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The Wisconsin Engineer

VOL. XVIII MARCH, 1914. NO. 6

A NEW FORM OF PIEZOMETER AND ITS APPLICATION TO EXPERIMENTS ON SUBMERGED WEIRS.

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The measuring weir must be used under conditions commonly known as free-fall, or free discharge, in order to make the usual coefficients applicable. In the case of free-fall, atmospheric pressure completely surrounds the nappe or overfalling vein of water and the experimenter is not concerned with the conditions existing in the pool below the weir. But when the level of the water in the lower pool rises above the elevation of the crest, it results in a condition known as submergence. The flow is then affected and the problem becomes a study of the effect of submergence on the discharge. The most important factor in its solution is the determination of the amount of submergence. This quantity is denoted by h in Fig. 1, which shows the characteristic form of the water surface at a submerged sharp-crested weir. Immediately below the weir is a standing wave with the crest at "b." Downstream from this point a peculiar wave action predominates and causes a turbulent surface condition, while still farther downstream the surface is smooth and the flow is apparently normal.

After a careful study of the peculiarities in the flow, the experimenter is at a loss to know where the depth of submergence should be measured. But the question—How should it be measured?—must necessarily be answered first. Could ordinary methods be used to measure the head in such turbulent water?[1] If it was a laboratory investigation and the standard method of a flush piezometer opening connected to a still basin was to be used, a region of steady flow would have to be selected. This condition seems to exist at the point "a" but there is no available data to indicate that a determination of the head made at this point would represent the effective depth of submergence. The measurement could be taken at "b," although conditions are not as steady as they seem to be at "a." Or the uncertainty of using locations "a" or "b," as well as the rough water below

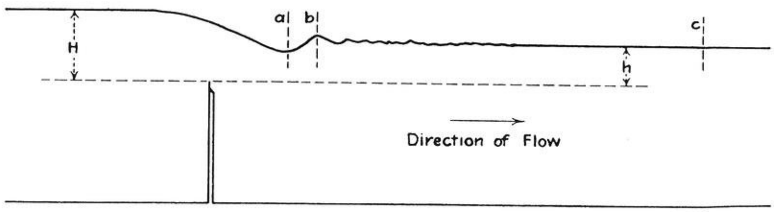

Fig. 1 Submerged Sharp-crested Weir.

"b," could be avoided by making the determination at "c." But there would still be some question as to whether the elevation of the water surface at "c" would be the same as the effective depth of submergence; and if not whether any fixed relation existed between them under varying conditions. Now, supposing determinations made at one of these suggested points and some other point was later found to be correct, in what way could the data be corrected?

Probably some more practical method of measuring the head could be used, but the question of location would still be important. It is the purpose of this article to briefly describe a satisfactory method of measuring the submergence and the re-

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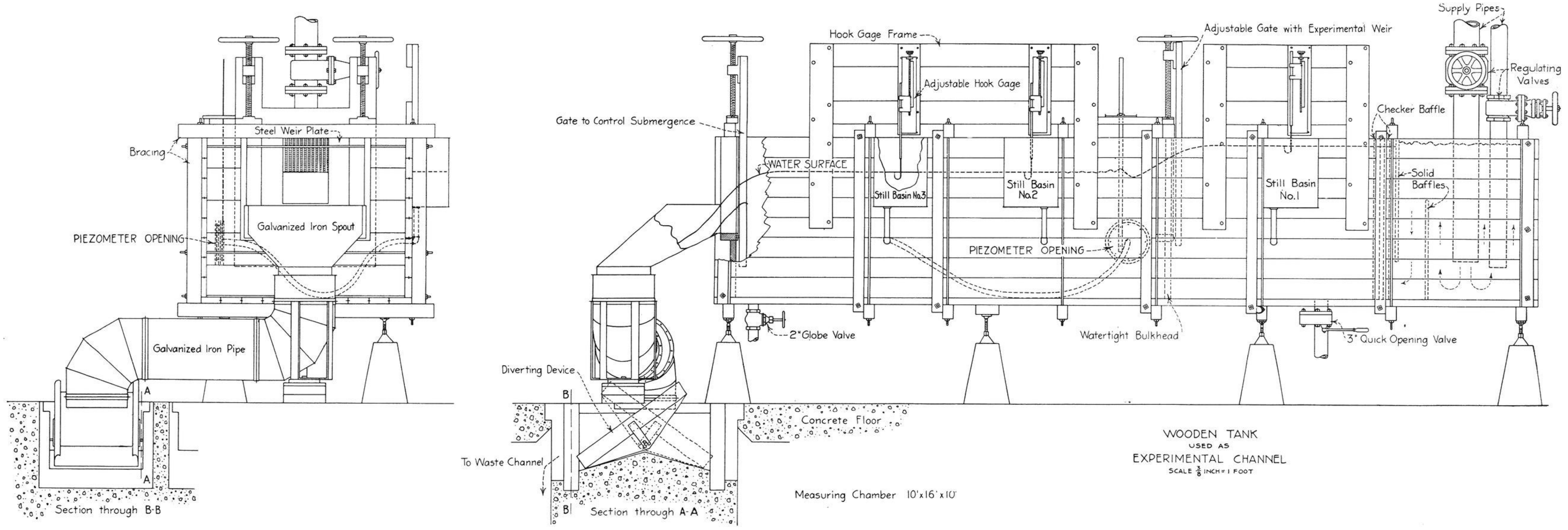
[1] For a practical illustration see cut on page 584, "Water Power Engineering" by D. W. Mead. The dam is under flood flow and although the downstream water is below the elevation of the crest, the form of the water surface would not be appreciably altered until the submergence exceeded 90 per cent.



Supplement to March, 1914 Wisconsin Engineer—Fig. 2.

sults of some experiments made to determine the point at which to measure the effective downstream head, in the particular case of a contracted sharp-crested weir.

