common idea of many people as to both the final manufacturing of airplanes and the production of manufactured raw materials for airplane use was that an airplane was *different*. If an elevator were supported by a cable having a certain pre-determined strength, the elevator was probably all right and could safely be used to carry passengers. If the same general practice were followed in building tension members to support the loads in airplanes, there was considerable doubt as to whether the strength of cable made in the same way and in the same mill would prove as satisfactory in the airplane as in the elevator. The very appearance of an airplane in the air suggested instability. There was a general feeling of apprehension and honest anxiety that prompted many people to be over careful. In some cases the result has been that so much emphasis has been placed on certain details of construction that others have been almost entirely neglected. Straight grained and clear spruce has been painstakingly selected for certain airplane parts that in many cases either were not stressed at all or were so fastened into the structure that failure would occur at the fastenings long before the main body of the member was highly stressed. A great amount of time and money and effort has been spent in making shanks and barrels of turnbuckles of the best alloy steel and bronze obtainable, with the threaded ends as nearly perfect as possible, because it was believed to be a duty to insist upon these things.

It was known by practically every one concerned that certain sizes of turnbuckles were from two to three times as strong as the loop fastenings in the wire with which they were always used, and that the turnbuckles were, therefore, more expensive, more heavy, and required longer to make than was required by the dictates of good design. The wire loop was not made stronger when the thing was "figured out" because it was found that it was strong enough. The turnbuckles were not made cheaper or lighter because they were in production and the probable delay incident to the change looked dangerous.

Many similar examples of the same misplaced emphasis could be cited. The prime object of the aircraft industries was to produce large quantities of machines that would fly rather than to excel technically. The urgent need was for the necessary hundreds of parts that could be used forthwith, and not for a few parts that were known to be extraordinarily good. In the beginning there were very few men available who had actually studied the business of making airplanes in quantity and still less who really knew what was good in an airplane and what was not. It is very natural and by no means a disgrace that the mistakes were inherited along with the good features of former practice by those who not only had to build airplanes quickly, but had to learn how to build them while they were doing it.

In the days when alloy steels were scientific fads and when the only load an airplane had to carry was the weight of the operator, it seemed entirely reasonable that the builder of a single airplane would use for compression members wood, and for tension members a wire of some sort. Of all materials available for airplane spars, struts, and longerons, wood requires less machinery to manufacture and less skill to form and is the least difficult to fasten in place. However, along with its other iniquities wood shrinks and swells and is difficult to manufacture accurately to dimension. It follows that, if a truss of exact dimensions is to be formed, tension members must be provided which can compensate for these differences. The tension members of an airplane formed with wood compression members must be adjustable, hence a wire with a turnbuckle.

When it was evident that many airplanes would be needed for the prosecution of the war it was plain that the thing to do was to proceed along known lines rather than to wait for developmental work which might or might not produce a good airplane that could easily be manufactured in quantity.

The men available for this work knew a lot more about *manufacturing* than about airplanes and set out to *manufacture* airplanes similar to the machines with which they were familiar. Thus it is that the airplanes that have been made are frail, short-lived machines, built up of thousands of wood parts more or less well fastened together with all sorts of fastenings,—including glue, nails, screws, bolts, tape, string, metal straps, wires, and cables—that are entirely unsuited to American manufacturing methods and very costly to build. Although great care is used in certain of the manufacturing processes, the resulting product has the characteristics of an inefficiently manufactured machine because of its lack of ruggedness and of its short life, which are inherent in this type of construction.

If it be assumed that the undetermined factors first mentioned are either of relatively little importance or of such quality and degree that they balance each other, it may be possible to make something of an estimate of the future.

Millions have been spent in training all sorts of persons in the manufacture and use of the present type of airplane. The very size of the industry at this time will insure that for some time to come the airplane of today will be thought of as the airplane as it ought to be by a great many people. Thus there will be considerable further effort toward popularizing this type of machine.

But in view of the great cost and rapid depreciation of this type of construction it seems improbable that any considerable success will follow. Unfortunately it seems probable that efforts will be made to "put over" the present type of machine on a large scale in the near future. Although some time may elapse before conditions are such that the enterprise seems attractive, there is very little doubt that some day a cheap and efficient airplane can and will be made.

Because of its ready adaptability to production methods, steel is the easiest and most satisfactory material to manufacture that will meet the requirements. In structural parts where lightness is essential great strength per unit of weight can be secured by the use of alloy steel properly heat treated. Fastenings may consist of rivets or welds, according to the quantity to be manufactured and the strength requirements. Because of the excellent mechanical treatment given to steel in the ordinary rolling mill and its ease of manufacture, rolled strip steel could well be used for practically all parts. The remarkable property of ordinary cotton fabric painted with airplane dope of both shrinking and increasing its strength in the process, will probably cause the use of this form of covering to persist for a long time, although it may be supplanted later by very thin sheets of rolled aluminum alloy or other similar metals.

It is probable that the future of the airplane motor will be governed by the advances that are made in automobile motor design and construction. It seems entirely unnecessary to assume that, although the present airplane motors are fairly satisfactory, the art will not progress as rapidly in the future as it has in the past. Certainly an efficient propeller should be produced in the near future. It is difficult to imagine why, if the proper precautions were taken, a steel propeller could not be built that would prove satisfactory. Most of the previously attempted metal propellers have not been built of the most suitable grade of steel or given the proper heat treatment. It is entirely unfair to confound a metal propeller made up of ordinary commercial mild steel and fastened with rivets with the best that can be done by using a chrome nickle vanadium steel properly forged and heat treated.

The most striking difference between the present airplane and the future airplane will probably be the matter of simplicity of design. It is entirely possible to manufacture from strip steel, by simple rolling, die-drawing, and continuous welding operations, tubes, channels, streamline, and other structural shapes that can be built into a simple airplane that will compare favorably with the best wooden machine that has thus far been made. Furthermore these steel shapes can be stressed either in tension, compression, or bending without any change in design and will serve equally well either way. This one consideration would practically eliminate one-half of the number of important structural parts that are now used. That is, there would be no distinct flying or landing member. Ribs, aileron horns, and control parts could be stamped from one piece instead of being built up as at the present time. Due to the fact that steel parts can be so accurately made to dimensions it would be unnecessary to use adjustable members to secure rigidity. Such adjustable members as are used could be reduced to the absolute minimum and then made sufficiently large so that their manufacture will not become tedious and, therefore, a great source of unnecessary expense.

Perhaps the greatest obstacle incident to such a manufacturing scheme is the general apathy of many of the directors of manufacturing industries concerning the proper heat treatment of steel parts. In general, for all forming, stamping, drawing, and welding, steel should be properly annealed before the operation to render the manufacture possible. In order to secure great strength in alloy steels it is necessary that the last manufacturing operation should be a hardening and toughening heat treatment effected by raising the steel to a temperature just above the upper temperature of its critical range (1400°–1700° F for most ordinary steels except those containing tungsten) and cooling rapidly by immersing the part to be treated in oil or water. To secure ductility and resistance to shock the parts should be tempered by being re-heated to a lower temperature than at first. It is entirely absurd to carry out all of the manufacturing operations properly except the heat treatment and to expect the finished article to be a good job. The difference between the proper heat treatment and none at all may mean a difference of strength of from 3 to 1. Tubular struts made of mild steel having an approximate ultimate tensile strength of 60,000 lb. per square inch are just three times as heavy as a strut of the same length and strength made of a good grade of 3½ per cent nickel medium-carbon steel properly heat treated to secure an ultimate tensile strength of 180,000 pounds per square inch. This practice is entirely safe if the heat treating is done carefully and exactly. The difference between proper heat treatment and improper heat treatment may mean the difference between a strong, rugged, long wearing part, and a part that will fail utterly as soon as it is loaded for the first time. Before heat treatment, 3½ per cent nickel steel has essentially the same physical properties as the same steel without the nickel, and a part made of such a steel and not heat treated would fall far short of carrying the safe load which it would carry were the part properly treated. The heat treatment to be used is usually not difficult to determine. The prime essential is the willingness to admit that the heat treatment is worth while, and worth checking carefully by physical tests as well as accurate temperature measurements.

