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The Wisconsin Engineer

VOL. XXI DECEMBER, 1916 NO. 3

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THE EFFECT OF SURFACE CONDITIONS UPON THE RATE OF HEAT TRANSMISSION THROUGH STEAM PIPE COVERINGS. PART II

A. D. FULTON AND R. C. PARLETT

DISCUSSION OF RESULTS

Curve 1, the total loss curve, has been plotted directly from the data obtained from the first test with painted coverings. The ordinates for any point on the curve represent total heat loss per hour, which is equivalent to the electrical energy required to maintain the pipe at the given temperature, while the abscissae are differences between pipe and room temperatures.

On the same sheet is plotted a curve of heat losses per hour from the short pipe at various temperatures; this curve is called "end correction." The difference of ordinates between the two curves at any value of temperature difference gives the net heat loss per hour from the 15 feet length of covered pipe. This net loss divided by the temperature difference and the area of the test section (22.03 square feet) gives the heat loss per degree temperature difference per square foot per hour.

The curves of net heat losses per degree temperature difference per square foot per hour are shown on the same sheet as the total heat loss curves, but to a much larger scale. These curves show that the heat loss is much less for a covering painted with two coats of cold water paint than for a plain canvas cover. A decrease in the radiation was, of course, expected, but not to such a marked degree. The curves further show that this decrease in heat lost from the covering per degree difference per square foot per hour becomes smaller as the temperature difference is increased. Stating this in another manner we may say that as the temperature difference between the pipe and the room is increased the painted covering loses heat at a greater rate than the unpainted surface. The decrease in heat loss per degree difference per hour per square foot of the painted surface over the plain surface varies from 5.89 per cent at 0 degrees difference to 1.35 per cent at 500 degrees difference. With steam at 150-pound pressure gauge, and the room at 72 degrees Fahr. a saving of 2.45 per cent would be effected by the use of

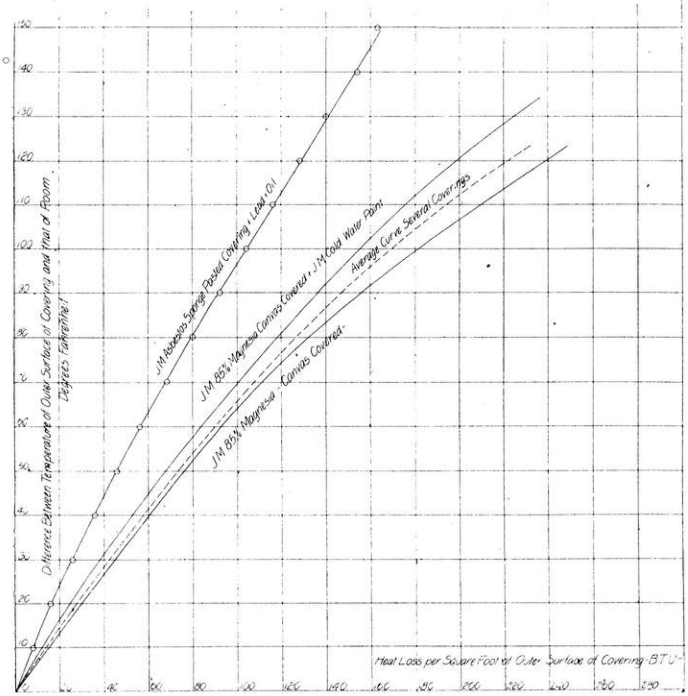


Fig. 3

cold water paint. Whether this saving is economically justifiable will depend upon the operating conditons, the cost of paint, etc.

The results of the second test with painted coverings have been plotted in curve sheet 1, in the same manner as those in the first test. From an inspection of the points plotted for the total heat loss curve, when the covering had been given one coat of flat white (lead and oil) paint, we find that the points fall on practically the same curve as for the loss from the plain covering. This shows that one coat of flat white (lead and oil) paint is of no practical value as a heat insulator. This is true since one coat sinks right into the covering and does not fill the interstices of the canvas as do the two coats of flat white paint in the first run. Two coats of this paint would probably show a marked decrease in the heat loss.

The full line curves on sheet 3 are plotted from the data of runs 1 and 2. The ordinate is the difference in degrees Fahrenheit between the surface of the covering and the room and the abscissae is the heat loss per square foot of outer surface of the covering. This was obtained in the following manner: the loss per degree difference (pipe-room) per square foot of pipe per hour, was obtained from curves 1 and 2, and this was multiplied by the temperature difference to get the total loss of the 15 feet section per square foot of pipe per hour; this value was multiplied by the ratio of the pipe area to the outside area of the covering (or ratio of radii), and the result gave the total heat loss from the 15-foot section per square foot of outer surface of the covering per hour.

The broken line curve in Figure 3 represents the average curve of six different coverings of the most diverse conductivities and shows that the rate of heat loss from a surface in contact with the air depends not directly upon the conductivity of the material beneath the surface but upon the character of the surface and the temperature difference between the surface and the air. This curve is the result of tests by McMillan and is of wide application to coverings with plain canvas surfaces.

The effect of painting the covering with two coats of cold water paint is shown by the two curves for J. M. 85 per cent magnesia. The test with the plain canvas covering is shown in a curve which falls just below the average. When the covering was painted with two coats of cold water paint this function of temperature difference changed considerably, as is shown by the curve above the average curve. The former curve shows that the heat loss per square foot of outer surface is less for the painted surface than for the plain surface at the same temperature difference and further that this decrease in heat loss is greater the greater the temperature difference.

The test with lead and oil paint shows a remarkable change in the function already described. Although the heat loss is practically the same for difference of pipe and room temperature as shown by curve 2, the heat loss per square foot of outer surface of covering decreases a very large amount for any constant temperature difference between outer surface and room. This decrease must be compared with the average curve since there were no data from which to plot the curve for J. M. asbesto-sponge covering with a plain canvas covering. It is seen

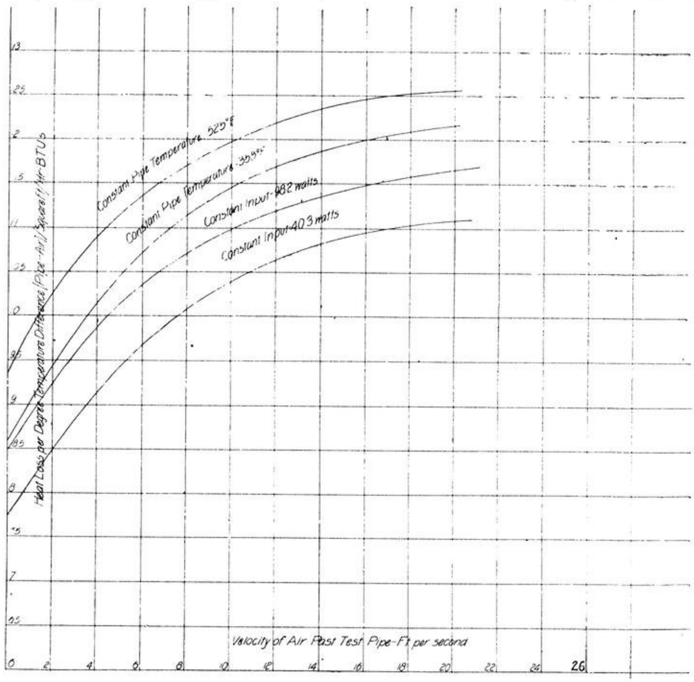


Fig. 4

that this decrease in heat loss increases rapidly as the temperature difference between covering and pipe increases.

The reason for the marked change in the function for painted surfaces may be explained as follows: the painted surface would ordinarily radiate less heat at the same temperature than would a plain canvas cover, but since more heat would come through the covering than could be radiated at that temperature, the temperature of the surface would be far higher than if it were plain canvas; consequently the temperature difference between the room and covering would be increased and would thereby change the curve.

The last readings of both runs were taken under the same conditions, except that the humidity was increased in one case from 26 per cent to 95 per cent and in the other from 29 per cent to 78 per cent. The first case shows a decrease of one-tenth of one per cent in the heat loss per degree difference (pipe-room) per hour and the second a decrease of 1.89 per cent due to the increased humidity. Since the second test was not as uniform as the first, we would conclude that the effect of humidity if any is so small as to be negligible in actual practice.

The results of the tests to determine the effect of air currents have been plotted in Figures 4 and 5. The ordinates of each curve are the heat losses per degree difference in temperature between the pipe and the air, per square foot of pipe surface per hour. The abscissae are the velocities of the air in feet per second past the pipe. The heat losses are thus obtained directly from the readings of input, there being no corrections in this case, by dividing by the temperature difference and by the total area of the short pipe (2.657 square feet). The velocity of the air past the pipe was obtained by dividing the cubic feet of air per minute discharged from the fan at the known R. P. M. by the free area between the covered pipe and the barrel (1.726 square feet) on curve 4. With the bare pipe, as in Figure 5, the cubic feet discharged per minute were divided by the free area between the bare pipe and the barrel (1.913 square feet) to obtain the velocity past the pipe.

Figure 4 shows that for constant pipe temperatures the heat losses from a covered pipe increase as the velocity of the air is increased and that this increases very rapidly at low velocities, whereas at higher velocities the increase is very gradual. For this reason we can see the importance of knowing the velocity of the air past any pipe, since the loss is increased greatly at the low velocities found in actual practice such as conduits and tunnels. From the two curves of constant temperature it would seem that the heat losses increase at the same rate, no matter what the pipe temperature.