Since 1907 the flow of water over submerged weirs has been investigated at the Hydraulic laboratory of the University of Wisconsin. The experiments were made on sharp-crested contracted weirs, which are weirs having a length of crest less than the width of channel in which they are placed. A large wooden tank located in the main floor of the laboratory was used for the experimental channel, and the submerged weirs were set as shown in Figure 2. Throughout the entire investigation the conditions below the submerged weir were unusual. This was probably due to the short length of the lower channel. However, it is possible that the peculiarities noted are characteristic of a contracted weir, due to the increased velocity at the reduced section. The actual maximum velocity of flow in the upper channel of 0.19 feet per second was increased to 3.10 feet per second at the weir. But for any flow used, the velocity of the water issuing from the weir was greater than that in the lower pool and thus formed a series of standing waves in the center of the channel. The manner in which the short length of channel affected the flow was very apparent. The lower end of the weir tank reflected part or the water, which still had considerable velocity in the center of the channel, and formed strong eddy and cross currents. This latter cause probably had more effect in producing the continually fluctuating water surface below the weir than any other influencing factors which were not so evident. The flow at all times was undoubtedly worse than would be encountered with a weir placed in a natural stream.

Nevertheless the submergence had to be measured. Some of the first experimenters attempted to us a piezometer with a flush opening such as was successfully used to measure the head H above the weir, where the flow was steady and uniform after passing through the baffles and the stream lines were normal to the plane of the opening. But when this piezometer was placed below the weir the cross currents entered the piezometer opening and affected the height of the water in still basin. Therefore various methods were devised to protect the opening but none were found very effective, and when the results of the experiments were correlated, they showed marked inconsistencies.

At this point the problem was taken up by the writer. The piezometer openings used by previous experimenters were fixed in the side of the weir tank. It was therefore decided to use an opening which could be placed in any part of the stream and yet not to be affected by the velocity of the water or the troublesome cross currents. The apparatus shown in Fig. 3 was designed, using Nipher's [2] idea of producing parallel lines of flow normal to the piezometer opening, and thus conforming to the requirements of a standard flush piezometer, according to Mr. Mills.[3] The plates were 1/8″ brass disks, while the screen was galvanized iron with 8 mesh to the inch. A non-collapsible hose was used to connect the piezometer opening, which was in one of the disks, to an ordinary still basin where the height of the water was measured by a hook gauge.

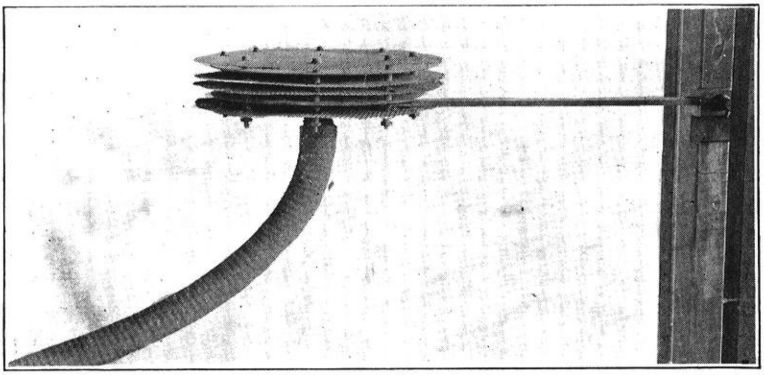


FIG. 3.

The apparatus was not calibrated under special conditions due to lack of time, but it was decided to use the instrument as orig-

[2] Proceedings American Philosophical Society, Vol. XLV (1906), "The Elimination of Velocity Effects in Measuring Pressures in a Fluid Stream", by Francis E. Nipher.

[3] Proceedings American Academy of Arts and Sciences Vol. XIV (1878), page 26, "Experiment upon Piezometers used in Hydraulic Investigations", by Hiram E. Mills.

inally designed, and if the coefficients for the weir obtained were consistent, the design would be considered satisfactory.

The study of locating the piezometer opening was begun by placing it in the center of the channel at the point "a" in the first trough. Later it was moved to the point of the first crest "b." However, both of these positions were found unsatisfactory. The values of the coefficients were plotted, but the points were very eratic. This clearly indicated that the submergence could not be measured at either of these places. The depth of the trough and the corresponding height of the following crest varied with the head on the weir and the depth of submergence. This probably accounted for the discrepancy in the coefficient curve. The downstream point "c" was tried, but the results, when plotted, were no better than when the piezometer was at "a" or "b." This was undoubtedly due to the short length of channel below the weir and in the case of a longer tank the location of the point "c" could be moved farther downstream and the results might be found to be more consistent.

After this, positions in the center of the stream were abandoned, and the piezometer opening was taken out of the region of high velocities and placed in positions along the side of the weir tank. This change resulted in a slight improvement of the coefficient curve. Finally the piezometer opening was placed just below the weir, and between the side of the tank and the stream issuing from the weir. This is a region of back water and the surface is comparatively quiet. A number of trial experiments were run, and the results proved very satisfactory. This position was then used and several series of experiments were made by varying the submergence and accurately measuring the discharge.

A simple formula containing a factor dependent upon the ratio $\frac{h}{H}$ and which could be theoretically derived, with certain necessary assumptions, was desired. This lead to the selection of a modified form of Herschel's formula.[4] The formula, as used, was $Q=3.142\ L\ (NH)^{1.5}$. The coefficient N was computed and plotted against values of submergence. An average curve was

[4] Transactions American Society of Civil Engineers, Vol. XIV (1885) P. 189, "The Problem of the Submerged Weir", by Clemens Herschel.

drawn through the experimental points which were too numerous to show. [Fig. 4.] From the fact that the maximum variation in the coefficient N, from the curve, which represented the average valve, was 0.005 under a range of heads from 0.2 to 0.93 feet, it is certain that the piezometer opening was located at a point in

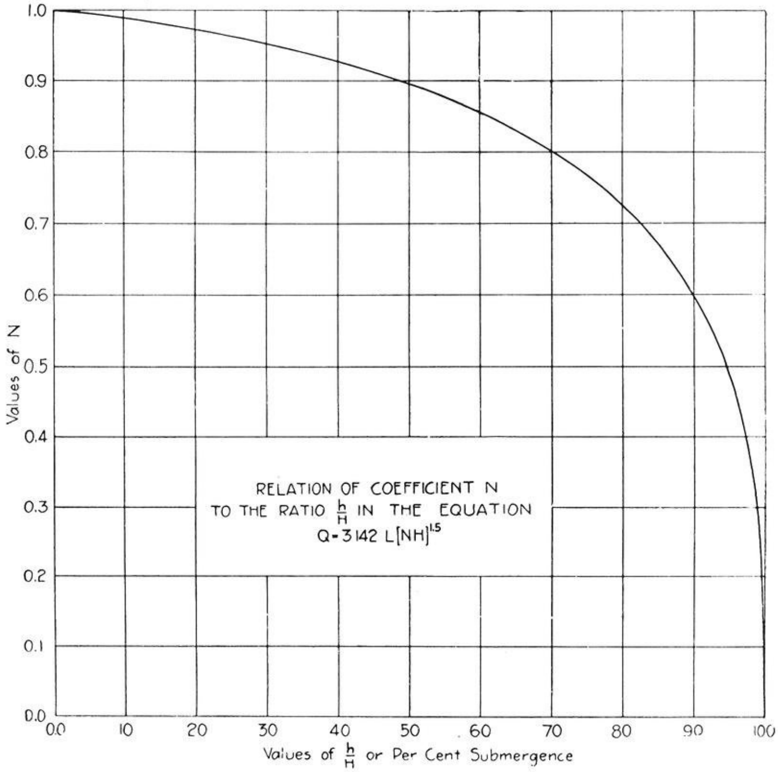


FIG. 4.