The technical considerations that have been touched upon indicate that the aircraft industry is due to pass through a considerable amount of evolution before airplanes will be manufactured any where near as abundantly as automobiles are today. Considerable time and money are necessary to produce this change. How long a time and how much money will depend largely on the unknown factors above mentioned, but it seems reasonably certain that the successful airplane of the future will be the result of creative engineering effort rather than the result of copying and modifying obsolete types of construction.

MAINTENANCE OF WISCONSIN'S STATE TRUNK HIGHWAY SYSTEM

J. T. Donaghey
Maintenance Engineer

The legislature of 1917 enacted a law commonly known as the State Trunk Highway Act, which provides for the laying out, marking, signing, constructing, and maintaining of a State Trunk Highway System. A committee, consisting of five members of the legislature, was appointed to cooperate with the State Highway Commission in the selection of the system authorized by law. This system was limited to 5,000 miles, and the law provides that it must interconnect all county seats and touch every town of 5,000 or more inhabitants.

The law further provides that, after the selection of the system, the State Highway Commission must mark and sign the system with some standard design or marker; that the portion of the system lying in each county, whether previously improved or not, must be adequately maintained by the county according to the specifications and directions of the State Highway Commission; that the county shall pay the actual cost of maintenance, but that the same shall be refunded by the State Highway Commission out of the automobile license funds to the extent of the amount allotted to each county under the law, which allotment is based upon the percentage of miles of Trunk System in each county.

Maintenance Policy

The Highway Commission realized the magnitude of the problem confronting it and decided upon installing a thorough system of patrol maintenance on the State Trunk System, supplemented in the majority of counties by what we call "gang maintenance", the latter work being performed by small gangs doing heavy blade grader work, scarifying gravel or macadam roads and reshaping them, resurfacing gravel or stone macadam roads, making surface treatments, etc.

The division engineers met with the several county state road and bridge committees early in January, 1918, and determined upon the number, length, and location of each patrol section. The sections vary from six to ten miles in length, with the exception that in a few counties motor truck sections were installed, generally covering from fifteen to twenty-five miles each. After dividing the trunk system in each county into patrol sections, the committee advertised in the local papers for applicants for the position of patrolman. The limits of the patrol sections, as well as the salary, were mentioned in the advertisement. Our division engineers met with the counties at a later date and assisted in selecting from the numerous applicants the best qualified men for patrolmen.

The patrolman must furnish a satisfactory team and wagon, and the county furnishes a light patrol grader, a road planer, plow, slip scraper, and other small tools for each patrol section.

Condition of the System, May 1, 1918

As early in the spring of 1918 as weather conditions permitted, our division engineers made a condition survey of the entire trunk system, showing by miles and tenths of miles the type of road and its condition. Changes in type and condition are shown on a progress chart in the main office as reported from time to time by the division engineers. This survey shows the 5,000 miles divided as follows:

	Miles Good	Miles Poor
Earth Roads	2363	702
Gravel Roads	1001	126
Macadam Roads	573	102
Concrete Roads	118	3
Other High Type Roads	12	----
	4067	933

Roads placed in the "good class" were those that could be maintained in a satisfactory condition by ordinary patrol maintenance methods. Those in the "poor class" required heavy blade grader work, drainage, resurfacing, or scarifying before the patrolman could maintain them in a satisfactory manner.

The survey showed 9,904 culverts on the system, of which 1,164 were wood, 1,050 stone, 3,550 steel, and 4,140 concrete. It also showed 2,568 bridges on the system, 324 of which were wood, 199 stone, 1,035 steel, and 393 concrete.

Results Obtained

The aim was to get as many miles of the poor converted into good during the season of 1918 as was possible, as it was appreciated full well that the patrolmen would gradually change the good to excellent, but could not materially change the poor to good without help.

We find at the close of the maintenance season, December 1, 1918, that the following improvement of the System has been accomplished by gang maintenance: Heavy blade grader work, 625 miles; scarifying and reshaping stone and gravel surfaces, 150 miles; resurfacing stone and gravel, 135 miles; placing a temporary surface of clay or gravel, 100 miles; covering bad sandy sections with hay or straw, 20 miles; bituminous surface treated, 250 miles; covering badly worn macadam roads with a light application of sand or loam, 25 miles.

FIG. 1. *A well constructed and well maintained limestone macadam road in Sauk County. Note the standard guard fence which is also well maintained.*

The gang maintenance work this first season has resulted in changing 325 miles of the poor roads reported May 1, 1918, to good, at a cost of approximately $200 per mile, and in leaving them in such condition that they can be maintained in the future by ordinary patrol maintenance methods.

Patrol Maintenance

The success or failure of the patrol maintenance system rests to a great degree upon the individual patrolman. If he is intelligent, conscientious, honest, a good worker, and follows rigidly the instructions given him, he will make a thorough success of his section. If each county highway commissioner insists upon each and every patrolman giving value received, and is not afraid to fire one who is not doing so, he will make a thorough success of the work in his county.

Representatives of the Highway Commission must visit the several counties often enough to know whether or not the maintenance work is being performed properly and adequately. If a county becomes negligent or allows the patrolmen to become lax, the Commission must step in and take charge of the maintenance work and pay for the same out of the maintenance funds allotted to the county.

We have had but one county this year that came close enough to the poor line to warrant notifying them that unless a change was noted at once, the maintenance of the trunk system would be taken over by the Commission. This action was taken September 1, and it was noticeable that more maintenance work was done in that county during September than in any previous two months.

There is employed on the system a total of 560 patrolmen. Of this number, 125 have quit or have been fired during the season. In nearly all cases the vacancies have been filled. Each patrolman was given a rating at the close of the season, based upon the improvement made in his section, rather than upon the actual condition of the section. There were 173 patrolmen in the excellent class; 204 in the good class; 108 in the fair class; and 75 in the poor class. This shows that those in the excellent and good class, or 67 per cent, are really making good and these are the men we wish to employ again next season. Those in the fair class, or 20 per cent, have possibilities of making good if coached properly. Those in the poor class, or 13 per cent, will not be employed another season. On the whole, it is believed that the patrolmen have done wonderfully well. Many of them have had no previous experience in road construction or maintenance, and it has been found that invariably they wanted instructions and advice from the County Highway Commissioner and the Commission to even a greater degree than it was possible to give it to them.

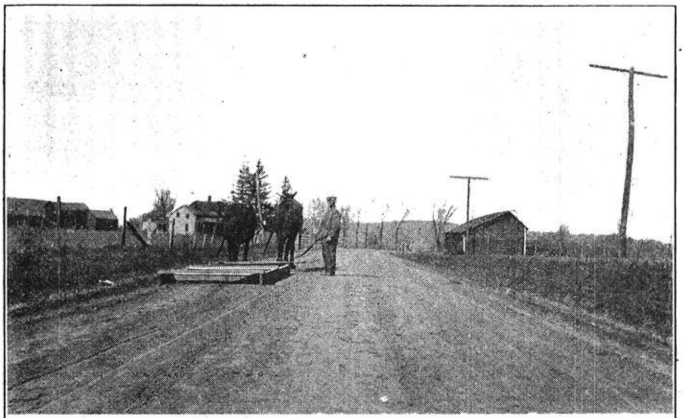

FIG. 2. *A patrolman on Trunk Highway No. 33, Sauk County, just having completed his second round trip with a road planer on an earth road, immediately following a twenty-four hour rain. Note how well the ruts are filled and the surface smoothed up.*

FIG. 3. *Heavy blade grader work in Oneida County. Many miles of good earth road have been constructed during the past season in this manner at a cost of from $200 to $300 per mile.*

The ages of the patrolmen range from 19 to 72 years, and neither the oldest one nor the youngest one is in the poor or fair class. The majority, however, are between 35 and 55 years. The majority, also, are farmers or retired farmers. There are also many retired merchants and professional men, as well as one or two preachers. At least one patrolman is worth no less than $50,000 and many that are rated at $25,000 to $30,000. In the majority of cases, this class is making good. They made a success of their own business and are now making a success of the public's business.