The curves showing the heat loss at constant input seem to indicate the same rate of increase in the losses for all inputs. The increase in losses at constant pipe temperature at six feet per second, which would probably be the maximum obtained in a tunnel under ordinary conditions, is 20.9 per cent over the loss at zero foot per second. This increase in losses at low velocities is practically the same as thought by Professor Carpenter,[1] and it is of such amount as to be seriously considered in tunnel or similar installations.

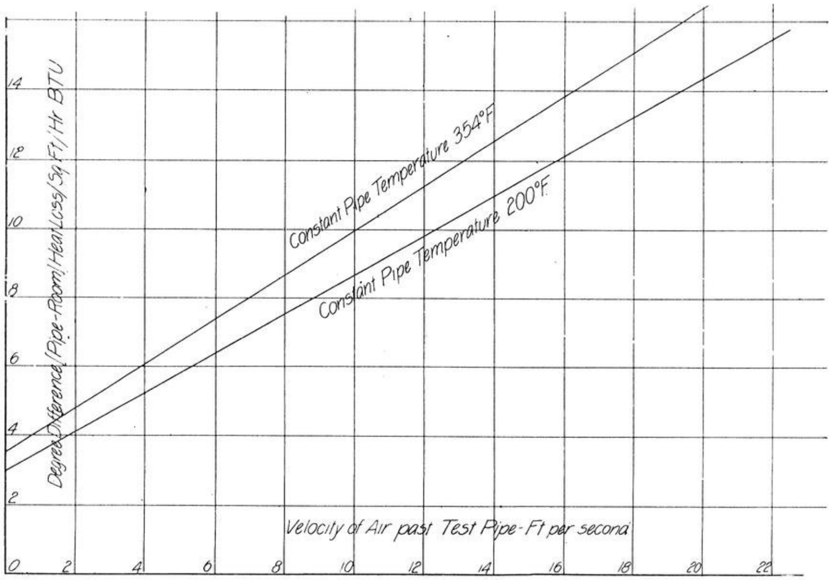


Fig. 5

The losses from the bare pipe of course increase more rapidly, as shown in Figure 5. The results seem to indicate that the rate of increase is practically the same at different pipe temperatures and that this increase furthermore is also almost in direct proportion to the velocity of the air past the pipe.

Summing up the results of the test we may say that the effect of humidity on the heat loss is negligible; but the effect of changing the character of the surface of the covering of a steam pipe, and the effect of the velocity of the air past the pipe is large enough to warrant careful consideration in determining heat losses in plants under these conditions.

[1] Transactions A. S. M. E., Vol. 19.

THE MISUSE OF ENGINEERING DEGREES

Albert M. Wolfe, C. E. '13
Principal Assistant Engineer, Condron Co., Chicago

It is frequently stated that an engineering degree conferred by a college or university is of no value. To prove directly that it is, is rather difficult, but the very fact that men who have had only practical experience in engineering appropriate degrees for themselves by "tacking" a C. E., M. E., or E. E. to their names is evidence that a degree must have some value. In this paper the writer wishes to bring out the following points on the misuse of engineering degrees: (1) the actual conditions caused by this misuse; (2) the cause; (3) the effect; and (4) a proposed remedy.

There is no doubt that misuse of engineering degrees has worked to a large extent to cloud the conception of the average person as to what the word engineer actually means. Moreover, owing to the broad classification of engineers, which adds to this confusion, the general public has little or no conception of this word as compared with such terms as lawyer, physician, or architect. People in small country towns are accustomed to hear the county surveyor, who in the majority of cases never had a theoretical training, referred to as the Civil Engineer, and so in addressing him, they add the letters C. E. for the sake of boosting up his pride. Then, too, the men engaged in the electrical trades are also frequently referred to as Electrical Engineers. While a great number of other instances of wrong application of titles could be cited, this really is unnecessary, for the tangled condition of the engineering profession as concerns titles is only too evident.

Various engineering colleges and universities, which by no means measure up to the standards set by larger schools, have done more than their share in contributing to this condition by conferring advanced engineering degrees to the graduates of their four year courses. Instead of giving graduates a degree of Bachelor of Science, which is all that they should give, they confer the more high-sounding degree of Civil Engineer, Mechanical Engineer or Electrical Engineer. As a consequence, there is considerable misunderstanding in the minds of those who have come in contact with engineers as to the real value of advanced engineering degrees. It can hardly be questioned that the value of the C. E. degree conferred by any one of the great universities denotes a higher standard of engineering knowledge than the same degree conferred by some small and seldom heard of college or correspondence school. The graduates of larger universities are therefore placed under a handicap, since the person not acquainted with the facts of the matter has no means of separating the "sheep" from the "goats." It should not be inferred, however, that good men are not graduated from small schools, but it should be well understood that the rank and file of the small college graduates who have had much easier courses of study than the men of the larger universities are incomparable with those who have undergone a more vigorous training. As a general rule the foremost engineering colleges do not confer advanced degrees upon the completion of the four year course, such degrees being given after one year of post graduate work or in some cases only after a number of years of practical experience and upon the presentation of a thesis on some engineering subject.

All these things and the natural, independent feeling of the average engineer have led to the non-recognition of the engineering profession by the general public, for there still exists a great multitude of people, who, when the word engineer is mentioned, immediately picture in their mind's eye a locomotive engineer, a surveyor, or a steel erector. In many cases the engineer does not move in the social plane which is in reality his, because most people are "silently grave at the risk of constant contact with such rough individuals."

As Mr. Whinery said in an address before the American Institute of Consulting Engineers on December 18th, 1912, the scope of the engineering profession is by no means definitely fixed. Mr. Whinery strikes the right chord when he says, "In the first place, it is necessary that the boundaries and limits of the profession shall be distinctly marked out. There must be some way of distinguishing between those who belong to it and those who do not.

"In this respect the profession of engineering is not anomalous. In law, medicine and the ministry it is required that there shall be some public, formal recognition and record of a man's right to admission as a member of the profession, involving also the power to terminate that right. This is wholly absent in the engineering profession. Any man, regardless of his competence or incompetence, or of his moral character, may hang out his sign as engineer, put a professional card in the engineering papers and pose before the public as a member in good standing. So long as he does not violate the civil or criminal laws, or trespass upon the accepted rules of morality that apply to all men in common, neither the state nor the profession can exercise any control over him. The public can only judge of his character and professional ability by his general reputation, just as it would in the case of an ordinary mechanic. There exists at present no power or authority either in the state or the profession to dispute his pretension or to brand him publicly as an impostor, and anyone bold or rash enough to characterize him properly may be prosecuted for slander. There is, in short, no such legal offense as engineering malpractice.

"It may be said that membership in reputable engineering societies is a sufficient passport to good standing in the profession, and the reserved right to expel an unworthy member, is a sufficient safeguard for the protection of the public. But admission to such a society is not a public notice in the official sense; and it is a rather singular and impressive fact that no man has ever, so far as I am aware, been expelled from any one of the leading engineering societies for incompetence or unprofessional conduct. Among so large a membership as these societies possess it would be surprising if no one had ever merited such expulsion. The absence of such cases is doubtless due, not to any lack of a disposition to act, but to the fact that no positive, authoritative and comprehensive code of practice and ethics has been formulated upon which a conviction could be based.

"The simple cold fact is that beyond vague impressions in the mind of the public and a fond fiction in our own minds, there is no adequate public or legal recognition of the profession of engineering. It is true that our engineering schools confer various engineering titles upon their graduates, which certify to their scholastic attainments, but can do nothing more, particularly since a degree in a profession that has no legal standing cannot be regarded as carrying much weight.

"If the situation here outlined be even measurably correct the conclusion seems inevitable that the first and most important thing necessary to establish and maintain a profession of engineering is the public legal recognition of the existence of such a profession, and some measure of official control of its membership by the state."

"Following, or in connection with this, there must be a sufficient degree of organization or solidarity within the profession itself to secure coherence and general unity of action. In other words, there must be adequate internal control of the profession."

The effect of all this lack of organization has been not only to lower the standing of the engineer but to reduce materially his compensation. Such a result is only natural, since the man who has had his training in "Hard Knocks College" is generally willing to work for much less than the graduate engineer. For certain classes of work such as simple surveying and laying out of work these non-technical men are no doubt as well fitted as the college bred engineer. However, the fact should always be borne in mind that very few of such practical engineers can readily solve the frequent special problems of engineering construction, whereas the college bred man will be able to surmount the difficulties in nine cases out of ten without great trouble. Employers should be willing to compensate for this characteristic at a much higher rate than they would for the "machine engineer." However, the facts indicate that the conditions in the engineering field are sorely in need of improvement.

In the writer's opinion the legalizing of the terms Civil Engineer, Structural Engineer, etc., is the only remedy, but what method of legalizing will bring the best results can not be said. In Illinois, thanks to the work of the legislative committee of the Western Society of Engineers, the structural engineers have made a long stride toward the passage of a license law for all engineers engaged in structural work in the state. This law makes it a misdemeanor for any one to practice structural engineering in the state of Illinois without a structural engineer's license—a license which is granted only to those who are qualified through past experience and practice at the time of the passage of the act or those who are able to pass the regular examination of the Examining Board. Without question this will be the means of eliminating the unfair competition of the commercial and the untrained engineer who does things by rule of thumb, or by main strength and ignorance. The results of the passage of this law are being watched for throughout the country.