the stream which was indicative of the effective elevation of the water surface on the downstream side of the weir. The maximum error to be expected in computing the discharge of the same weir by the use of the coefficient N (as determined from the curve) is 0.73%, provided, of course, that the conditions are within the limits of the experiment.

The data taken at the points "a," "b," and "c," was not sufficient to justify any statement as to the correction that would have to be applied to the coefficient as obtained at these points in order to use them in computing the discharge of the weir.

The piezometer opening is at present being calibrated by comparing it to a standard flush piezometer opening, in a channel with a uniform flow under a range of velocities. It will later be used in connection with experiments on a suppressed weir (which is a weir with a length of crest equal to the width of channel) under various conditions of submergence. Here again the problem will be to determine the position of the piezometer to give uniform results. The question of the effective height of the water below the weir will probably be more complicated than in the case of the contracted weir.

It seems possible that the form of piezometer opening here described could be adapted to conditions of actual practice. It would then furnish a means of observing the downstream head on a submerged dam, and thus increase the usefulness of the dam or weir as a measuring device.

In adapting the piezometer to practical conditions, as just suggested, large possibilities for its use are insured, providing the coefficients for various types of dams are extended to include conditions of submerged flow. If the capabilities of this apparatus had been generally known at the time of the recent floods in the Ohio Valley, much valuable information could have been secured by its use. The records obtained would have added materially to the available run-off data, and such data could have been used to great advantage in the design of future flood protection works.

A TURBO-GENERATOR FOR SHIPBOARD USE.

Prepared from a paper submitted by FRANK E. FISHER, electrical designing engineer for the Diehl Mfg. Co.

Apparatus for use on shipboard in general and for use on United States war vessels in particular must be light in weight, compact in design, sturdy in construction, high in efficiency and capable of withstanding sudden and severe overloads.

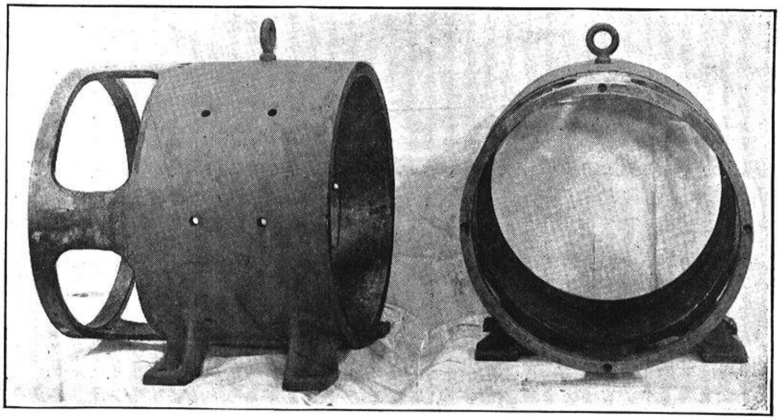


FIG. 1.

In choosing a generating unit for this service, turbine drive offers many advantages, and in most instances is adopted. The high turbine speed reduces the size of the generator but makes mechanical construction, commutation, and bearing problems more difficult.

The special features of a turbo-generator to meet this service are considered in this article and the particular machine is a 10 k. w., 125 volt compound-wound 3,600 r. p. m. generator, driven by a Terry steam turbine, operating under 200 lb. steam pressure, with an exhaust of from 26 inches vacuum to 5 lb. back pressure. This discussion is limited to the generator.

Mechanical Construction. The yoke or frame of this machine is a steel casting cylindrical in shape, with an extension on one end in which are openings through which the brush rigging and the commutator are readily inspected. (Fig. 1.) The particular shape of the yoke is such as to insure a smooth, homogeneous casting free from blow holes. The ends of the yoke are faced off at the same time that the pole seat cut is taken, thus insuring accurate concentricity of the poles, brush rigging and bearings. The interchangeable end shields, or bonnets, carry solid bronze bearing sleeves of the ring oiling type. A ratio of bearing length to diameter of two and a half to one, proper clearance, and an oil ring of such size that it lubricates the bearing freely without throwing oil out of the housing, insure cool operation of the journals. A good grade of dynamo oil of medium weight is used.

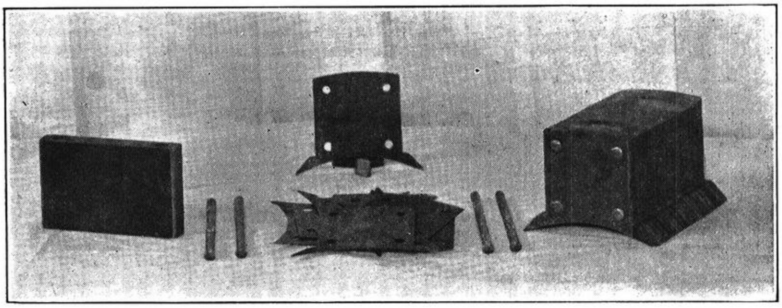


FIG. 2.

The main pole pieces are built up of carefully annealed sheet steel punching assembled on rivets. The shape of the punchings is such that, when complete, "toothed" pole tips are obtained. (Fig. 2.)

The main pole windings are wound separately. The shunt coils consist of a number 18 B. & S. gauge single cotton covered wire wound in layers; while the series winding is built up of 1/32 in. by 3/4 in. copper strap wound flat. The interpole pieces are of wrought iron and the coils are built up of 1/32 inch by 2¾ inch copper strap wound flat. (Fig. 3.)