A bonus of $5.00 per month will be paid in addition to the regular salary to all patrolmen giving satisfactory results in 1919. It is believed that this will result in better maintenance and be worth many times its cost. The patrolmen's salaries will also be increased to some extent. They will range from $130.00 to $145.00 per month.

Expenditures

The total state trunk highway maintenance funds allotted to the counties for the season ending December 31, 1918, amounted to $1,008,336.76. In addition to this, many counties made further appropriations for the maintenance of the trunk system. These two funds amounted in all to well over $1,200,000.

The cost of the patrol maintenance of the state trunk system was approximately $600,000 or $120 per mile for the entire season. This amount covers the monthly salaries of the 560 patrolmen, the cost of extra labor on patrol work, and the supplies and repairs used by the patrolmen. The balance of $600,000 covers the cost of the gang maintenance work, previously described, and the unexpended balances that remain to the credit of a few counties.

Ideas Successfully put in Operation and Lessons Learned in 1918

1. A good earth road may be had for from $100 to $300 per mile by the use of a heavy blade grader and large tractor.

2. Width and smoothness of surface are of more importance than easy grades.

3. Where a patrol maintenance system is in operation, no road should have more than a four to six inch crown for a 24-ft. shoulder to shoulder roadway.

4. An application of two to three inches of sandy gravel, not larger than one inch in size, on the surface of a clay road will give excellent results. Small stock piles should be deposited

along the road for the patrolman's use in strengthening the weak places. Ruts will occur, but persistent light grading or planing will surely result in an excellent and cheap temporary surface.

5. What is ordinarily termed "sand roads" can be converted into a very satisfactory road to travel by light grading, consisting of moving in the unused top six inches of soil to the center for a wearing surface and keeping the surface smooth with a grader or planer. The bad sand requires a mixture of clay if available. If not, a covering of cedar shavings, marsh hay, straw, fine brush or weeds.

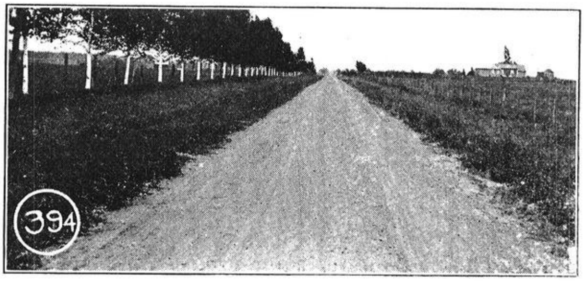

FIG. 4. *A well maintained gravel road in Taylor County. The majority of the maintenance work in Taylor County is performed by the use of a tractor pulling the grader or planer.*

6. The patrol sections should not exceed eight miles in length for team patrol and the patrolman should live on his section and near the center of it. It would be economy for counties to build a shack for each patrolman near the center of the section. The saving of his time would repay the cost of the shack in two seasons.

7. The best single tool for the patrolman's use in keeping the road surface smooth is the four wheeled, two horse road grader. Next is the road planer.

8. A wavy, uneven gravel road can be scarified and reshaped with a grader at a cost of from $50 to $75 per mile, and thereby converted into an excellent road to travel. If new material is required it should be of a size that will pass a one inch ring.

9. A 9 ft. gravel or macadam road can be scarified and widened to a 16 ft. width by covering the old surface and 3½ feet of each shoulder with from 2 to 3 inches of fine gravel. By the persistent use of the light grader or planer, the surface can be compacted without the use of a roller.

10. A 9 ft. macadam road can be successfully widened to a 16 ft. width by resurfacing with 2 to 3 inches of stone, extending the stone over 3½ feet of each shoulder and binding the new material with bitumen. If properly constructed, the 3 inch depth of stone on the shoulder will amply care for reasonably heavy traffic.

11. A badly worn macadam surface can be maintained cheaper by the application of about 2 inches of sand and result in a more satisfactory road to travel than if surface treated. It must be gone over frequently with the road grader or planer.

12. No road should receive a bituminous surface treatment except where the surface is smooth and clean, and, where used, the bitumen should be of a quality and of a sufficient quantity to penetrate the road surface thoroughly. Holes appearing in the surface should be patched immediately by the patrolman. It is a waste of funds to apply surface treatments and not use an absorbent of stone chips, pea gravel, or torpedo sand. The surface treatment of roads taking care of heavy traffic, that have been previously treated, should be continued, provided that they have been properly maintained.

Conclusions

The Commission is satisfied with the showing made in 1918,—its first year of state trunk maintenance—but is not contented.

It is realized that the maintenance of the trunk system is a big undertaking and that mistakes are made; that certain sections are not always properly maintained; and that patrolmen are seen loafing or not getting on the job in time. Such conditions are bound to prevail to a limited extent. The public is asked to assist in bringing about perfectly satisfactory conditions by offering "constructive criticism" and information. Remember that each and every patrolman is working for and being paid by you. It is, therefore, your duty to report a patrolman who is not doing his duty. The Highway Commission will also appreciate suggestions or advice on local problems that you are thoroughly familiar with. We are all working for the same cause and the way to insure a well maintained highway system in every county is by thorough cooperation between all concerned, the county, the state, and the general public.

THE RAILWAY EMPLOYEES' STATUS UNDER COMPLETE GOVERNMENT OPERATION*

PAUL HUNTZICKER
Senior Civil

In an exact interpretation, the railway systems which are the backbone of the inland transportation system of the United States, have not as yet come under complete and responsible government operation. In a large degree, pending troubles have been sidetracked and postponed during the present temporary emergency. However, the probability of strict government operation and ownership is real enough to justify the limitation of this article to a discussion of the employees' status under complete government operation.

The employees' status embraces the three-cornered relations that must exist between the public, the government administration, and the railway employees,—taken as a whole and taken as groups. In these relations there are certain well defined subdivisions. In the relations existing between the employees and the government administration are the methods of employing the workers, the probable attitude of the workers under government operation, and the organized employees in politics. The public in its turn will expect, and in a sense demand from the employees, courtesy, qualified men, no unified political activities, and no exorbitant demands. From the government the public will demand economy, service, and the elimination of political pull and graft in appointments.

In a present-day factory, we find that its output is increased to an appreciable extent by a careful treatment of its labor problem. In another case we find certain coal mine operators inviting adverse public opinion and serious labor difficulties by ignoring altogether any appeals of its workers. And in a third case we have seen an employer who has spent thousands of dollars to make his men satisfied, and because he did not understand the human nature of his workmen, his entire efforts collapsed. In a government operated railway system where a couple of million of workers with 8,000,000 dependents are brought under a

*This essay was presented to Tau Beta Pi in accordance with the initiation requirements of 1918.

single system, the labor problem may become acute either in the actual demands or in the exercise of political influence.

In the important relations existing between the administration and the employees, the method of employment is fundamental. For purposes of analysis, the army of employees can be divided into three logical classes. There will be the executive class comprising the educated and trained workers in the business and engineering offices; there will be the mass of organized tradesmen such as trainmen, mechanics, and perhaps clerks; and there will be that group of unorganized workers who do no less important work than the second group, but who have not the initiative to form an effective organization. In the opinion of the writer, if organization is permitted the second group will absorb nine-tenths of all the non-professional workers, and class three will include only the seasonal workers.

Under government operation, the executive group will come evidently under civil service regulations similar to those existing at present in other branches of the government. Little difficulty is to be expected from the handling of this group by a competent civil service board, because in all probability present working conditions in this class will be improved. It is hoped that it will not be necessary for the average engineering graduate in railway service to work ten years before securing a salary of one hundred dollars a month. There are serious disadvantages attached to a government civil service position, and they cannot be alleviated for many years to come. Inefficiency and lack of initiative will exist, but there is no reason why men can not be trained to give as earnest efforts to the government as they do to private employers.