If the license law method cannot be used in all states great good could be done by a national law which would specify the class of degree which the various universities could confer. Under such law all second-rate schools would be forbidden to confer any advanced degrees upon its graduates. The passage of such a law would also prohibit the conferring of advanced degrees upon any but those who have had several years of practical experience in addition to their college course. For, in the writer's estimation, a college graduate should not be allowed to style himself as an electrical, civil or other class of engineer unless he has had enough actual experience in engineering work to give him a good idea of the greater part which common sense plays in engineering work. No legislation of the kind just mentioned can be carried out by technical men acting singly or in small groups. Such work requires the concerted effort of a great body of men welded together in an organization such as the Associated Technical Men, whose one aim is to enhance the material conditions of engineers. When the time comes that the general public has the same conception of the word "engineer" as it has of the "doctor" or "lawyer," then will the engineer have less grounds for complaining of meager compensation and non-recognition.

A NEW HYDRO-ELECTRIC PLANT OF UNUSUAL DESIGN

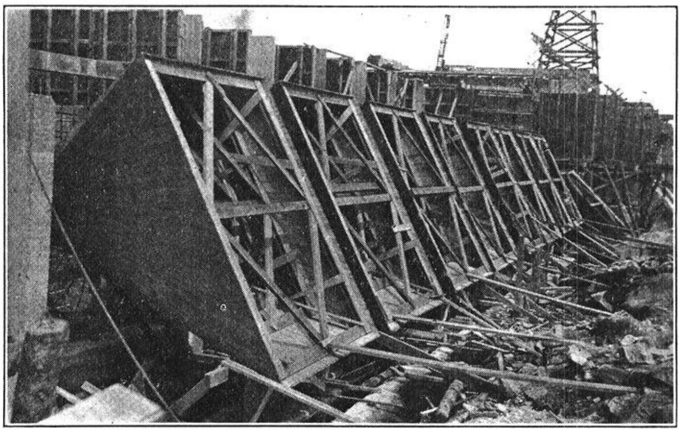
EVERETT COLE

Within the next few weeks the Wisconsin-Minnesota Electric Light & Power Company will have practically completed the concrete work on their new hydro-electric plant at Wissota, Wisconsin. Because of some new features that are being tried in America for the first time, this plant will be of unusual interest to engineers and particularly to those interested in hydraulics. When complete, the project will cost approximately three million dollars and will consist of six 6600 K. V. A. units, only three of which are to be installed at the present time. The generators are to deliver 13,200 volts, and this pressure will be stepped up to the transmission line voltage of 110,000.

Although preliminary work was begun in July, 1915, actual construction was not commenced until early in the following October. At the time this work was begun, it was thought that the plant would be ready to deliver power to St. Paul by January 1, 1917, but unexpected floods last spring not only compelled suspension of all work for some time, but also caused such extensive damage to the work completed at that time that it was practically necessary to begin the entire construction anew. It is now estimated that the plant will be in operation by March 1, 1917.

The dam will make available a head of 58 feet, and will be able to flood over 8,000 acres with the stored water. This area was purchased by the company entirely without the aid of the law—a rather creditable, but, in some cases, a somewhat expensive procedure, though it did avoid delays and troubles probably equally expensive. Approximately 60,000 cubic yards of concrete will be used in constructing the dam, power house, and spillway although the greater part of the dam is of earthwork construction and the power house walls are of brick. The power house is located on the lower side and is integral with the dam. The concrete is supplied from two mixers, the combined capacity of which is two cubic yards per minute, and is delivered to the forms chiefly by means of an overhead cableway. This cableway is suspended between two towers 1,180 feet apart, on either side of the dam, and under a full load of ten tons clears the river beds by over one hundred feet.

Two features of the construction which are unique and particularly interesting to the engineer are (1) the ten sluice tubes which discharge into the draft tube and (2) the design of the spillway gates. The ten sluice tubes are carried directly through the dam, sloping slightly downward and discharging horizontally into the draft tubes. The four middle draft tubes consist of two sluice tubes each, whereas the two end draft tubes have



only one tube each. The flow of water through the sluice tubes is controlled by means of gate valves, eight being motor operated and the other two being hand operated. These sluice tubes are five feet in diameter with a total capacity of 10,000 second-feet, increasing the capacity of the spillway, obviously, by that amount. This gain in spillway capacity, however, is chiefly an incidental result, the primary object of the tubes being to produce an "injector effect" in the draft tube and thereby to tend to increase the partial vacuum on the discharge side of the turbine. From tests which have been made on a smaller scale it is estimated that the efficiency of the turbine will be increased approximately four per cent by this arrangement. At present, efforts are being made to secure a patent on this particular type of tube. It is understood, of course, that the sluice tube will be used only when the river is supplying water in excess of that being used by the plant.

The spillway gates, thirteen in number, each sixty-four feet wide, are of the type known as the Stauwerke automatic gate. As mentioned, this design of gate has never before been used in America, but is said to be giving remarkably good service in Switzerland under conditions very similar to those prevailing at Wissota. The gate is mounted on a horizontal axis at right angles to the stream, and is so adjusted that a counterweight just balances the pressure of the water at normal level. Any slight rise of level thereby increases this pressure and tilts the gate, thus permitting a much greater quantity of water to pass through the spillway. These gates are expected to regulate the water level of the pond to within four inches of normal under all ordinary conditions, and never to allow it to rise more than six inches above normal even under the most extreme conditions. In addition to being automatic and providing close regulation, the Stauwerke gate possesses a third advantage in that it is curved down stream and hence presents a concave surface to the stream. This design prevents all clogging by drift or ice.

With these two distinctive ideas in dam construction being thus tried on a large scale, the results which the Wisconsin-Minnesota Company obtains at Wissota will no doubt be well worth the attention of all engineers interested in hydraulic power development.

THE HOSPITALIER CARPENTIER MANOGRAPH

D. W. ALLISON

For the accurate determination of the cyclic fluctuation of cylinder pressures in the internal combustion engine, the Hospitalier Carpentier manograph is used in practically every automobile and aviation engineering laboratory of any pretension in this country. It is an optical indicator, similar in many respects to the standard power indicator, in which the pencil-

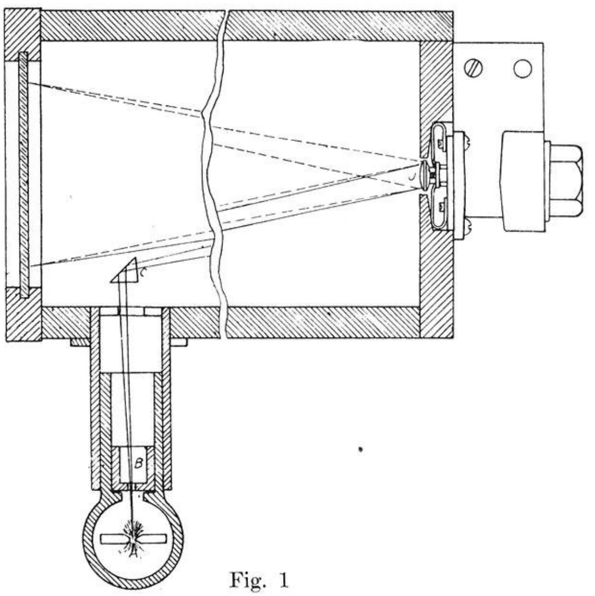


Fig. 1

carrying arm and mechanism have been replaced by a pencil of light rays. The development of this ingenious instrument has been due to the research of Professor E. Hospitalicr and M. Carpentier of Paris, who in 1900 applied the principles set down by Professor John Perry to the designing and testing of alcohol engines.

An explanation of the construction and the operation of this instrument may be brought forth to best advantage by referring to figure 1. From the source of light A, which is generally a hand-operated electric arc with suitable adjustable resistance, a practically parallel pencil of rays passes through the pin hole B in the movable focusing slide W to the interior of the manograph housing and upon the total reflection prism C. From here the ray is reflected to a small concave mirror U, situated at the extreme end center of the manograph casing, and thence back to the ground glass plate at the opposite end, a distance equal to the focal length of the mirror. In this way, either translatory or vertical motion of the mirror moves a small point of light back and forth across the plate.

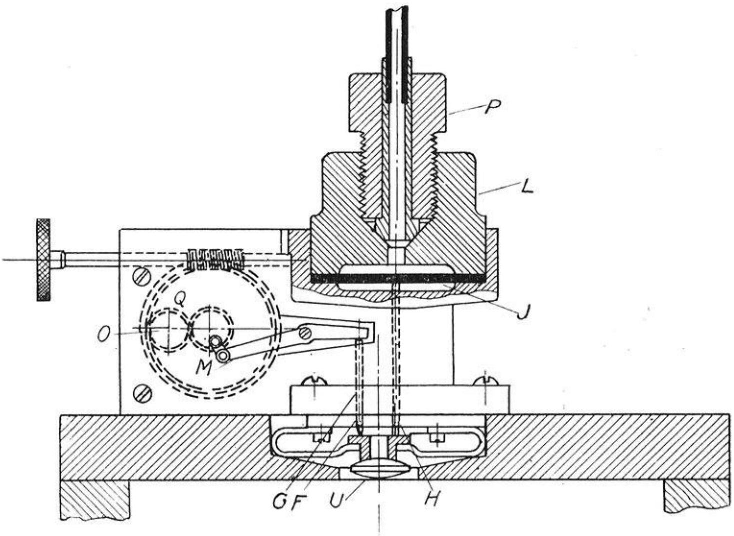


Fig. 2

In order to give a motion to the point of light corresponding to the variations in cylinder pressures expressed in relation to the position of the piston, the mirror is rocked in a vertical plane relative to the cylinder pressures and in a horizontal plane, simultaneously, relative to the piston travel. This motion is derived in the following manner.