The ratio of armature length to diameter is larger than common, giving a comparatively low peripheral speed. The core is built up of No. 28 B. & S. gauge sheet steel carefully annealed after punching and each sheet is given a coat of insulating japan before assembly. The commutator is of the V construction and in addition to the clamp rings, two steel rings, shrunk on, hold the commutator in shape. The mica between bars is undercut about 1/64 inch. A brush density of approximately 30 amperes per square inch obtains at full load. A balance ring with drilled and tapped holes for receiving balancing weights is mounted at each end of the armature. The brush rigging is mounted on a rocker ring which is split in two parts and revolves about the bearing housing.

The form wound armature coils are riveted and soldered to high commutator risers, giving a fan effect. Additional ventilation is obtained by means of longitudinal vent holes through the core and ventilating spacers transverse to the shaft.

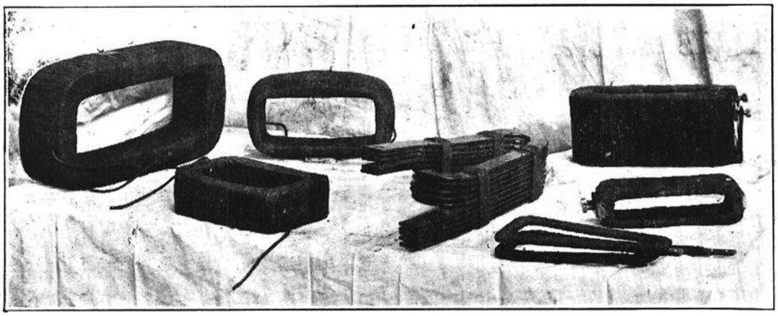


Fig. 3.

Electrical Design. The use of commutating poles, if properly designed, insures perfect commutation, which means a long lived commutator. It also permits operation with a low ratio of field ampere turns to armature ampere turns, which means a small magnetic circuit and field winding resulting in light weight and small space. Commutating poles have a marked compounding effect, reducing the large number of series turns. A plain shunt generator with a strong commutating pole winding can be flat compounded with a proper bush setting, but without series windings. However, parallel operation of the machines is impossible if good results are desired.

The strength of the commutating winding in the case of the generator under discussion is approximately 20% stronger than the armature, while the ratio of field strength to armature strength is about one to one.

The armature balance must receive particular attention for such a machine. It is usual to subject the armature to careful balance tests during various stages of its manufacture and after completion. After the machine is given its final test, the armature balance is checked again at half speed, full speed and ten per cent over normal speed. This overspeed test also serves to try out the strength of the bandwires or wedges, as the case may be. (Fig. 4.)

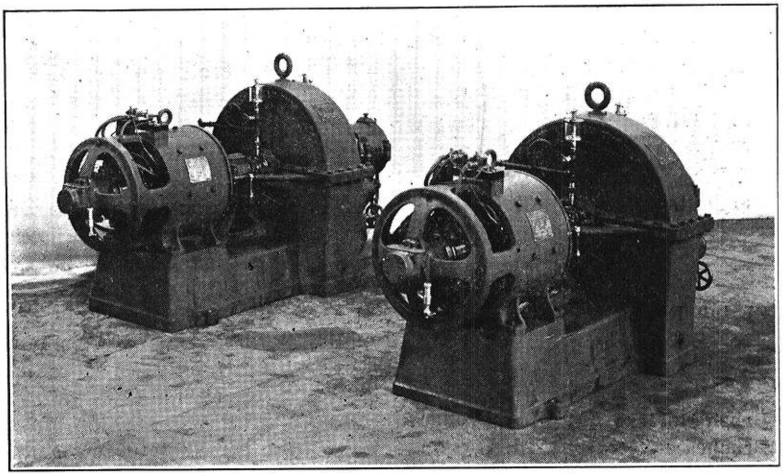


FIG. 4.

The outline on the following page will serve as a summary of the machine above considered.

Data for 10 K. W., 125 volt, 3600 r. p. m., Turbo-Generator

Part	*Material*	*Remarks*
Yoke	Cast Steel	
Main Poles	Electrical Sheet Steel	Laminations not japaned.
Commutating Poles	Wrought Iron	Rectangular Section.
Armature	Electrical Sheet Steel	Laminations annealed after punching; insulated with japan. Armature diam.=7½ in. Peripheral speed=7,080 ft. per minute.
Band Wires	Phosphor Bronze on core Steel end Bands	
Commutator	Hard Drawn Copper Bars	Bolted type. Diameter is 5 inches. Peripheral speed is 4720 ft. per minute.
Shrink Rings	Nickle Steel	Two rings—one at outer end of commutator—one behind risers.
Brush Holders	Bronze and Brass	Baylis reaction type.
Brushes	Carbon	Special turbo-generator brush, light in weight, graphitic in composition.

Weight of Generator 525 lb.
Weight of Set 1350 lb.

THE AESTHETIC VALUE OF MUNICIPAL BRIDGES.

By Henry Grattan Tyrrell, C. E.
Bridge Engineer, Chicago.

The greatest opportunity for building fine ornamental bridges is in and about the large centers of population. That these chances have to a great extent been neglected, is shown by a review of those in any of our principal cities. Inspection of bridges in different places has been made by the writer from time to time, and impressions of those at Milwaukee are given as typical of all.

Milwaukee, as a whole, may well be proud of its development, of its fine streets, parks, and public buildings, all of which have arisen in less than eighty years. The city hall, post office, library and Soldiers' Home are among the finest in America, and its commodious office buildings, stores and manufacturies are generally known throughout the country.

The subject of bridge building in Milwaukee is interesting at the present time, because of the completion of a fine new bridge at Oneida street, and because of the proposal which is now before the people for constructing another high viaduct, at a cost of $350,000, over the Menominee river, connecting Thirty-fifth street and Thirtieth avenue. The new one which will soon be opened at Buffalo street, costing $175,000, replaces an old swing built by a local company thirty-eight years ago, which was very light, inadequate and otherwise unsatisfactory. That one is needed over the river at State and Martin streets is shown by the vote taken last autumn to issue $150,000 worth of bonds for rebuilding it. In addition to its two car tracks, the other traffic over State street bridge is heavy, and is all crowded on a 16-foot roadway, with only hand opening mechanism. All of these projects indicate a definite purpose on the part of the city to install the best kind of bridges throughout, and in this respect to make ideal conditions along the rivers, which other municipalities might well imitate.