The greatest friction that the administration will experience will be with the second class, which is the large group of unionized workers. The connections with this group will require the services of the best men that the government can secure, and, when a solution of the problems involving this group is found, a smoothly running system can be expected in so far as labor conditions are concerned.

One of two employment systems will be used,—collective bargaining, preferred by the unions, or civil service preferred by the administration. As the right of workmen to organize is fairly well established it will follow that the unions will try to force their preference at the beginning, and, if they succeed completely, the case immediately develops into a discussion of the relation of the government to the unions which is taken up at another point. If the unions do not succeed in pressing their preference, and the government is able to install civil service regulations, the advantages and disadvantages of such a system will follow. The writer believes that a modified form of collective bargaining will be agreed to in which an arbitration board composed of workers and executives will fix the qualifications of men eligible for union membership.

With the third class of unorganized seasonal workers which will be small in comparison to the second class, the appointive system exercised by gang foremen and chiefs now used is likely to be retained under contemplated government operation.

Upon the attitude taken by the workers toward their work and their employers depends the major part of the solution of the railway labor problem under federal operation. If the employees become arrogant, if they press exorbitant demands, if they look on their positions as a pension, in short, if they have not a wholesome conception of their place and duty in our social order, we can expect continual dissatisfaction to exist in the tri-cornered relations between the government administration, the public, and the railway employees. Because this phase of the question depends on the pressure of public opinion, education, management, and treatment of employees, it is not a tangible subject to make pre-determinations on.

A study of the effect of unionism in the government operation of railways is one which is too elaborate for the scope of this essay. Such a study should be made in light of present trade union conditions. There is, however, one condition which can be discussed at this point, and that is the effect of unions in politics.

It is not desired to give a pessimistic impression of this phase of government operation, but all organized self-interested bodies entering politics are necessarily bad, and some are worse than others. With federated unions within the railway system having a combined membership of 1,500,000, and with a control of 4,000,000 votes in the case of equal suffrage in all states, it will be seen that considerable political pressure can be exercised. With a federation or alliance with trade unions outside of the railway system, there may result a vote which can be equalled only by the combined commercial and agrarian efforts. This last mentioned case is the maximum that could result. If this combination pressed absurd legislation with no elasticity, regretable complications would follow with the probable complete and temporary collapse of unionism in the railroad system. In the event that the union workers in politics could dictate their will, there may result the unfortunate condition in which unjust demands far below the collapsing point could be pressed, secured and maintained at the sacrifice of some other group in the socio-economic order. To a large degree this matter must be dealt with before the actual conditions arise.

In taking up the relation between the public and the railway employees, we come to a field which does not lend itself to concrete analysis. Any differences that the public may have with the railway employees would be passed to the government administration, and that department would be held responsible for the action of the employees. The government administration in turn might try first to sidestep any agitation, but if matters came to a climax they would respond to the wishes of the party which would give the larger political support.

There are certain definite demands that the public will make on the men in the service of the railways; among them will be courtesy, non-political activity, and no exorbitant requests from the government. If there are any petty matters that the public does not like, they will be taken into politics and sufficient leaders will rise to champion any cause that will support a suitable number of followers.

The political activity of the railway workers cannot be organized for an aggressive program without an equal reaction on the part of the public. Any concerted action by the former group might flare into uncontrollable proportions. And it can be said without reserve that any administration will do what it can to keep the railway workers from exciting an organized political movement.

In close relationship to the subject of non-political activity exists that of non-exorbitant demands on the part of the organized railway employees. In the ultimate analysis both of these subjects could be carried to public opinion. In the past couple of years a case involving what might be considered a mild form of an exorbitant demand was passed to congress to settle. Congress simply smoothed the rough spots out, and passed the burden back to the public who have been so occupied since with other matters that no reaction has made itself manifest. The question of what constitutes legitimate demands would have to be solved and not passed back and forth in this three handed game.

The third major relation which is that existing between the public and the government administration, in a large part is dependent on the other two cardinal relations. The problems that will arise, altho mainly political, will be really an outgrowth of existing labor conditions under the contemplated government operation. The public will expect economy, service, and little or no graft in appointments, and their means of forcing these demands will be by political pressure.

These political relations between the public and the government are outside the scope of this article, therefore, they will not be discussed here. The troubles which arise from labor conditions have been discussed sufficiently in their respective places under the first two major relations.

From the preceeding discussion of the three-cornered relations, certain conclusions can be drawn as to the policy which should be pursued by the administration. Perhaps one of the most urgent steps will be to keep the railway workers from any concerted political activity either in their own sphere, or in combination with external organizations. In short, the first essential policy will be to keep the railroad men out of politics.

The next important policy, which a great deal of diligent and careful study can be devoted to, is that of the method of employment. Collective union bargaining should not be given complete control, nor should the government pursue too arbitrary a policy. It must develop some system in which initiative and ambition will receive rewards, but it must also protect the unskilled labor from a bare living wage. This subject, when solved, can furnish a key to many of the other problems which will follow government ownership.

The third and final step in the policy of the administration is that of devising a scheme to educate its workers to their duty, to their relation with the rest of the worlds' workers, and to nonselfish ideals,—all of which will develop the men into an intelligent group at whose hands we can expect reciprocal fair play.

NOTES ON SOLDER, SOLDERING FLUX, AND SOLDERING

F. A. Kartak
Director of the Standards Laboratory

In connection with both the instructional and the testing work which is being carried on in the Electrical Engineering Department, the writer has had occasion from time to time to study the various soldering processes which are available for the joining of metals. The results of this study were recently collected into a brief set of notes which is here reproduced in the belief that it may prove of interest to others. While these notes are not intended to cover the entire field of soldering, they refer to the details of the processes as ordinarily used in laboratory and industrial work, pointing out in particular the actions of the various fluxes.

Soldering is the process of uniting two pieces of metal with a third soft metal which is applied in a molten state. The metals to be united may be either the same or dissimilar, but the solder must be such as will alloy with both at the soldering temperature.

Two conditions must be fulfilled in all soldering work:

(1) The surfaces to be united must be bright, smooth, and chemically clean.

(2) Contact of air with the surfaces to be soldered must be excluded during the process, since this will likely oxidize the surfaces at the soldering temperature.

These conditions are in general partly fulfilled by a mechanical cleaning of the surfaces, as by filing, scraping, scouring, grinding, etc., and further by the use of a so-called flux which may assist in the cleaning as well as preventing the oxidation by excluding the air.

Solders

Both the compositions of the solders and of the fluxes used depend upon the natures of the metals to be joined. Solders may in general be classified as hard solders and soft solders, typical examples of which are given in Table I.

The hard solders melt only at the higher temperatures and are usually employed for fine work where considerable mechan-

TABLE I.*

No.	Name of Solder	Composition in Parts	Flux	Melting Point
1	Lead solder, coarse	Tin, 1; lead, 3	Rosin	797° F.
2	Lead solder, ordinary	Tin, 1; lead, 2	Rosin	439° F.
3	Lead solder, particularly good	Tin, 1; lead, 1	Rosin	388° F.
4	Tin solder	Tin, 1.5; lead, 1	Rosin, or zinc chlor. solution	334° F.
5	Tin solder, particularly good	Tin, 2; lead, 1	Rosin, or zinc chlor. solution	340° F.
6	Hard solder for copper, brass, iron	Copper, 2; zinc, 1	Borax	above 797° F. (Nos. 6–15)
7	Hard solder for copper	Malleable brass, 5; zinc, 1	Borax	
8	Hard solder for copper, readily fusible	Copper, 1; zinc, 1	Borax	
9	Hard solder for copper	Hammered sheet-brass	Borax	
10	Silver solder for gold-workers	Silver, 19; copper, 1; brass, 1	Borax	
11	Silver solder for sheet	Silver, 2; brass, 1	Borax	
12	Silver solder for silver, copper, iron	Silver, 1; brass, 1	Borax	
13	Silver solder for steel	Silver, 19; copper, 1, brass, 1	Borax	
14	Silver solder readily fusible	Silver, 5; brass, 5; zinc, 5	Borax	
15	Gold solder	Gold, 12; silver, 2; copper, 4	Borax	
16	Bismuth solder	Lead, 4; tin, 4; bismuth, 1	Rosin, or zinc chlor. solution	320° F.
17	Bismuth solder	Lead, 3; tin, 3; bismuth, 1	Rosin, or zinc chlor. solution	311° F.
18	Bismuth solder	Lead, 2; tin, 1; bismuth, 1	Rosin, or zinc chlor. solution	291° F.
19	Bismuth solder	Lead, 2; tin, 1; bismuth, 2	Rosin, or zinc chlor. solution	232° F.
20	Bismuth solder	Lead, 3; tin, 5; bismuth, 3	Rosin, or zinc chlor. solution	201° F.
21	Tin solder	Lead, 4; tin, 3; bismuth, 1	Rosin, or zinc chlor. solution	---------