Fastened to the back of the mirror is a right-triangular steel plate which is pressed against its three supports, D, E, and F, by means of a spring device on the opposite side. Support F on the back of the mirror rests against a pin G, to the opposite end of which is connected a bell crank driven by a small crank and connecting rod mechanism M. A spur pinion meshing with another pinion, O, of the same number of teeth, is connected with the crankshaft of the test engine through a flexible shaft and suitable couplings. In order that the reciprocating motion of the pin G be precisely in phase with the motion of the engine piston, it is essential to furnish some mechanism whereby the angular relation of the engine crankshaft to the crank M may be altered. For this reason, the plate Q is provided with worm teeth meshing with the worm on the thumb wheel shaft R. Now since the shaft of the drive pinion is supported in a bearing in the plate Q, concentric with the shaft of M, turning the thumbwheel thus changes the angular relation and brings the motion of G in phase with the motion of the piston.

The second support H is pressed against the steel diaphragm J, held stationary between the brass cap L and the plug P, a connection from which is made with the combustion chamber with a small bore copper tube. This diaphragm is so constructed that deflection of its center is proportional to the gas pressure in the plug chamber behind it. By these means, any fluctuation in the cylinder pressure will cause a proportional deflection of the diaphragm. The other support S merely serves as a fulcrum for the plates. To summarize or to explain the complete working of this instrument let us assume the motion of G to be in correct phase with that of the piston and that at the instant in question a charge is being fired. The diaphragm moves out; pin G is forced against the plate, and under the influence of these two forces, the mirror and spring deflect. The angle of incidence of the beam of light from the reflection prism is thereby changed, and the beam moves across the ground glass plate proportionally to the expansion and to the piston travel during the cycle only to a reduced scale. Examination of the plate while the engine is operating, owing to our persistence of vision, shows a continuous line similar in shape to the ordinary indicator card.

One of the greatest uses of the manograph is in the determination of the indicated horsepower and hence the mechanical efficiency of the internal combustion engine. The work done in the complete cycle is of course determined from the indicator diagram by finding the area enclosed by the expansion and compression curves and by subtracting from this the negative work represented by the area enclosed by the induction and scavenging lines. But to find the indicated horsepower, the laboratory method is to ascertain the average ordinate for the diagram—including the negative portions as well—and to multiply this by the scale of the diagram, thereby reducing it to pounds per square inch. From this factor,—that is the mean effective pressure, indicated horsepower is readily calculated. By subtracting from this the brake horsepower (determined at the same r. p. m.), the internal losses due to friction or other internal resistance are readily calculated.

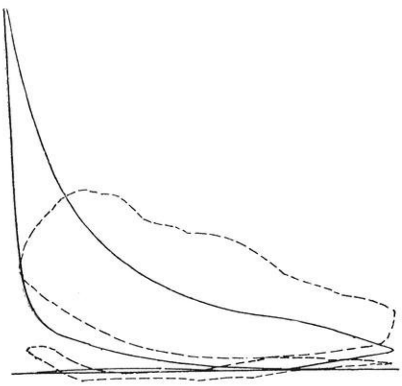


Fig.3

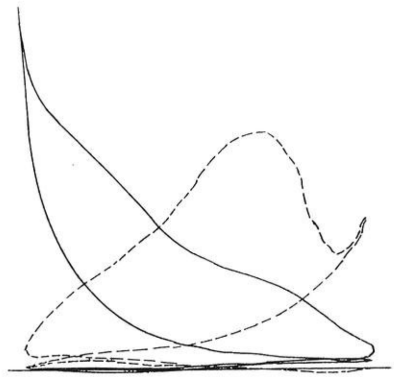


Fig. 4

Ignition troubles, poor carburetion, and defective timing of the valves are also readily determined from the use of the manograph, as is evident from the accompanying cards. The two diagrams superimposed in figure 3 show the effects of late and early ignition. Figure 4 brings out to good advantage the comparison between good and poor carburetion.

In making an accurate study of the internal action of the conditions existing in the combustion chamber, several precautions are to be observed in the use of this instrument. It has been found that as the speed of the engine increases, the twist in the flexible shafting also increases to a noticeable degree and must be corrected by means of the phase adjustment. Furthermore, for absolutely accurate work, the ratio between the connecting rod length and the crank of the instrument must be the same as in the test engine. For all ordinary purposes, however, the error arising from a different ratio is entirely negligible.

One other error which is very difficultly eliminated is created by either diminution or increase in pressure between the cylinder and instrument. If the copper tubing is of a very fine bore and exceedingly long, a difference in pressure is caused by the resistance to gas flow, while if the tube is of large bore and very short in length, either there is an effect upon the capacity of the combustion chamber or the diaphragm is affected by the heat from the cylinder. The tubing used to connect up the Hospitalier manograph in the steam and gas laboratories is of about 1/8 inch bore.

ALUMNI LETTERS

TEN YEARS OUT

J. W. Bradshaw, e '06

Traffic Superintendent, Michigan State Telephone Co., Detroit, Michigan

VALUE OF BROAD TRAINING FOR THE ENGINEER

My printable history appears singularly uneventful. I started in with the traffic department of the Chicago Telephone Company immediately after graduation, and I was with them constantly until last March, when I was transferred to the same department of the Michigan State Telephone Company. My chief work is to see that some 4,000 young women do their work properly, and the only conclusion that I have been able to draw so far, is the one reached by Adam and Solomon some years ago: that women are hard beings to understand.

After ten years from school, I still believe that, other things being equal, the best recommendation a young man can have when looking for a job is his college education, particularly if the college be Wisconsin, and the course engineering.

I am very glad that the tendency appears to be toward a more general engineering course. Apparently the most important thing we get out of college is mental training and a knowledge of a few fundamental governing principles. In my day we obtained some information regarding the principles of such sciences as physics and mechanics, but the principles of civics, economics and history were a closed book to us. It has always seemed to me that this was a mistake.

Lastly, I wish to make a recommendation which I know will be heartily concurred in by all the hardy undergraduate engineers, that is, that every student from his entry as a freshman to his graduation be required to take courses in English Composition, and in Oratory and Debating. Such courses would be of more value in dollars and cents and in general satisfaction to the men taking them than any courses that could possibly be given.

NINE YEARS OUT

GEO. E. WAGNER, m '07
Superintendent of Distribution, Madison Gas & Electric Company.
Madison, Wisconsin

One of the most important assets of the present day engineer is his ability to co-operate. No man, whatever his position may be in the business world, can afford to be over-bearing; he must always bear in mind that the lowliest man can do more for him as a friend than the foremost man would do against him, even as an enemy. The great importance of co-operation is nowhere more significant than in public utilities. Practically no man has a position so high that he can afford to be arrogant; nor is any man so humbly placed that he needs to be a slave.

Employees of the public service corporations have every reason to consider themselves as independent as any one else; but, while they represent the company, they should continually bear in mind that the company is a servant of the public and that its highest duty is to render service well and acceptably. Every representative of a public service corporation should at all times be as agreeable toward patrons of that corporation as is a merchant who wishes to sell his goods.

No one should construe these statements an an intention to portray employment in a public utility as disagreeable. It is at times very difficult to make the public understand your position, but after you have converted a knocker into a booster, there is a sincere feeling of satisfaction. The many different problems to be solved make public utility work very fascinating and such work offers a field for which an engineer, and especially a graduate, should carefully consider.

EIGHT YEARS OUT

C. L. BYRON, e '08
Patent Attorney, International Harvester Co., Chicago, Illinois

BEING MORE THAN AN ENGINEER

The engineer has earned and ever will maintain a strong and prominent position in the achievements of the world. He is distinctively constructive. In these maddened days of efficiency he must of necessity specialize to be of true expert or professional service. This does not mean that an engineer should be an engineer and nothing else. Too much emphasis cannot be laid upon the fact than an engineer should combine his engineering with salesmanship, manufacturing, promoting, law, or many other branches of business. In fact, it is by such combinations that exceptional strides may be made. In additon, the engineer will do well to take an active part in his community and to be a leader in public affairs. He should be able to meet any man on common ground and be able to give convincing statements, opinions, and facts on most phases of public and professional interest. Be an engineer *and* something else. Do not get into a rut. It has been said that the only difference between a rut and a grave is the depth. In short, the engineer should combine his engineering with something else, and be an honored leader in as wide and varied a circle as possible.