New street bridges are needed over the Kinnickinnic river at Clinton, Beacher and Lincoln streets to replace old swings with center piers. The first of these with two car tracks on an 18-foot roadway is very crowded and much too light for its traffic. The Beacher street bridge, though having no street cars, has extremely light framing, and its turntable is nothing more than a curved beam, the opening being accomplished by hand power. The road is only eighteen feet wide, though the adjoining street is more than twice that width. The Lincoln street swing, which is the last one over the river, was moved to its present position from Broadway when that bridge was rebuilt. The three other swing spans over the Milwaukee river at, and north of Chestnut street, though more adequate in some respects, obstruct the channel with their center piers.

Viaducts in the city are very fine and serviceable, and even attractive in certain details, though little effort has been made in the selection of aesthetic outlines or proportions. The best effect in viaducts usually results when bents are united in pairs, with alternate spans differing greatly in length, and the truss members curved rather than horizontal or parallel. The reversed inclines to the Twenty-seventh street and the Sixth street viaducts adjoining the canal, are quite unusual, though a somewhat similar spiral forms part of the Mississippi river bridge at Hastings, Minnesota. The long and high viaduct over the Menominee valley at Twenty-seventh avenue, has unfortunately, excessive vibration in its longer spans, due probably to the top heavy effect produced by the heavy deck sixty feet wide for double car tracks, and paved with brick and granolithic. The Wells street viaduct, for double track electric service, with its deck 100 feet or more above the valley, is quite imposing. Columns have side batter, and vibration is not perceptible.

Park bridges in Milwaukee are also quite attractive, and could hardly be improved. The stone and metal bridges in Lake Park were erected in 1893 from designs by Mr. Oscar Sanne. A brick one in this park was built with the body of the arch in five rings of hard burned sewer brick, spandrel faces and wings of brown brick, and the arch blocks on the face, as well as the trimmings and railings of terra cotta. It has a length of 100 feet, and cost $10,500. A metal arch with a clear span of fifty feet and length of 90 feet, has a 26-foot roadway paved with asphalt on buckle plates, and two 7-foot walks covered with cast iron plates. Steel ribs with end hinges, the outer ones being faced with ornamental cast iron, support the deck which is protected by iron railing. The total cost, including masonry, metal and paving, was $10,800.

Over the north and south ravines, near the Government lighthouse in the same park, are two bridges of artistic design, each having a span of eighty-seven feet, the two together costing

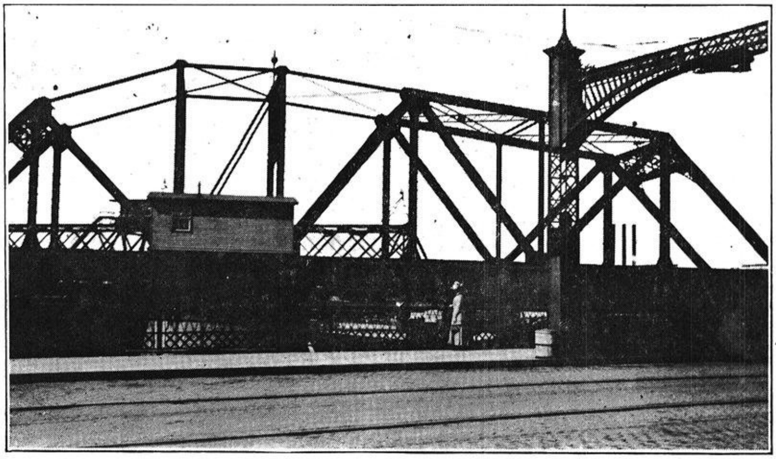


FIG. 1.

$36,500. Each bridge has six, two-hinged steel arch ribs supporting asphalt roadways and cement sidewalks on buckle plates. The abutments are of fine coursed ashlar, surmounted with Bedford stone railing, but over the arches the railing is of ornamental iron. At the four abutment corners adjoining the opening are ornamental posts supporting clusters of lamps, and at the abutment ends are pedestals with figures of lions.

A more recent and ornamental bridge, in Lake Park near the pavilion, crosses a gorge fifty feet deep, and is much seen and enjoyed in the summer time. The structural features consist of two reinforced concrete ribs twelve inches wide and fifty-four inches deep, with an inner flange on the lower side of the arch ribs. These ribs are twelve feet apart in the clear, and they support spandrel walls which carry the six-inch reinforced concrete floor slab. Cross walls and struts twelve feet apart longitudinally, connect the arch ribs, and between them is a double system of steel angle bracing, the ends of the angles being securely fastened in the concrete. Spandrel walls are twelve inches thick with expansion joints at each end adjoining the abutments. The arch ribs and abutments are a monolith and the floor is cambered eight inches longitudinally for drainage. The abutment side walls are connected with cross walls which support a floor slab similar to that on the bridge.

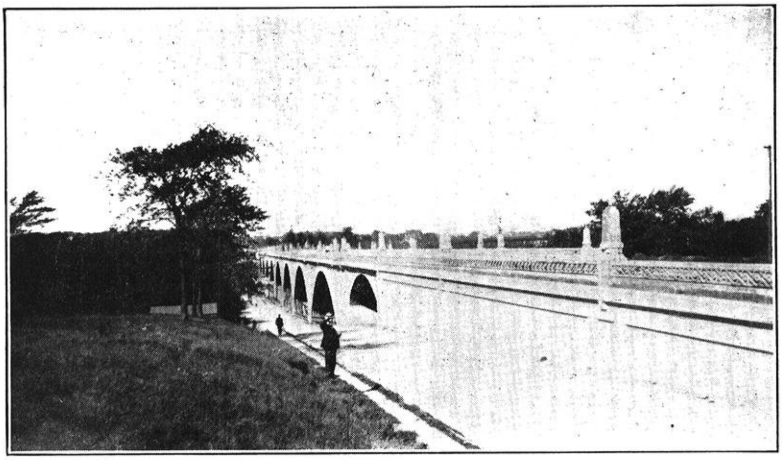


FIG. 2.