*Brant, Metal Alloys.

ical strength of joint is required or where a joint of better electrical characteristics as for fine instrument work is desired. The soft solders (or tin solders), which are those employed in the majority of soldering processes, are used principally because of the lower soldering temperature permitted, this temperature rarely exceeding 400° F. At the lower temperatures it is not so difficult to prevent oxidation of the surfaces to be soldered, nor to prevent the burning of insulation or other materials in the vicinity of the joint.

Fluxes

The proper flux to be used will depend to a considerable extent upon the nature and material of the surfaces to be joined.

A flux may act in one or more of the following manners:

(1) As a means of covering the brightened metal surfaces to exclude air.

(2) As a solvent for the metal oxides formed by the action of the air.

(3) As a coagulant or detergent, thus cleansing and floating away from the metal surfaces the oxides and other foreign matter present.

The active constituents of the most commonly used fluxes may be clasified as shown in Table II.

TABLE II.

Principal Constituents of Soldering Fluxes.

Name of Material	*Principal Fluxing Action*	*Principally used on*
Rosin (colophony)	Detergent	Tinned iron, copper, brass
Zinc Chloride	Oxide Solvent	Copper, brass, tin, iron
Ammonia	Reducing Agent	Brass
Ammonium Chloride	Oxide Solvent	Copper, brass, tin, iron
Hydrochloric Acid	Formation of Zinc Chloride	Zinc, galvanized iron
Ammonium Phosphate	Oxide Solvent	Zinc, tin, copper, brass
Lactic Acid or Ammonium Lactate	Oxide Solvent	Zinc, copper, brass
Phosphoric Acid	Oxide Solvent	Copper, brass, bronze
Borax or Boric Acid	Oxide Solvent	Copper, brass, silver, gold
Powdered Glass, or Sand	Oxide Solvent	Iron

Rosin (or colophony) can be used alone only where the surfaces are bright and clean. When heated in the process of soldering, it flows over the joint, excluding air and floating away the excess foreign matter. It finds its principal use in soldering iron covered with a coating of tin, where it is essential that a flux be used with which there is no possibility that the tin coating will be eaten through. Rosin may be used only for soft soldering since it chars at the higher temperatures.

Zinc Chloride which forms the active constituent of practically all ordinary soldering fluxes, acts as a solvent for the metal oxides. It should contain no free acid and is often neutralized by the use of ammonium hydroxide (ammonia). This is, however, a somewhat questionable procedure, since any free hydrochloric acid in the zinc chloride will react to form ammonium chloride which may have a corrosive effect if not carefully washed from the finished joint. For this reason when the zinc or ammonium chlorides are used as fluxes, it is advisable to wash the finished joints to remove any excess of the chlorides, since both of them form a corrosive menace, especially in fine soldering work.

Ammonium chloride, as pointed out above, acts similarly to zinc chloride but is a stronger corrosive agent.

Lactic acid or ammonium lactate has been found satisfactory for soldering zinc, copper, and brass. It is particularly useful for soldering small zinc parts where zinc chloride is not satisfactory because of its peculiar action on zinc. When lactic acid or ammonium lactate are used on copper or brass they will tarnish these in a few hours, because of their reaction with copper oxide which takes place at ordinary temperatures.

Ammonium phosphate in aqueous solution may be used on zinc, tin, copper, and brass but not on iron. When used in place of lactic acid, it will not tarnish copper or brass.

Hydrochloric acid is used in the soldering of galvanized iron or large zinc parts, where it reacts with the zinc to form zinc chloride. Great care must be taken to wash away the excess acid upon the completion of the joint to prevent future corrosion.

Borax and boric acid are generally used as fluxes for hard soldering at high temperature. The dry crystals of borax fuse and form a glasslike coating with the oxides which are dissolved by virtue of the boric acid present.

Glass or sand, finely powdered, is often used in hard soldering, the oxides being dissolved by virtue of the silicic acid present.

Phosphoric acid, in a solution of alcohol, has been successfully used as a flux, the acid dissolving the metal oxides.

Ammonia, when used on brass, acts as a flux by reducing the oxides.

Soldering Compounds

In commercial work, with some few exceptions, it is usual to find fluxing compounds containing one or more of the above constituents. These compounds may take the form of liquids, fats or pastes, or solid sticks or powders.

Soldering liquids or fluids. The so-called soldering fluids for ordinary work usually consist of a solution of zinc or ammonium chlorides to which has been added alcohol and glycerin in about the following proportions:

(a)

Saturated solution of zinc chloride	5 parts
Alcohol	4 parts
Glycerin	1 part

The alcohol aids in the cleansing of the metal surfaces and the glycerin assists in giving the solution fluidity and adhesion to the joint when applied.

(b) A similar flux is obtained as follows:

Zinc chloride (neutral)	27 parts
Ammonium chloride	11 parts
Water	62 parts

(c) Mueller's Soldering Fluid consists of

Phosphoric acid solution	1 part
80% alcohol	1 part

(d) For the soldering of tinned iron, when it is not desirable to apply the rosin in powdered form, the rosin may be dissolved in alcohol, benzine, turpentine, or sweet oil. If the latter solvent is used, the disagreeable odor of benzine is avoided and the solvent does not evaporate on expcsure to air. The benzine and alcohol, however, aid in the cleansing of the metal surfaces.

Soldering fats or pastes. For the soldering of cooking utensils and the like, where the gummy residue left by the rosin flux after soldering is objectionable, soldering fats are often used, whose residues are greasy and may easily be wiped off. The soldering fats consist generally of a base of rosin, tallow, and olive oil to which has been added a small quantity of sal amoniac or zinc chloride. Good proportions are as follows:

For soldering tin plate, melt together 150 parts beef tallow, 250 parts rosin, 150 parts olive oil and add 50 parts of sal ammoniac dissolved in as little water as possible.

To give this a pasty consistency, reduce the amount of rosin.

The so-called acid-free pastes to be found on the market are probably nothing more than the above compound with slight variations in proportions. Very often a vaseline base is used. Even though they are advertised as "acid-free" they should be looked upon with suspicion since the sal ammoniac if allowed to remain on the completed joint may have a corrosive action.

For soldering iron, 50 parts olive oil, 50 parts powdered sal ammoniac.

For soldering aluminum melt together 50 parts rosin, 50 parts tallow and add 25 parts zinc chloride.

Soldering sticks are made in much the same manner as the soldering fats or pastes through the addition of sufficient rosin to permit the compound being cast into sticks upon cooling. The disadvantage in the use of a stick in soldering is that the flux must be applied by melting it upon the heated metal of the joint to be made, thus encouraging oxidation before the flux can take action.

Soldering salts or powders. Rosin in powdered form may be applied directly to a tinned iron joint in soft soldering.

The so-called commercial soldering salts are probably nothing more than powdered rosin and zinc or ammonium chlorides together with some base material.

Borax used in hard soldering is usually applied in a dry or powdered state.

Powdered glass or sand used in soldering iron at a red heat is applied in a dry state.