SEVEN YEARS OUT

ALBERT M. WOLFE, c '09
Principal Assistant Engineer, Condron Company, Chicago, Illinois

THE IMPORTANCE OF PRACTICAL EXPERIENCE AND THE STUDY OF ENGLISH

It affords me great pleasure to contribute my little mite to your most commendable plan of publishing monthly letters from graduates of the College of Engineering. To my mind you could find no better scheme of giving the undergraduate the benefit of the practical experiences, views and ideas of his predecessors. A closer fellowship and a real spirit of unity will thus be effected, which will unquestionably work toward the betterment of conditions in the engineering field.

During my experience of two years in municipal engineering and five years in structural engineering, I have learned that engineering is by no means an *exact science,* as some would have us believe. To execute an economical design for a structure requires not only a good theoretical training, but also a wide practical experience in construction; for often the thing which is theoretically correct does not work out in practice. In other words, the more practical experience a man can crowd into his college course and the immediate years after his graduation, the greater will be his value to any employer and the more rapid will be his progress from a professional and material viewpoint.

Then also, I have noticed that the engineer who has a knowledge of, and applies *business methods* to his professional affairs usually has the higher standing in a community and also the larger income. For this reason I believe every undergraduate should choose for some of his elective studies, regular courses in economics, business law, contracts, business administration, etc., as given by the School of Commerce.

A great many engineers still cling to the old idea that an engineer does not have to be a good writer or a fluent speaker to be successful. Nothing could be farther from the truth, and anyone can prove this statement by jotting down the names of the engineers in this country whose services demand large fees, and then investigating their qualifications and attainments. In practically every case you will find them capable writers and public speakers.

With these facts in mind I have always regretted that during my college course I did not appreciate the value of courses in English literature, composition and public speaking. I realize full well that the undergraduate has his "hands full" with the courses mapped out for him, but, on the other hand, his advance will unquestionably be more rapid if he denies himself a few "play hours" each week to take up these studies which are not in his prescribed curriculum. The college engineering clubs and Debating Societies furnish an excellent training for the man seeking to make himself proficient in the art of public speaking; and THE WISCONSIN ENGINEER gives you a chance to "break into print" and thus obtain actual experience in technical writing. My advice to the undergraduate is, "Make hay while the sun shines," for after graduation such opportunities are not always available.

SIX YEARS OUT

W. B. SCHULTE, ch '10
Treasurer, C. F. Burgess' Laboratories, Madison, Wis.

AN INTERESTING PROBLEM IN CHEMICAL ENGINEERING

Among a number of engineering problems with which the writer has been connected, one of the most interesting has to do with the recovery of materials from "exhausted" or "run down dry" cells. This is a problem with which some of the recent engineering graduates may be familiar as it was the subject of laboratory investigations and classroom and seminar discussions in the Chemical Engineering Department.

The principal constituents of a dry cell are manganese dioxide, carbon, graphite, ammonium chloride, zinc chloride, metallic zinc and water. These are so combined that the electrical energy is derived from the chemical action between the various materials. The result of the action is the production of more water and zinc chloride and a reduction in the oxygen of the manganese dioxide. While there is a change in the composition of the constituents, there is no decrease of material except through the loss of some water and ammonia by evaporation. In other words, except for the small loss of water and ammonia, an old, or used dry cell contains exactly the same elements as a new one.

Up to this time exhausted dry cells had had no value. Although junk dealers had attempted to reclaim the zinc, they found that the amount hardly compensated for the labor of stripping it off of the cell. It appeared possible, however, that if all of the chemicals, as well as the metal, were recovered, the process could be worked at a profit. After several years of experimenting on methods of extracting and treating the materials, a process was finally evolved and this has been in operation in Madison for about two years.

The process is a combined chemical and mechanical treatment, and it may be said that practically all of the materials of the cells are recovered in some useful form. New operations had to be developed and new apparatus and equipment evolved at the expense of time and money and the methods of handling solids and liquids of corrosive activity had to be worked out.

The products which are obtained are numerous; among them the most important are spelter and zinc, purified manganese dioxide, which may again be used in dry cells, various manganese compounds and salts, which are used in the paint and varnish trade, the glass and brick industries and in dyes. Other products are zinc salts, solder, and galvanizing fluxes, which under the present conditions are in demand. One interesting feature about the process is that it removes elements such as copper, nickel and cobalt which are sometimes found in dry cells in small quantities and which are known to be extremely harmful. As in the manufacture of dry cells from natural manganese dioxide, it is impossible, because of the cost, to remove these poisons, many cells on the market have small quantities in them. These cells then are not of the highest quality but fortunately the process of recovering the materials from them is such that the resulting manganese dioxide and manganese compounds do not contain the poisons and are superior in quality to the original material that is put in the cells.

In addition to the purely engineering problems, the development of this business involved the study of the source of supply of old dry cells. It was necessary to find out where and at what price these could be accumulated, and an organization was built up to take care of their collection. Freight rates had to be obtained and new freight classifications ordered. The sale of the products themselves involved some study and organization.

Other recent engineering graduates who have been directly connected with this problem are O. W. Storey, Ch. E. '10; C. E. Broders, E. E. '14; and H. J. Helfrecht, Ch. E. '15.

FIVE YEARS OUT

F. P. Hutchinson, e '11
With Harrington & King Perforating Co., Chicago, Illinois

THE MAN AND THE JOB

I had not been out of the university very long before I became aware of the fact that men who follow straight engineering work are not as a general rule very well paid. These men are often quite brilliant and capable of solving the most intricate problems set before them, but they are by no means paid a salary commensurate with the study, time, and expense involved in their training. When I cast about for a reason, I found two, which to me seemed very fundamental. The first reason is that the engineer is not enough of an all-around man. He becomes so interested in the engineering end of a problem that he loses sight of the practical side. Every engineer delights in the study of an intricate problem and may evolve a solution which the shop could not execute nor the sales department dispose of. I have seen fine engineers spend hours in study and discussion of a difficult problem which was uninteresting to the management, but fascinating to the mathematician or designer. In the meantime they were neglecting their uninteresting work, which, however, paid good profits to the business. The second reason is that engineers are not as good in salesmanship as they might be. Of course every engineer is not a potential high price man, but it is far too often that engineers lack the ability to bargain for their services to their own best advantage. They are engineers only, and are at a disadvantage when they barter with keen employers of men. They are talked into a corner. They are afraid to take a chance.

Every engineer who must earn his own livelihood should not forget that his services increase in value in direct ratio with that portion of the profits which may be traced to his work. This means that he must not necessarily do that which is the most interesting, but design, construct, or operate with one eye on low cost and the other on the production of material or service which will have a maximum desirability and hence the greatest profit. He should watch himself so that he will not get into a rut, and should cultivate a keen sense of proportion, not only in relation to the commercial value of the job in hand but also in relation to the value of his own services, so that he may realize the most therefrom.

I presume that some committee looking for endowments will read the above and immediately assume that I must be the man they are looking for. But I feel safe, for I have an alibi—I have left the field of straight engineering.

FOUR YEARS OUT

H. E. WILLMORE, e '12
Buyer, Electrical Merchandise Dep't, Sears-Roebuck & Co., Chicago, Illinois

SELF ADVERTISING

During a recent interview, a young Chicago lawyer drawing a salary of somewhere in the twenty thousands a year, said that he attributed his success to the advertising he had received from his law book. His statement ran about as follows: "Not long after I received my degree from the ———— university, I wrote and published a law book. It was read and I was pronounced a wonder. Why, they're even using this book as a text-book."

No doubt the book is a good one or it would not have met with success; no doubt this man strengthened his own knowledge by writing it. But I doubt if any text book ever published netted the author twenty thousand dollars a year. The significant thing about this man's statement,—the moral if you wish,—is the fact that he found it pays to advertise.

Being a "good mixer" is nothing more or less than being a "good self advertiser." And probably the best self advertiser in the United States today is "Teddy" Roosevelt. He is such a good advertiser that he is known by everyone as the "greatest of all Americans" or as a "conceited ass" (depending upon your political affiliations). He is such a good advertiser that he has to do very little advertising any more; every time he makes a move all the newspaper editors (friends and foes alike) hand him a large part of the front page and a column or two of editorials. The result? He holds a greater political power than any one man in the United States.

THREE YEARS OUT

R. C. BOCHERT, e '13
Engineer, Pawling & Harnishfeger Co., Milwaukee, Wisconsin

SUCCESS AS A RESULT OF INDEPENDENT THINKING

One day, a short time after I left school, I happened to be in the Chief Engineer's office when the telephone rang. After the conversation had ended, the Chief Engineer turned to me and said: "I can't use that man for he keeps me so busy answering minor questions that I might just as well do his work." That was all that was said about that subject, but before leaving his office I had made up my mind that it was better to do a problem wrong than to have your superiors do all your thinking for you.

Since that time, I have had the misfortune of doing a problem absolutely wrong. Naturally, I felt pretty bad about it, but after we finished discussing my mistake, the "Chief," as we called him, said: "Don't let that discourage you, for anybody that does not make mistakes is not doing anything."

I don't want the young engineer to think that mistakes are necessary for success, but I do want him to remember that after a young man has successfully completed any engineering course, he has had enough training to tackle almost any problem, if he will acquire the confidence that comes from independent thinking.

TWO YEARS OUT

Arthur W. Consoer, c '14
Office Engineer, Bureau of Bridges, Illinois Highway Commission

THE CONTINUATION SCHOOL

A period of two years is entirely too short a time to acquire the "old grad" point of view. Many years must slip by replete with all sorts of successes and failures before an alumnus gains the necessary mental perspective.