By far the finest concrete bridge in the city is that on an extension of Grand avenue, crossing the Menominee valley with ten spans, eight of which are 145 feet long with open spandrels, while one at each end, with spans of sixty and eighty feet respectively, have solid spandrels. Arches are all slabs rather than ribs, and the piers are each cored out by two arched openings, dividing them at the bottom into three parts. The total length is 2,080 feet, and the road is sixty feet wide, guarded at each side by a heavy ornamental concrete balustrade.

On the whole, Milwaukee is fortunate in having quite a number of fine bridges worthy of preservation. A further review of the opening bridges in Milwaukee was given by the writer in Municipal Engineering, for July, 1913. The greatest fault in bridges generally, throughout America, is their lack of aesthetic treatment. The condition is all the more unfortunate because these structures are worthy of greater thought and study, since they are usually such conspicuous objects. The lack of beauty in their design is no doubt partly due to the dearth of literature on the subject, and the general absorption of the bridge building business by the bridge trust, the prime object of which is not to improve the appearance of our American cities, but rather to earn the largest possible dividends for its stockholders, regardless of the atrocious designs which it may impose on municipalities.

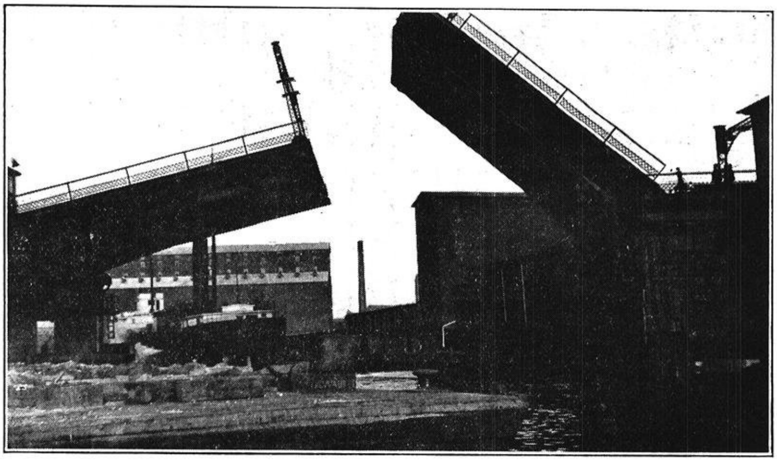


FIG. 3.

The most important work in connection with any great constructive enterprise is the preparation of the design, for on this, the success or failure of the whole project depends. If the design is faulty, the money, time and thought spent on its construction are largely wasted, and all the labor of engineers, architects, contractors and artisans is lost. If the design is lacking in beauty, the structure may remain for centuries as a mockery to its originators, unless fortunately it should fall through structural weakness. The Romans realized the need of both strength and beauty and they reared their structures to endure. Some of them, like the bridges at Rome, built nearly twenty centuries ago, are still standing.

Ugly bridges in beautiful surroundings, such as Lake Park in Milwaukee, would be artistically unsatisfactory, and the designers have, therefore, very wisely placed structures there that are both useful and ornamental, giving a character to the park that it would otherwise not have. Indeed these little park bridges produce an impression on the occasional visitor to the city, which is probably remembered longer than the central part of the city itself, though the cost of these structures is comparatively small. Bridges are failures, if the materials of which they are constructed are lacking in durability, for the period of their existence is then quite limited. The Municipal Art Commission of New York realized the need of enduring material for the proposed memorial to Henry Hudson, and they very wisely refused to accept any design in metal, giving their approval to a beautiful one in reinforced concrete. The need of greater attention to design is therefore evident, as upon it, the whole success or failure of the structure depends.

Almost no attention has been given by engineers to the artistic character of bridges, and but little to their proper proportions. For fifty years, mathematical engineers have wrestled with their computations, evolving formulae and establishing their conclusions, and in this direction there is little left to be desired, but during this time, little or no improvement has been made in the visible appearance of their creations, and in fact, a definite backward movement is evident. The result is, that the greatest need at the present day in bridge building is aesthetic treatment. To accomplish this end, no city in America is more promising than Milwaukee, with its democratic and broad socialistic views. Progress in this direction is indicated by a tablet on the new Michigan street bridge over the Milwaukee river. Instead of the usual elaborate plate bearing the names of all the local ward politicians who happened to be in office at the time, the city has inscribed the names of all the people. On this democratic tablet are the words "Built for public service, by the people of Milwaukee."

By way of suggestion, let us refer to the Tower Bridge at London. For more than twenty years it was the subject of discussion by city officials and citizens, all of the designs, and especially the one built, being severely criticized. It was under construction from 1888 to 1894, and was formally opened for travel on June 30th. The engineer was Sir John Wolfe Barry, and the architect Sir Horace Jones. The steel work alone cost $1,685,000, and the entire structure $4,146,000. The clear distance between faces of towers in the center span is 200 feet, and each of the end spans has a clear width of 270 feet. Between the towers are two overhead foot bridges with a headroom under them of 139 feet. These can be reached by elevators and were intended for pedestrian travel when the bascule leaves are open for the passage of ships but are no longer used. The structural parts of the towers are of steel enclosed with stone facing, and this feature and the method of cable stiffening, have been most severely criticised.

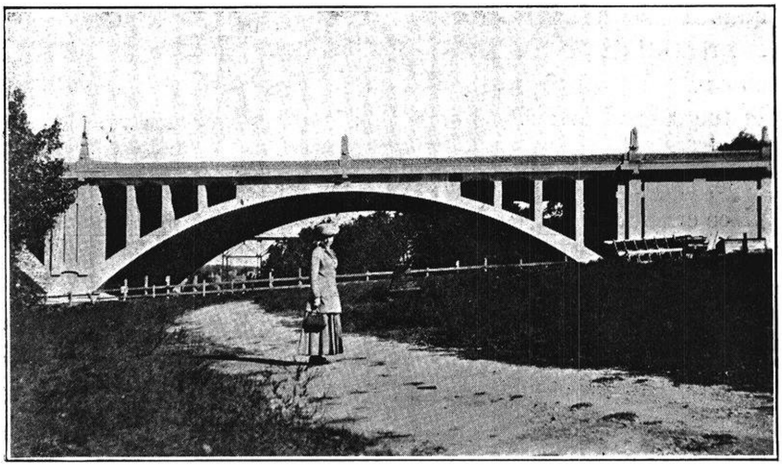


Fig. 4.

After an experience of twenty-five years in bridge engineering the writer is impelled to insist upon higher standards in this branch of city development, that the disfigurement of our cities with unsightly and uncouth bridges therein, may cease, and that dominany commercialism may give way to the public demands for finer and more attractive constructions.