Soldering Methods

After properly cleaning and clamping or holding together the metal surfaces to be joined and applying the flux, the joint may be heated either by the direct application of the flame of a blast lamp or blow torch or by the application of a soldering "copper" or "iron," which has been previously heated. The use of the "copper" is advisable in interiors and in close quarters where there is danger of igniting other materials by the flame of the torch.

Whenever possible in soft soldering, additional mechanical strength should be given the joint by clamping, such as by a twisted wire joint, a clamped seam in sheet metal, etc., the solder serving principally as a locking or sealing medium. In hard soldering or brazing work, the solder is mechanically strong enough to withstand such strains as the metals may be subjected to.

In using soldering "coppers," the life of the copper is greatly shortened if it is allowed to overheat in the flame of the blow torch or in the furnace, by excessive oxidation and consequent scaling. If it is badly overheated it may be necessary to file off the oxide and smooth the point after which it will be necessary to "re-tin" the point or tip. This is accomplished by heat-the copper to its proper temperature, and coating with solder, by rubbing it on the solder after cleaning by contact with soldering flux or preferably with ammonium chloride.

Blow torch manipulation (see Croft, Am. Electrician's Handbook, p. 103).

In hard soldering it is preferable to clamp the two edges or metal parts in proper relationship, place the borax flux upon the joint, heat with a blow pipe or torch, and when the joint is sufficiently hot, apply the solder.

The spreading of solder upon a brass or copper surface may be prevented by painting the surface around the soldering zone with a weak solution of water glass over which the solder will not flow.

For removing enamel insulation from magnet wire previous to soldering it has been found satisfactory to burn the insulation from the wire at the desired point and then clean the copper surface with nitric acid. The excess acid should be carefully washed off before using flux and solder.

In soldering cables or wires into lugs it is first necessary to tin the recess in the lug by heating and applying flux and solder. The end of the cable or wire should be similarly tinned. By applying heat to the lug and partly filling it with solder, the process may be completed by plunging the tinned cable end into the lug and cooling it while holding it in position. Only enough solder should be placed in the lug to completely fill the space around the wire or cable. If more is used, it will overflow and adhere to the outside of the lug unless this be first covered with a coating of light oil of high flash point.

The soldering of aluminum has always been attended with difficulty for the reason that metallic aluminum oxidizes almost instantly upon exposure to air. The difficulty has, therefore, been to obtain a satisfactory metallic contact between the solder and the aluminum. A satisfactory manner of soldering is by first cleaning the aluminum surfaces thoroughly of grease and dirt with benzine. The following solder is then applied with a "copper." After the molten solder has covered the surface, it should be scratched through with a wire brush to break the oxide on the metal surface. Quick manipulation is necessary. A satisfactory solder for this purpose is

Block tin	28	pounds
Phosphor tin (10% phosphorus)	14	pounds
Lead	3½	pounds
Spelter	7	pounds

The soldering of cast iron is a difficult process for the reason that it is difficult to obtain a uniformly adhering soldering surface. A smooth cast iron surface contains numerous small particles of carbon which interfere with a satisfactory joint. To clean cast iron surfaces for soldering, especially in corners or openings in which it is difficult to scrape or brighten mechanically, a thorough acid pickling followed by a lavish treatment with strong soapsuds will be found satisfactory in many cases.

In soldering iron to cast iron a flux consisting of equal parts of cast iron filings and calcined borax may be used. The black glassy mixture should be pulverized and spread on the joint as a powder.

Acknowledgments for suggestions and comments obtained in connection with these notes are extended to Professors A. L. Goodard, O. L. Kowalke, and F. C. Krauskopf of the University of Wisconsin.

EDITORIAL

THE COMMERCIAL AIR-CRAFT

A new industry has been born of the war. The development of the aeroplane, induced by military necessity, has been greater in four years of war than even the most optimistic dared to expect in ten years of peace. We cannot attempt to catalogue even a small portion of the many achievements that have recently been made. Suffice it to say that aeroplanes have already been constructed and successfully flown which will carry eighty men and that the Atlantic Ocean, from present indications, will soon be bridged with air liners capable of carrying a score of persons. In addition to this, the United States government has just developed a method of manufacturing helium on a commercial scale. This gas, which has almost the same lifting power as hydrogen, may be used in dirigible balloons, and has a great advantages over hydrogen in that it is not inflammable. This eliminates the greatest drawback of the dirigible, and it is highly probable that the future will see a rapid development of this method of aerial navigation.

It is almost a certainty that the air-craft industry is destined to be an important factor in the commercial world, and the men who get into the game early are going to reap big rewards. Mr. Ogden, in his article, run elsewhere in this issue, has pointed out the lines along which many men think that the aeroplane will be developed. Air-craft development has passed out of the hands of the inventor, and is now in the hands of the skilled designing engineer, and the scientist. Many men, and many years, may yet be needed before the air-craft industry will take its place along with other great industries, and before air transportation will compete with land or water transportation, but "as surely as night follows day," the old must give way to the new, and the big opportunities are always with the rising industries.

G. B. W.

THE MIXER

Plans are under consideration for an Engineer's Mixer. For the benefit of the 282 freshman engineers, we will explain that the Engineer's Mixer usually mixes the students and the faculty pretty thoroughly and is a real, large time. The engineers are credited with having more than the average college spirit. The reputation is founded on the fact that we know each other intimately from frosh to prof, and we sticken side by each. The Mixer will be an opportunity you cannot afford to miss. Take our word for it even if you have doubts about the matter, and keep the date open. Watch the bulletin boards.

THE DANCE

It is time that the Engineers came forward with their annual dance. Lets make it a real one this year. No war to worry us and we should go into it with the spirit that will make it a long-remembered affair. Here is a chance to combine pleasure and duty. Don't wait to be pushed, come on and help us pull. Everyone come.

QUESTION: WHAT IS A PATRIOT?

Perhaps you have noticed, among the items of interest uncovered during the investigation of the so-called Security League, the statement that Nutts McElroy, the nation's little patriot, received, for such services as he rendered to his country in her hour of peril, the modest stipend of TEN THOUSAND DOLLARS per year. Ten thousand iron men! Think of it. Ten thousand, for going up and down the land in Pullmans and calling men in uniforms, "damned traitors." Let me see, Percy, what was the emolument pertaining and attaching to your job as buck private,—thirty dollars? Ah, yes! I stand corrected. "Thirty dollars every month,—deducting twenty-nine." One man gets thirty dollars per month (part of which he actually receives) for bleeding and dying for his country; another gets ten thousand a year for pleading and lying. Yes,—we admit it—the incident still rankles.

WISCONSIN TRADITIONS

Now that the S. A. T. C. has disbanded and the University is returning to the normal order again, it is time that the student body took an interest in the traditions of their Alma Mater.

During the last year or so the freshmen have been allowed to break nearly all of the rules which are held as traditions at Wisconsin. This was natural because some of these are in direct conflict with military rule. Now that the military times have passed let us make sure that the traditions shall return with as much force as they held in past years. Every upperclassman is responsible and it is up to him to do his share. W. B. B.

BREAKING INTO THE GAME

For years the engineering profession has been agitated about its "status." After sitting by for a reasonable time, waiting for a grateful world to walk up, acknowledge our worth, place the bay upon our perspiring brows, and pile willing tribute at our feet, we have suddenly decided that we will have to hustle around and corral whatever of honor, power, and emolument our souls crave. The world seems to be too busy with its own selfish affairs to see to it that engineers get all they think they should have. Bien! The reconstruction period is the logical time to start something; therefore, we find that steps are being taken to break into the game. We have been told that the engineer is fitted by training to direct public affairs and that he should take an active part in them. Here and there an engineer has been able to do so, but there has been no concerted effort to make our opinions felt. There are 100,000 of us but we have acted as units in spite of our great engineering society organizations. Now comes the Engineering Council and establishes a National Service Committee which will be located at Washington and will furnish "instant, active, and constant representation of engineers at the seat of the National Government." It is a wise and hopeful step. With the Committee on Development to decide what we want and the National Service Committee to get it for us, our "status" is looking up. L. F. V.