The few months of my alumni life have been spent in a "continuation school." Each day brings new problems and unfamiliar details, and many times it has been impressed upon me how very little is really contained in the text books and how often I must have been asleep in lectures at the university. But it is this constant exhilaration or freedom from monotony that puts the joy in an engineer's work. I believe that the things which we cub engineers enjoy most are the opportunities to tackle something that is new and to express in a tangible way an idea that we can call our own.

It is only fair, however, to admit that sometimes this enthusiasm results in startling disregard of some of the sovereign rules of engineering design and good practice. But even so, the joy in engineering work remains, and it is still true that in no other vocation is there offered such opportunity to even the younger men for original thought and in no other profession is it so easy to keep out of the ruts.

ONE YEAR OUT

E. L. GOLDSMITH, e '15

PATENT LAW AND THE ENGINEER

Patent law is a new and very specialized field for the engineer, and it is the patent attorney who binds the legal profession to the engineering profession.

An important qualification which an engineer engaged in patent law practice must possess in addition to his practical and theoretical training, is ability to analyze and draw distinctions and to use ingenuity in expressing those distinctions well. Without this foundation a patent solicitor may find himself arguing with the Patent Office upon subject-matter which is in issue only because of his inability to express exactly what he wishes to say. Do not be surprised to hear that I virtually had to begin restudying English grammar, rhetoric, and composition in a night school. I need only refer to the letters of Bickelhaupt and Van Derzee in previous issues to show that this fundamental weakness is prevalent in technical graduates.

In conclusion I may say that the field of patent law is especially inviting to the engineer who has pursued a broad technical course, who desires to follow closely and be intimately associated with the world's industrial progress and who is willing to devote all his spare time to studying law.

JUST OUT

R. P. ORR, e '16

Engineer, American Telephone and Telegraph Co., Chicago, Illinois

VALUE OF PERSONALITY

I can easily realize why those just out might hesitate to give out any of their ideas for publication; not because those ideas are so valuable, but rather because they have so little value. My opinions and viewpoints have been subject to so many changes that they are by no means well enough crystallized to risk putting them before the readers of THE WISCONSIN ENGINEER. However, I will try to express a few of the thoughts that have passed through my mind since I left the University.

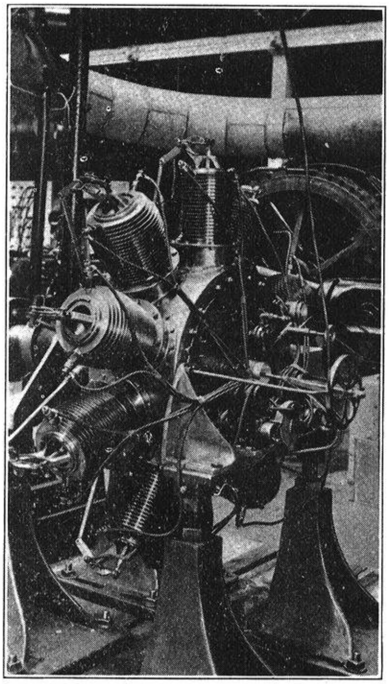
I am in the plant engineering department of the American Telephone and Telegraph Company at Chicago. When I interviewed the engineer here in regard to a position I was told among other things that the mere ability to figure out stresses or to juggle complex formulae was a rather cheap commodity. At New York the company has several of the best mathematicians in the country at work calculating all the formulae needed in the telephone business. One might believe that this work would require no exceptional ability, but just the opposite is true. The engineer told me that these mathematicians received $5,000 a year. I must admit that I was rather stunned to hear that this was not a high salary, and I began to wonder what a regular fellow (like myself) might expect to get. But I have since learned what was meant. These men are the biggest men in their profession, and when compared with the leading lawyers, doctors, executives, and a few engineers, their salaries are not very large.

In the brief time I have been here I have come in contact with many different kinds of people: clerks, managers, cashiers, cable splicers, linemen, construction bosses, accountants, testmen, and operators; college men, high school men, grammar school men, and some with practically no school education at all. In specific cases I have stopped and asked myself, "Why is this man doing this particular work?" and "Why is he fitted for it?" In the equipment men I found a sort of a genius, a man, who on his own initiative had undertaken to study higher mathematics and electricity, and who in some respects was better able than I to understand and explain complex electrical phenomena. His ingenuity had shown itself in several inventions of considerable value. Yet this man did not have a very good position; it was not a responsible one and not nearly so remunerative as it seemed to warrant. I inquired of one higher up why this was so, and was told that the man was unreliable, could not be trusted with money, and could not handle men; in short, he lacked the essentials of good personality.

Although this is not a fable it has a moral. The engineer who wishes to succeed must see to it that his training and thinking are broad enough to develop the best personal qualities. The big men, as I see them, are not mathematicians, are not inventors, not economists, not efficiency experts; they are rather all of these things and more, with possibly a little greater interest in one phase of life than another, but with those qualities that enable them to deal successfully with all sorts of men.

THE ROWE LE GAUCEAR AEROPLANE ENGINE

The ten-cylinder Le Gaucear Monosopape engine now undergoing tests in the Steam and Gas Engineering laboratories is the product of the Le Gaucear–Rowe Motors Company of Chicago. This engine, which is of the non-revolving radial type, weighs



slightly less than 500 pounds, but is rated at 150 horsepower, giving the exceptionally low figure of 3.3 pounds per horsepower. The bore and stroke are 134 and 174 millimeters, respectively, corresponding in English units to about $3\frac{5}{8}$ and $6\frac{15}{16}$ inches. To one appreciating exactness of detailed design and construction, this engine is a masterpiece of machining and a good example of French emphasis of detail.

Little expense has been spared in this design; the cylinders have been machined from solid billets of chrome-nickel steel and have been made exceedingly light in construction. In the head of each cylinder is one large valve of tungsten steel of 82 millimeters full clearance, operated by a pushrod and spring mechanism patterned after the Gnome. The pistons are also made of chrome-nickel steel and are of rather interesting built up lightweight design. In the head of each is a large set screw by means of which the gudgeon pin is held stationary in its bearing. Three piston rings of bronze, the upper one of which is of L section, are fitted to the piston, no junk ring being used. The usual practice of using the crank and master connecting-rod assembly has been followed as in practically all engines of the radial type, there being two master rods on each of which four connecting rods operate. The main bearings of the engine, three in number, are annular Hess-Bright ball bearings.

The cycle upon which this engine operates is rather interesting in that it is essentially a four cycle engine operating upon two cycle principles. Near the center of the cylinder are several ports leading to the crankcase which are uncovered by the piston skirts during all but the last portion of the stroke. Shortly before the end of the expansion stroke, the valve in the head opens, permitting the pressure within the cylinder to drop to practically atmospheric pressure before the intake ports are uncovered. In this way it is claimed that little or no transfer of gas occurs at this time. The valve continues to remain open as the piston travels back on its next stroke and does not close until a portion of the intake cycle has been completed. After this double functioning valve closes, a partial vacuum is of course created in the cylinder so that upon uncovering the ports in the cylinder walls, an exceptionally rich charge is drawn in through the simple mixing valve employed. This mixture is of course diluted to correct proportions by the air already present in the cylinder. The remainder of the cycles during which the charge is compressed and fired is precisely the same as in the standard four cycle engine.

Two Bosch magnetos on a two-spark single distributor system are driven off the end of the crankshaft. For lubrication of the engine, pure castor oil, owing to its high viscosity at high temperatures and other general advantages an aeroplane and racing engine design, is used in a full loss system. It is forced by a gear pump through a system of leads in the crankcase and by drilled crankshaft cheeks and pins to the important bearing surfaces. Although this is but the experimental engine, it is expected to manufacture these engines on a commercial basis and to market them for about $6,600 each.

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VERSATILITY

Have you ever analyzed your feelings of admiration or possibly of envy for the truly versatile man, the man of quick comprehension, quick perception, and quick action, the one who can change from this way to that without loss of momentum? Have you ever stopped to consider how infinitesimally small are our own individual powers as compared with such great masters as Goethe, as da Vinci, Franklin, or innumerable others even in our own national history? But with the changed order of the day, the versatile man is undeniably exceptional. The day is come when our accumulations of scientific information are so vast that knowledge of all science is impossible, indeed, even of one science, and when encyclopaedic knowledge can be classed only as superficiality and shallowness.

We are all amateurs or specialists to a greater or less extent and must make our choice between mere dilettantism and accurate limited knowledge. The question then arises as to whether broad culture for the average man is worth while. As a specialist his chances for success are good if he follows his work in a slow, conscientious, and consistent manner. To be sure, the way of the unspectacular plodder, concentrating in his own special field of endeavor, is the most certain way to success in this age when no achievement is to be had cheaply. The present versatile men of varied accomplishments are those who have been the plodders and have followed their one endeavor to the height of their profession. And again, these men are undeniably exceptional. They are men in whom development of one branch has led to the most ramified state, men from whose single concentration has resulted vast usefulness. What the modern world demands for the solution of its varied and difficult problems is the man of great capacity, of greater ability to concentrate his entire powers on the development of his work, the man of precision, of resource, of ability to handle men as well as machines, in fact, the *versatile* resourceful man.

Direction and limitation of our studies while in college should be determined alone by the use we are to make of them. Since our knowledge can not incorporate all, does it not necessarily follow that we should direct our attempts toward the acquirements necessary to our particular calling?

Then what is the ultimate answer? Concentrate your abilities to the development of your ideals, stabilize them, and in their accumulation, use judgment and resourcefulness.

* * *

With each successive issue of THE WISCONSIN ENGINEER, considerable criticism and comment is heard concerning the nature of this publication, the articles printed, and the management. It is our desire to make you feel that THE ENGINEER is your magazine and that it is a necessary and vital part of your course. If you feel that this is not the case, we want you to tell US what it lacks, to suggest improvements or additions that we may make, or if you have ideas that may help us, to let us hear of them.

Our aim has not been to publish matter of mere momentary value and interest but rather to give to our readers valuable reports of research or investigations carried on either in this university or by our alumni. The criticism has been made by some of the underclassmen that the articles of THE ENGINEER have been too technical or too mathematical. Occasionally a mathematical article has been printed, but at the same time it should be born in mind that the true highway of engineering is anything but free from the integral sign and the logarithm.

In this issue we are printing several short articles of real general interest. One of these is a description of a new dam; another is a description of the Hospitalier Manograph, an extremely important instrument in automobile engineering laboratories; and one other is a writeup on the much discussed aeroplane engine now in the Steam and Gas laboratory, not to mention Mr. Wolfe's article or Parlett's and Fulton's thesis. Read them through and let us know if they are what you want.

* * *

The following poem was written by Berton Braley of Leland Stanford University and was printed in THE WISCONSIN ENGINEER several years ago. By request we are again publishing it and wish to express our obligation to the author.

TODAY'S MAN

When the sage says, "It can't be done at all,
  It will only prove a failure and a mess,"
Comes a fellow with a queer sort of gall,
  Just remarking, "We can put it through, I guess!"
There's an old and battered briar in his face,
  And his eyes are calmly humorous and clear,
For there seems to be an easy sort of grace
  And power in the civil engineer.

He will tunnel through the quick-sand and the muck;
  He will bridge whatever gulf you want to span;
He has vision, he has Energy and Pluck,—
  If you want a working dreamer, he's your man.
In the jungle, fighting fever and the damp,
  In the desert where the torrid sun's aglare,
In the bleak and frozen North he pitches camp,
  If you want him where the job is—he'll be there.

He has turned the wildest fiction into truth,
  He has made the maddest fancies into steel,
He's alive, he is daring, he is Youth
  Crushing Doubt and all Disaster under heel!
He's Efficiency—that always finds a way!
  He's Faith, which conquers Unbelief and Fear.
If you are seeking for the spirit of Today,
  You'll find it in the Civil Engineer.

—Berton Braley.

ALUMNI NOTES

R. B. Anthony e '07, who was formerly Chicago manager of the Bristol Co., is now with the E. A. Wilcox Manufacturing Co. His business address is now 6330 Stony Island Ave., Chicago, Illinois.

C. W. Esau c '11 has left engineering to go into the real estate business with his brother Charles.

Another one to leave the engineering field is B. V. Edwards m '09, who has become an evangelist, we are told.

C. A. R. Distelhorst c '12 has been appointed engineer to the Wisconsin Highway Commission. His address is Room 208–09 Stephenson Building, Milwaukee.

M. E. Chandler m '13 has resigned his position with the J. I. Case T. M. Co., Racine, Wisconsin, to become a member of the engineering staff of the Stromberg Motor Devices Co., Chicago.

H. L. Budd e '10 has accepted the position of State Representative of The Mercury Manufacturing Co., 4110 S. Halstead St., Chicago, Ill.

W. H. Damon e '12 is now working in the engineering department of the Wisconsin Railroad and Tax Commissions.

P. N. Elderkin e '15 is with the Singer Manufacturing Co., South Bend, Indiana.

Walker Anderson Jr. e '13 has been transferred from the testing department to the industrial control department of the General Electric Co., Schenectady, New York.

R. E. Baker ch '15 is specializing as a chemist and metallurgist with the Keokuk Electric-Metals Co., Keokuk, Iowa.

A. P. Balsom e '06 has resigned his position as traveling salesman with Crerar–Adams & Co. to become district manager of the C. A. Roberts Co., 22–24 North 2nd St., St. Louis, Missouri.

F. R. Brownlee m '08 is now superintendent of The Wisconsin Cement Construction Co., 982 Humboldt Avenue, Milwaukee.

R. J. Coon c '05 is now a hardware merchant in Ladysmith, Wisconsin.

H. C. Estberg e '07 has accepted the office of manager of The Washington Gas and Electric Co., Washington Court House, Ohio.

J. I. Bush g '06, who for some time has been manager of the sales organization of the Second Ward Savings Bank, Milwaukee, has resigned that position to become Chicago manager of the Guaranty Trust Co. of New York. His office is in the Hannah Trust Building, Chicago.

E. A. Burmester is now a member of the firm, Burmester-Moore Reality Co., 803 Ford Building, Detroit, Michigan.

E. E. Engsberg e '09s has been promoted from the position of telephone engineer for the Interurban Telephone Co., Waterloo, to that of general superintendent.

S. L. Clark c '07 has been appointed Junior Structural engineer on the Interstate Commerce Commission. His address is 914 Karpen Building, Chicago, Illinois.

B. B. Burling ch '06 has resigned his position as Professor of Electrical Engineering, James Miliken University, Decatur, Illinois, to teach in The Milwaukee School of Trade for Boys.

G. W. Brown c '86 has been made manager of the U. S. Naval Fuel Station at Tiburon, California.

CAMPUS NOTES

The Engineers' Mixer, given under the auspices of the U. W. Engineers Club, was a success when viewed from any angle, as Prof. Millar would say. About 300 engineers gathered in the Auditorium, and led by Nordmeyer, sang the usual engineers' songs with the customary pep.

A series of tests were then run on several members of the faculty, the first being upon the "Steam Gauge," Professor Callan. The results of this test were very satisfactory, the instrument performing with its usual precision. Next a short test was run on Professor Mack, who is now our State Engineer, and one on Professor L. S. Smith. The results showed that no changes in calibration have occurred during the past year. Professor Disque spoke of the fine spirit of co-operation existing between the students and members of the Engineering faculty, and of how in this respect the College of Engineering stands far ahead of the other colleges. Professor Millar also gave a short talk in which he pointed out the danger of being sidetracked by things which, due to our narrow angle of view seem very important, but which in reality are of no consequence.

The engineers were then treated with music by Buchholz and his troupe of Musical Marvels. Analysis showed the presence of higher harmonics of considerable amplitude.

* * *

The manufacture of an outboard motor is now being undertaken by students taking Shop 7. The drawings for the motor, as well as all patterns and jigs, have been made by students under the general supervision of Mr. Goddard. The motor will be produced on a strictly manufacturing basis, all parts being machined in jigs and held to close gauge limits, assuring complete interchangeability. All cast iron parts will be made at the foundry, while parts such as connecting rods and crank shafts will be made of electric-furnace steel in the Department of Chemical Engineering under the supervision of Dr. Watts. A sufficient number of these motors will be made, so that each student who has assisted in their manufacture will receive a motor.

A large spectroscope has recently been received by the department of Physical Chemistry. This instrument was made to the specifications of the department by Kruss of Hamburg. The construction was started shortly before the war, but it was only recently that the exportation of the instrument was permitted. The whole lens system, as well as the two Cornu prisms, are of quartz, and by this means it is quite possible to secure a photograph of a spectrum throughout a region of 2,000 to 8,000 Angstrom Units at one setting. A wave length scale enabling wave length to be read directly is available and is so designed that it can be photographed with the spectrum.

* * *

Our wireless plant in Science Hall has recently been redesigned, and a large amount of equipment, including a transmitting equipment of four kilowatt capacity, as well as a rotary gap with a spark frequency of 480 per second, has been added. With this apparatus it is expected that a transmitting radius of about 1,000 miles will be secured. In the near future, Professor Terry expects to install also an arc transmitter generating undamped oscillations and in this way to do possibly a few experiments in wireless telephony. The receiving equipment is very efficient, for by using the ultradion, the German stations of Nauen and Eilvees come in strongly. The stations of Tuckerton and Sayville can be heard outside the wireless room.

* * *

The Senior Chemical Inspection trip this year covered a somewhat larger field than usual. The trip began on November 13th with the inspection of the works of the Patton Paint Co. of Milwaukee. Later in the day, the Milwaukee Coke and Gas Co., the Glass Works of Wm. Fangen & Son and one of the units of the Illinois Steel Co. were also visited. The next day, the works of the Pfister and Vogel Leather Co. and the National Distilling Co. were inspected. In the afternoon the plant of the U. S. Glue Co. at Carrollville was visited, the party leaving for Chicago in the evening. On Wednesday the engineers visited the works of the Carter White Lead Company and the South Chicago Works of the Illinois Steel Co. Thursday the works of the Standard Oil Company at Whiting, Indiana, the plant of the Grasselli Chemical Company, and the U. S. Metals Refining Company were inspected. On the last day of the trip, the party went through the works of the Illinois Zinc Company, the National Metals Company and the German American Cement Company.