ALUMNI NOTES

By ETHAN W. SCHMIDT

ENSIGN G. L. BOSTWICK, e '17, has been on the Destroyer Conyngham for nine months, on convoy duty, running in and out of England and France. He is reporting back to the Boston navy yards.

BOB CONNELLY was a recent visitor to Madison. Bob went into the flying game and became a pursuit flyer. He finished first in his group and, therefore, was made instructor in aerial acrobatics and kept in this country. He didn't get across himself, but he did send lots of other men over the water. He has been at nearly every flying field in the country and has done more or less exhibition flying besides. If any of you visited the War Exhibit in Chicago last summer, you probably saw him in the air as he was one of the group of flyers that thrilled those Chicago crowds.

PROF. J. G. D. MACK, state engineer, was appointed by Gov. E. L. Philipp as delegate to the national rivers and harbors congress in Washington, Feb. 6–7.

WILLIAM ERICKSON, former staff member on the ENGINEER and now training for naval officer, is aboard the S. S. Virginia, a tanker. He sends a postcard from Port Arthur, Texas.

PERRY T. FESS, c '14, is taking the naval training at Stevens Institute. He expects to complete the course.

HENRY GUMPRECHT, c '18, who was instructor to the vocational students in surveying during the first quarter, is now with the Aluminum Company of America, in charge of a topographic party at Maryville, Tenn.

F. S. HALLIDAY, c '13, Chief Engineer of the Green Bay and Western R. R., was in Madison, Jan. 7. He is married and has a boy, Franklin, two years old. Apparently one railroad and a family isn't enough to keep him busy for he is also raising some fancy cattle.

S. L. HOUGHTON, min '14, was a visitor during January. He has been with the Engineer's Corps on harbor work in France. He has now been ordered to Cuba for further service.

PROF. J. D. MACK'S son William was in Madison just after Christmas. He was gassed at the opening of the great allied offensive along the Marne salient last July, and has been in the hospital ever since. He appears to be well but has not yet been discharged.

LT. A. W. MEISELWITZ, c '18, visited the University early in January. He was commissioned in the C. A. at Ft. Monroe, and was later stationed with a battery in Alabama.

MAJ. LEWIS E. MOORE, Corps of Engineers, U. S. A., who was in charge of heavy highway bridge work with the A. E. F. in France, has returned to the U. S. and been discharged. He has resumed his duties as engineer of the Massachusetts Public Service Commission.

LT. FRANK S. MOULTON, c '17, returned to Madison shortly before Christmas. He was stationed at Montgomery, Ala., with a field artillery unit. He is back at his job with the state architect in the Capitol.

LT. L. B. NASH, e '17, has spent the past nine months on the U. S. S. Roanoke, mine planting in the North Sea. He is now reporting back to the Portsmouth, N. H., navy yard, and hopes to be discharged soon.

M. A. POWERS, ch '17, has resigned his commission as 2nd Lieut. in the Aviation Section and has resumed his duties with the New Jersey Zinc Co., at Palmerton, Pa.

CLARENCE W. SCHMIDT and HOWARD H. FULLER, both e '18, have received their commissions as ensign after a course at Stevens.

JOSEPH P. SCHWADA has resigned from the Emergency Fleet Corporation and is back with the Engineering Staff of the Wisconsin Railroad Commission.

HAROLD N. SHAW, e '18, is still at Stevens completing his training.

ENSIGN K. G. SHIELDS, m '18, received his commission on January 18, after taking the course at Hoboken. He was a recent visitor while awaiting assignment.

EARL R. STIVERS was commissioned lieutenant on Sept. 11. He was in command of a replacement company with orders to sail on November 11, when the armistice was signed. He has since been discharged.

LT. EDWARD THWAITS, ex '19 civil, visited Madison for a few days about February 1. He was commissioned in the F. A. at Camp Taylor and instructed in the O. T. C. until shortly before Christmas. He will take a position with the Texas-Wisconsin Oil Co., and will live in Madison for the present.

W. H. WETZLER, C. E. '10, is now Principle Surveyor of concrete ships for the American Bureau of Shipping, New York City.

JOHN WESLEY WILLIAMS, graduate of the chemical engineering department of the university, has been appointed superintendent of the ammonia department of the government's $30,000,000 nitrate plant at Sheffield, Ala. The plant will produce nitrates in peace time and constitute an "insurance policy against war," as its product would prove more valuable in case of war than several battleships, it is said.

J. G. ZIMMERMAN is now with the Jefferson Electric Mfg. Co. at 426 South Green St., Chicago. He will have charge of the research and development work along ignition lines.

Remember the Pal, you old timers? It used to be located where Blind & Sander's shoe store now is. Then, about 16 years ago, it moved across the street into quarters that were then the *dernier cri.* Now it is to be moved once more,—this time to 20 N. Carroll St., on the Square. Time was when the Palace of Sweets was famous, not only in Madison but throughout the state; now it has many pretentious rivals. Time was when you could take a co-ed there and be a regular fellow for about twenty cents; but now,—well, just kiss that four bit piece good bye when you hand it to the fair waitress.

JOHN MURRAY RAY, c '13, C. E. '16, died at his home in Rogers Park, Chicago, on December 13, 1918, of pneumonia, after only a few days illness.

He was born November 29, 1889, at Attica, Indiana, where he spent his boyhood and where he went to high school. He entered the University of Wisconsin in the fall of 1909, and quickly surrounded himself with a circle of warm friends, at the same time establishing a reputation as a hard worker and a keen student. He was a member of Triangle.

During the vacations of his college days he worked in the west with the U. S. Geological Survey. After graduation, he joined the staff of Sloan, Huddle, Feustel, and Freeman, consulting engineers of Chicago and took up valuation work. About a month before his death, he went with Baehr & Co., consulting engineers.

He married Bertha Day Poole of St. Paul in 1914, and had one child, John Murray Ray, Jr., born in 1917. Besides this family, he leaves a brother, Lt. Myron T. Ray, Commerce '14, and two sisters, Florence and Martha.

Keen, clean-cut, and public spirited, Murray Ray was rapidly developing into one of Wisconsin's most sturdy sons. His untimely death has created a feeling of profound regret and loss among his many college friends.

CAMPUS NOTES

By WILLARD B. BELLACK

Awfully warm for January, wasn't it, my dear?

Even the upperclassmen, with their corduroy trousers, managed to get through the month without the usual shivers and shakes.

But the nice weather was all lost to that lawyer. He wouldn't venture out for fear of the gibes from the steps of the E. B.

Won't some one start a dental school or something to give us a little opposition?

Spring is on the way and St. Patrick's day is coming. Erin go braugh!

No sooner was the January ENGINEER placed on sale than Clif Ives comes hammering upon the editorial door. "Come in, Clif," says we. "Blankety-blank-blank!" says he. "Say, where do you get this stuff about you and Mantonya building the good ship Cardinal, hey?" says he, "Don't I get any credit for my hard labor on that barge, hey?" "Stop your heying," says we "and we'll apologize." And so we do. Be it hereby known, therefore, that the U. S. S. Cardinal, pictured in the January issue, from anchor to poop-deck, is the creation of the aforesaid Clif. He designed, constructed, and launched the clumsy scow, and we wish he'd take it and go away and chase Germans with it, and leave us alone.

The CIVIL ENGINEERING SOCIETY held its first meeting of the year on January 30. CAPT. CORP spoke about his experiences in the Sanitary Corps at Camp Kearney. The society is planning some rather ambitious stunts for the coming months.

Prof. L. S. Smith's course in CITY PLANNING is proving popular with "hill" students. The class numbers 101, many of whom are women students. Nearly all are upperclassmen and they represent four colleges. There are only ten engineers registered. The course is given in Room 304 of the Physics-Economics Building.

"But yesterday . . . once more was the fearsome feud between the engineers and the law school renewed with terrific violence. Since the time when peg-top breeches were in style, and the law school was overflowing . . . has this subtle gorilla warfare existed." (*Madison Daily Paper.*) Guess that little co-ed reporter is trying to make a monkey of us, eh Al?

The FRESHMAN ENROLLMENT in the College of Engineering is divided as follows:

Electrical	90
Mechanical	69
Civil	54
Chemical	53
Mining	15
Architecture	1
Total	282

TAU BETA PI

The following men have been elected to Tau Beta Pi: Roland A. Ragatz, ch, High Junior; Erwin C. Brenner, ch '19; Paul Huntzicker, e '19; Walter A. Koehler, ch '19; Emil F. Stern, m '19; Edward O. Werba, min '19; Lawrence P. Works, e '19.

In past years it has been customary to celebrate St. Patrick's Day with a minstrel show or the renowned Engineer's Parade. Last year a parade was arranged, but preparations were not begun until late. Because we are rapidly returning to pre-war standards and reviving old customs, this tradition of ours should be brought to the attention of the entire university by means of an exceptionally good festival. It is perhaps too late to begin

BACK TO NATURE

"Why is it, Sam, that one never hears of a darky committing suicide?" inquired the Northerner.

"Well, you see, it's disaway, boss: When a white pusson has any trouble he sets down an' gits to studyin' 'bout it an' a-worryin'. Then firs' thing you know he's done killed hisse'f. But when a nigger sets down to think 'bout his troubles, why, he jes' nacherly goes to sleep!"—*Life.*

preparations for the minstrels, which "took the can of corn" in the old days. However, some feasible stunt must be decided upon, and then every man in the college will have to push with all his might, in order to make it an event of historical importance. Let's see action begin early, and let's have a good scheme planned in advance,—then enlist everybody's energy to "whoop 'er up."

The Student Section of the American Society of Mechanical Engineers held an initiation on the evening of January 30th. The initiates outnumbered the old members, but were given a warm reception just the same. Several of the Juniors will remember that night for the rest of their natural lives. After the initiation, Prof. Berggren delivered a short address upon the value of engineering societies to the students, and Prof. Larson also said a few words, after which came the doughnuts and apples.

The fifth edition of JOHNSON'S *Materials of Construction* has just been issued. This edition has been rewritten by PROF. M. O. WITHEY, associate professor of mechanics at this university and JAMES ASTON, e '98, Ch E '09, metallurgist with the A. M. Byers Co. of Pittsburgh, and edited by Dean F. E. Turneaure. A review will be given in the near future.

The MINING CLUB held its initiation January 17, in the Mining Laboratory, which offers unusual facilities for stunts and noise. After the paddles had been carefully checked as to dimensions and applied to the new members, a dinner was cooked in the lab furnaces. Broiled steak and fish, baked potatoes—Irish and sweet—(um-m-m, Oh Boy!), coffee, and rolls constituted the menu. Maj. Fitzpatrick, secretary of the State Board of Education, spoke on Mining Education, a subject to which he is giving special attention. Prof. Winchell of the Geology Department also spoke, and Slaker and Werba told of their experiences last summer in Cuba. And, by the way, why is that man Werba so very anxious to go back to Cuba when he graduates?

MR. H. C. BALCH and G. H. LIPPERT, who instructed in surveying during the first quarter, have resumed their practice as architects. They are located in Madison.

ODE TO MAZUMA

Little bankroll, ere we part,
Let me hug you to my heart.
All the year I've clung to you,
I've been faithful, you've been true;
Little bank roll, in a day,
You and I will go away
To a gay and festive spot;
I'll come home, but you will not.

Call Field Stablizer.

PROF. EDWARD BENNETT discussed the *Losses in the Low Radio Antenna,* on January 10, before the local section of the A. I. E. E. The discussion was lead by PROFESSOR TERRY and MR. CROTHERS.

LT. W. CHISHOLM, instructor in pattern making, has returned from the University of Illinois, where he was engaged in teaching aerial machine-gunnery, and has taken up his work in the shops.

PROF. JESSE B. KOMMERS has an article in Engineering News of January 2, entitled *Beam Deflections Under Distributed or Concentrated Loading,* in which he proposes a new algebraic method for computing deflections which he says compares favorably with the graphical method, both in time required and in accuracy.

PROF. D. W. MEAD has recently received orders for 1500 copies of his book on *Water Power Engineering* to be used by the army in France.

Ever and anon the editorial sanctum is graced by a visit from some charming co-ed in search of a copy of the ENGINEER. Just what the attraction may be is more or less of a mystery. We are considering the advisability of starting a Woman's Page. Can we staff it?

LT. MILTON M. BRAMLETTE, mining soph, who was in the flying section of the Signal Corps, has re-entered school.

G. H. CHAMBERLAIN, soph civil, has returned to school after taking a course at the O. T. C. at Toronto, Canada. He has completed the course and was on his way across the water where he was to take a finishing course before receiving a commission, when the armistice was signed. He spent seven weeks in England looking around before he returned.

R. I. DRAKE, senior chemical, has returned to school. He made 11 trips across the pond as second-class electrician in the transport service.

LT. EVERETT L. GRUBB, mining soph, has returned to complete his work. He served in the Artillery Corps.

LT. RAY HEFFERNEN, junior civil, has returned to complete his work after 12 months in France with the field artillery. He took an active part in the fighting at St. Mihiel and in the Argonne.

HE KNEW THEM

A young British private was on night guard at a lonely outpost in France, when suddenly he heard the tramp of an advancing regiment. "Halt!" he called. "Who goes there?"

"Irish Fusiliers."

"Pass, Irish Fusiliers, all's well."

Silence reigned for some minutes and then he heard another regiment advancing. "Halt! Who goes there?"

"London Scottish."

"Pass, London Scottish, all's well."

For some time there was silence, and then another regiment was heard. "Halt! Who goes there?"

"None of your d—— business!"

"Pass, Canadians, all's well." *Ladies Home Journal.*

MAURICE M. HANSON, senior civil, who edited the S. A. T. C. section of the Badger, has recently been appointed fraternity editor also. If Moose puts the same punch into his Badger work that he put into selling ENGINEERS to the S. A. T. C. men, it will be a humdinger.

SGT. H. C. KNAPP, junior chemical, has returned to finish his course. He has been an instructor in the Marine Corps. Basketball prospects will now look up.

GEORGE KNOBLAUCH has not been able to return to school this quarter as he hoped. His address is 123 East 8th Street, Ashland.

STUART C. LAWSON, mining '17, has been appointed instructor in Mining Engineering and will be in charge of the Mining Lab. He has been with the Dupont Company.

LT. IVAN C. MILLER, junior chemical, is back in school. He spent some time as instructor of aerial acrobatics. Recently he has been stationed at Dayton, engaged in testing new machines. Only three out of thirteen men who went into the game with him are now living.

CORPORAL CASER V. LOOMIS, soph electrical 1916–17, has been cited for bravery and will receive the D. S. C. He enlisted in the Marine Corps the day war was declared, and got into the fighting early.

During an enemy attack, Corporal Loomis voluntarily left a sheltered position, and, in entire disregard for his own safety, set up his machine gun in the open under heavy enemy fire. By securing enfilading fire on the advancing enemy, he broke up the counter-attack within 100 yards of the American lines.

Made a call on Prof. Goddard in his sanctuary the other Friday afternoon and what do you suppose we saw? Co-eds! Nearly a dozen of them. The lathes were squeaking nervously, but to no avail. Each Co-ed had her sleeves rolled up and was turning out planer bolts as if they were eight-inch shells. 'Twould seem that no corner of the campus is free from her presence. Sh—sh we might tell you that one of the lathes went amiss and the fair operator said something which would have sounded very unladylike if we did not know how a lathe must be talked to.

On February 3, another of the oscillator bulbs was tested in the station in the Physics building. In working with Great Lakes with radio telegraph, tests were very satisfactory, but due to trouble with the generator, the telephone tests were not so good. Speech was audible, but not clear.