* * *

NINETEEN SIXTEEN ALUMNI

CHEMICAL ENGINEERS

F. E. Bash, Assistant in the Development Department of the Leed's & Northrup Co., Philadelphia, Pennsylvania.

Kenneth E. Burke, American Tar Products Company, Carrollville, Wisconsin.

Adolf Canar, Chemical Engineer, American Creosoting Company, Kansas City, Missouri.

David N. Carlson, United Furnace Company, Canton, Ohio.

Herbert A. Gollmar, United Furnace Company, Canton, Ohio.

V. C. Hameister, National Carbon Company, Cleveland, Ohio.

Herbert J. Moon, United Furnace Company, Canton, Ohio.

Huber E. Nelson, River Smelting & Refining Company, Keokuk, Iowa.

Paul R. Stimson, United Furnace Company, Canton, Ohio.

Stanton Umbreit, American Tar Products Company, Carrollville, Wisconsin.

C. B. Willmore, Anaconda Copper Company, Anaconda, Montana.

CIVIL ENGINEERS

A. O. Ayres, Junior Engineer, Wisconsin Highway Commission, Madison, Wisconsin.

John Broyles, Wisconsin Highway Commission.

William Cargill, Prairie Pipe Line Company, Independence, Kansas.

H. A. Doeringsfield, Engineer with the United States Steel Corporation, Hibbing, Minnesota.

Samuel Eby, Draughtsman and Computer with U. S. Engineering Survey of Fox River, Wisconsin.

P. S. Egbert, Assistant City Engineer, Mitchell, South Dakota.

George Eldred, Highway Engineer, Wisconsin Highway Commission, Madison, Wisconsin.

W. C. Green, Secretary and Treasurer of Adolph Green Construction Company, Green Bay, Wisconsin.

C. A. Henkel, Assistant Engineer with William F. Henkel, contractor, Mason City, Iowa.

G. Gilbert Botham, grading and irrigation, Twin Falls, Idaho.

E. W. Fisher, Salesman, American Steel & Wire Company, 208 S. La Salle St., Chicago.

H. F. Janda, Instructor in Civil Engineering, University of Cincinnati.

Louis F. Nelson, Junior Engineer, Milwaukee Sewage Commission.

Raymond A. Phelps, Assistant to W. A. Kirchoffer, Consulting Engineer, Madison, Wisconsin.

H. T. Pott, Assistant Engineer, Pittsburg Coke Company, Pittsburg, Pennsylvania.

James A. Schad, Junior Engineer with Milwaukee Sewage Commission.

Keith C. Spayde, Engineer, McClintic-Marshall Company, Pottstown, Pennsylvania.

H. M. Swietlik, Junior Engineer, Milwaukee Sewage Commission.

John W. Tanghe, Junior Engineer, Milwaukee Sewage Commission.

Howard Thwaites, Junior Engineer, Milwaukee Sewage Commission.

ELECTRICAL ENGINEERS

Wallis Salmon, Michigan State Telephone Company, Detroit, Michigan.

G. L. Ballard, Toledo Light Company, Toledo, Ohio.

Kenneth H. Cope, Public Service Company of Northern Illinois, Evanston, Illinois.

Karl Ehrgott, American Telephone and Telegraph Company, Chicago.

R. N. Falge, National Lamp Works, Cleveland, Ohio.

Harvey Griem, Switchboard Operator, Wisconsin Public Service Company, Green Bay, Wisconsin.

J. Frank Johnson Jr., Toledo Light Company, Toledo, Ohio.

Owen H. Loynes, American Telephone & Telegraph Company, New York City.

Paton Mac Gilvary, Waukesha Gas Electric Company, Waukesha, Wisconsin.

William Arthur Olson, Western Electric Company, Chicago.

Roswell P. Orr, American Telephone & Telegraph Company, Chicago, Illinois.

Harry C. Pollak, Western Union Telegraph Company, New York City.

Wilbur Roadhouse, Wisconsin National Guard, Somewhere in Texas.

Nicholas Schmitz, Facility Engineer, Chicago Telephone Company, Chicago, Illinois.

William K. Walthers, Mechanical Appliance Company, 133 Steward Street, Milwaukee, Wisconsin.

With the General Electric Company are the following men:

W. A. Royce, Philip Roberg.

The Westinghouse Company has claimed the following list of men: George Andrae, Edwin L. Andrew, Philip Jameson, John Wise.

MECHANICAL ENGINEERS

N. D. Barnett, Baehr Engineering Company, Chicago, Illinois.

B. S. Buckmaster, Great Lakes Boat Building Corporation, Beecher and Greenbush, Milwaukee, Wisconsin.

C. H. Casberg, Rockford Drill Company, Rockford, Illinois. Assistant Superintendent of Machine Construction.

Arthur Davis Fulton, Ammunition Inspector, Bartlett Hayward Company, Baltimore, Maryland.

John Frederick Gross, Davison Chemical Company, Baltimore. Sumner Rodriguez, Standard Oil Company, 16 Broadway, New York City.

Robert J. Mensel, Dodge Manufacturing Company, Mishawaka, Indiana.

Thomas Gilder, Assistant Superintendent, Moberly Light & Power Co., Moberly, Missouri.

C. "Bubbles" Maurer, Appraisal Engineer, 1606 City Hall Square Building, Chicago, Illinois.

William Dow Harvey, American International Corporation, 120 Broadway, New York City.

John W. Grosskopf, Apprentice, Chain Belt Co., Milwaukee, Wisconsin.

Frederick Connit, Apprentice, Allis-Chambers M'f'g Co., Milwaukee.

E. W. Fisher, American Steel & Wire Co., Chicago, Illinois.

Rudolph Michel, General Electric Company, Schenectady, New York.

Raymond C. Parlett, Baltimore Copper Works, Baltimore, Md.

Harry V. Plat, Baehr Engineering Company, Chicago.

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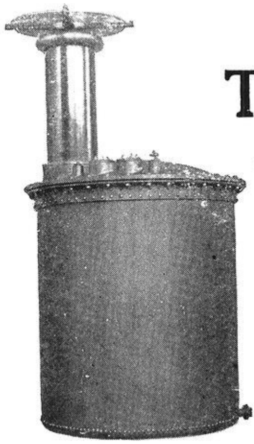
SUCCESSFUL WISCONSIN ENGINEERS

LYNN A. WILLIAMS, m '00

An engineer, who with the aid of graduate work and a year in the law school has widened the scope of his profession until he is now regarded as one of the truly big patent attorneys in Chicago, is Lynn A. Williams m '00. In the fall of 1901, Mr. Williams entered the patent law firm of Charles A. Brown, Cragg, & Belmont. Following the withdrawals of Messrs. Bellfield and Cragg from the firm, Mr. Williams continued in the employment of Mr. Brown until September, 1907, when Mr. Brown and he joined partnership under the name of Brown and Williams. After one or two reorganizations of partnership, Mr. Williams became one of the members of the firm of Williams, Bradbury, and See, attorneys and counselors in patent and trade-mark causes in Chicago. Mr. Williams has been quite actively identified with most of the litigation of the Westinghouse Electric & Manufacturing Company under the Tesla rotary field patents and has had charge of several litigations of the General Electric Company. During the past fifteen years, he has also taken a large part of the patent litigation in the telephone field. He has as clients in the state of Wisconsin A. O. Smith Company, the Pfister & Vogel Company, the W. S. Seaman Company of Milwaukee, and the Webster Electric Company of Racine.

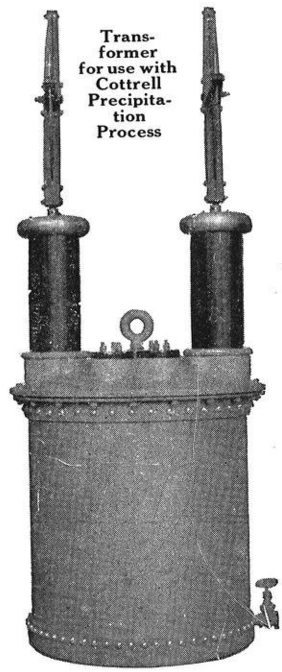
In 1903, he married Helen Harvey, daughter of the state superintendent of instruction at that time, a member of the class of 1902. He is now the father of two boys, one seven and the other three years old, the older of which, according to Mr. Williams, is a pronounced engineer. Mr. Williams is a member of the University Clubs of Chicago and of Evanston, Illinois, the U. W. Club and the Wisconsin Society of Chicago as well as several other clubs of more or less diversified character. He served one year as president of the Alumni Association and has been for two or three years a director and chairman for the Entertainment Committee of the Wisconsin Society. It is certain that Mr. Williams has maintained far more interest in the university than is true in the average case and that he is certainly worthy of a place under the title of Successful Wisconsin Engineers.

High Voltage Testing Equipment



300,000-Volt Testing Transformer

The engineers of the General Electric Company have an intimate knowledge of the severe conditions under which testing transformers must operate. This knowledge has been acquired in the extensive high voltage research work of this Company, and in the commercial testing of large quantities of raw materials and of completed high voltage apparatus. This exact knowledge has been applied to the design of a standardized line of testing transformers known as Type "K." This line will meet every requirement.



Transformer for use with Cottrell Precipitation Process

In all Type "K" designs, circular coil construction is used, and careful attention has been given to the mechanical as well as to the electrical stresses that must be withstood.

If you need testing equipment, the recommendations of our engineers are at your service.

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