When, some years ago, the writer was asked by the cities of Copenhagen, St. Petersburg and Sydney, to prepare designs for bridges there, the invitations were declined by the writer with great reluctance, because of the opportunity for artistic design which is usually acceptable in the capitals of foreign countries. It is interesting to Americans to know that the design for at least one of these bridges, that over the Neva at St. Petersburg, adjoining the palace of the Czar, is the work of an American.

TWO METHODS FOR THE TREATMENT OF FLUE DUST FROM IRON BLAST FURNACES.

By Robert B. Richards '11.

In all iron blast furnace practice the furnace man is troubled by having to use ores in such a fine state of division that the escaping gases, by virtue of their velocity carry a considerable quantity of the furnace charge with them. This trouble is not so great when the ore is rich; for then these small particles have enough weight to keep them from escaping with the gases. But in the case of low grade ores, this loss is sometimes very great. The Clinton ore found at Mayville, Wisconsin, is of this latter type, and for a long time gave the furnace operators at that place considerable trouble. The ore is low grade, light in weight, and a great percentage of it is very fine (like flax seed), or even more like the grains of öolite found in some limestones.

It must be understood that the gases which escape from the iron blast furnace pass, by means of large pipes or "down comers," to a cylindrical tank with a hopper bottom which is called the dust catcher. Here the gases drop most of their load, consisting of small ore particles, and some coke and limestone dust. This mixture is called flue dust and is drawn from the dust catcher in cars or "buggies" to be stocked, charged back into the furnace direct or treated in some process, which makes the material a better product for the blast furnace. The quantity of the flue dust made by a furnace varies greatly with the ores charged, the blast pressure carried and other conditions, but an average of about three per cent of the total charge escapes in this manner. "On this basis there would be approximately 3,000,000 tons of flue dust produced in this country per annum. In as much as the iron content of blast furnace flue dust is within a few per cent of being as high as the iron content of the ore charged into the furnace, the annual loss of iron in flue dust produced and wasted is enormous."

It is usually very difficult to get a furnace superintendent to charge flue dust direct into his furnace, but in many cases this must be done. The resulting loss is very great, since the material has once escaped with the gases, a large percentage will do so again. Hence, it is said that every furnace man of a few years' experience has involved some method for the treatment of flue dust, and since flue dust treatment is not at all a universal practice as yet, it follows that most of these processes are not practical.

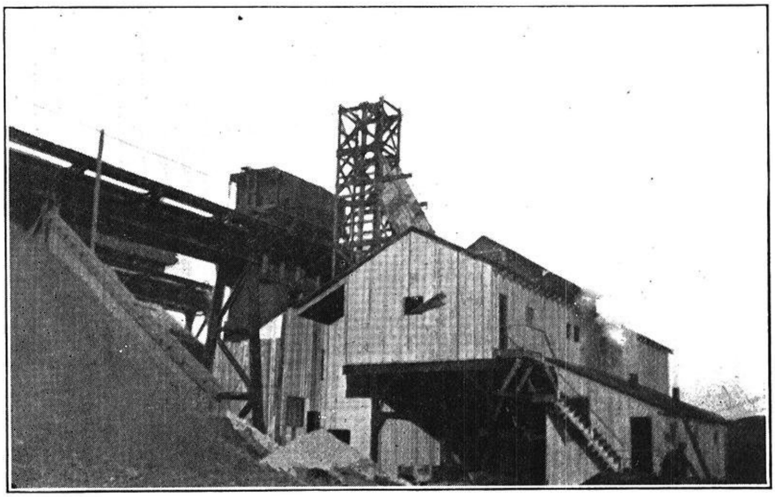


PLATE III.

Among those which are now in use may be mentioned the so-called nodulizing process, where the flue dust is rotated in a long cylindrical kiln, and the heat for the agglomeration is obtained from the coke in the flue dust and from powdered coal blown into the cylinder. Another is called the Dwight-Lloyd process, in which a down-draught is used to sinter thin layers of flue dust spread on moving grates, the coke in the flue dust again furnishing the heat. A comparatively recent method, and one which makes use of the same general principal as the Dwight-Lloyd machine, is that now in use at Mayville, called the Greenawalt Sintering process. This process is now used in connection with the Grondal Briquetting plant, which has been in operation at Mayville for nearly two years. This latter process strikes at the root of the evil by mixing the fine ore with flue dust and pressing it into brick form and then baking it into a hard cake.

It is these last two processes which have come under the writer's direct attention, and which it is the purpose of this paper to briefly discuss.

THE GREENAWALT SINTERING PROCESS.

This process makes use of the heat value in the flue dust, and in some cases a little added coke, to effect the sintering.* The plant consists of the following three elements:

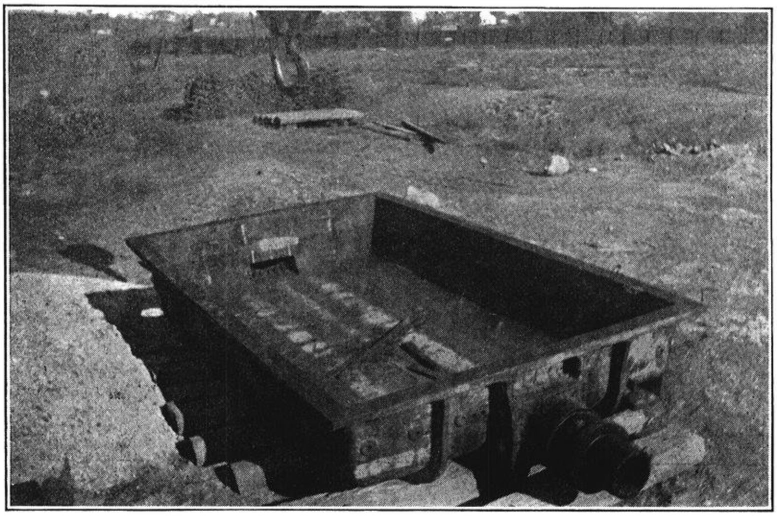


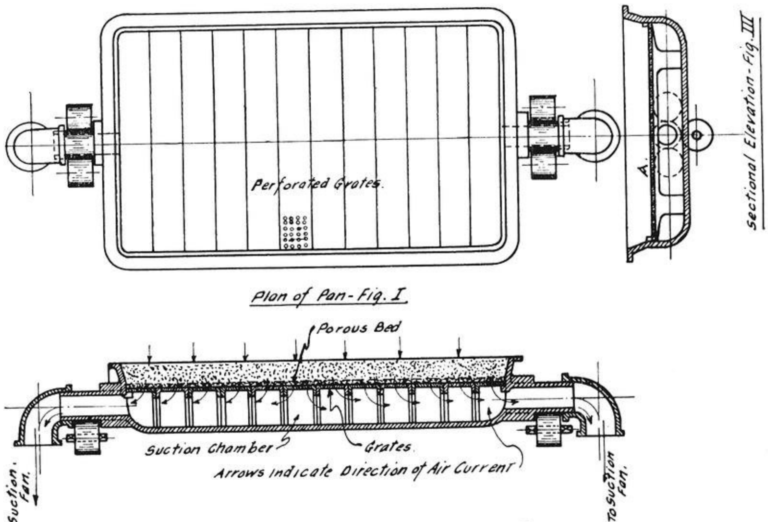
PLATE I.

1. A large pan made of 2″ cast iron or steel. (Plate I.) This is 12′ long, 7′ wide, and 2′ deep, and rotates on its end axis. (See Figures 1, 2 and 3.) Setting in this pan are twelve grates, which are 7′ long, 1′ wide, and 1′ high. (See A, Figure 3.) These divide the pan into two parts. The portion under the grates acts as a suction box, and at both ends of the pan are 10″ pipes which lead to a suction fan. (See Figure 2.)

2. The suction fan and motor need little mention, the motor being a 25 H. P. D. C. variable speed motor running up to 1,500 R. P. M., and the fan of sufficient capacity to give a vacuum of as high as thirty inches of water.

*By Sintering, as the word is here used, is meant the incipient fusion of a mass of small particles.

3. Over the top of the pan and running on rails at either side of it fits an inverted pan, called an igniter, 12′ long, 7′ wide and 6″ high, (See Plate II and Figures 4 and 5.) The top plate of this is perforated and the whole clamps tightly over the pan. It carries above it a tank of kerosene, upon which an air pressure of eighty pounds is kept. This kerosene is piped to six spray



Sectional Elevation Thru. Center - Fig. II.

burners set at equal distances about the under side of the igniter. (See Figure 4.)

In sintering a charge of flue dust, the pan is supported in a horizontal position, and a layer of about 1″ of some refractory material is spread over the grates. (See Figure 2.) This forms a porous bed which serves a two-fold purpose. It protects the grates from burning and prevents the flue dust, which is placed upon it from being sucked through the grates. Many materials may be used for this bed. At Mayville, limestone, fine ore lumps, crushed slag and screened sinter, have all been used with good results. Next the pan is filled with flue dust and leveled off well. This is done at the Mayville plant by means of an electrically driven charge car. (See Plate IV.)

The fan is now started and a draught is started down through the flue dust and porous bed and out through the 10″ pipes at both ends of the pan. The igniter is next clamped to the top of the pan and the kerosene sprays lighted. These are allowed to burn for from fifteen seconds to one minute when they are shut off and the igniter removed. This ignition starts the top of the flue dust layer burning and the suction through the bed

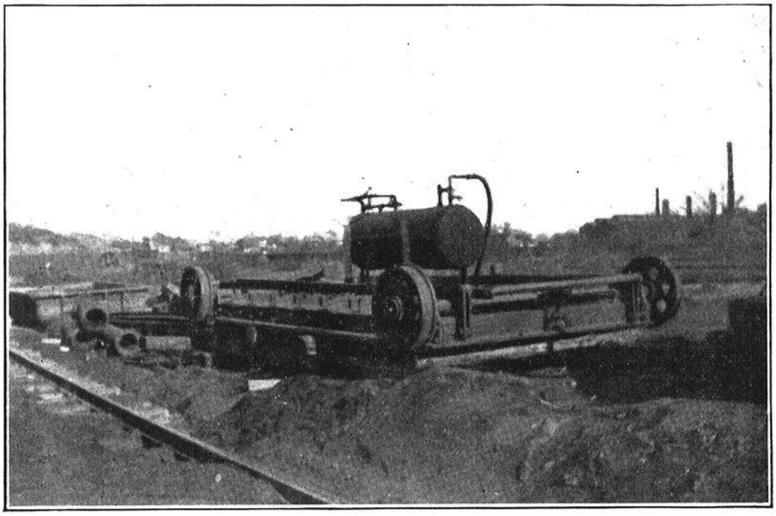
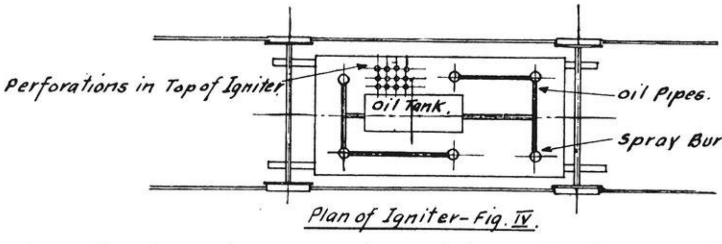


PLATE II.

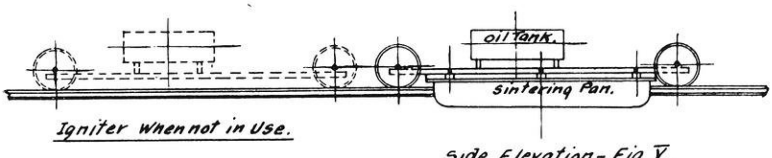
does the rest of the sintering. The fire on top of the layer, by means of the coke in the flue dust, slowly penetrates the entire mass down to the porous bed and, when the mixture of flue dust,



Plan of Igniter—Fig. IV.

coke and moisture is correct, sinters it into a hard, porous, black cake. (See Plate V.) One pan of flue dust gives about 2.5 tons of sinter.

The length of time taken to properly sinter flue dust varies from twenty-five minutes to over two hours, depending upon the mixture taken and the suction carried. Dumping and charging the pan again takes from five to ten minutes. When the charge is completely sintered, the pan is rotated and the cake of sinter is dumped into a car below. The product thus made is hard, of



a higher specific gravity than flue dust, and of a size to remain in the blast furnace.

The cost of making this product is low enough for it to com-

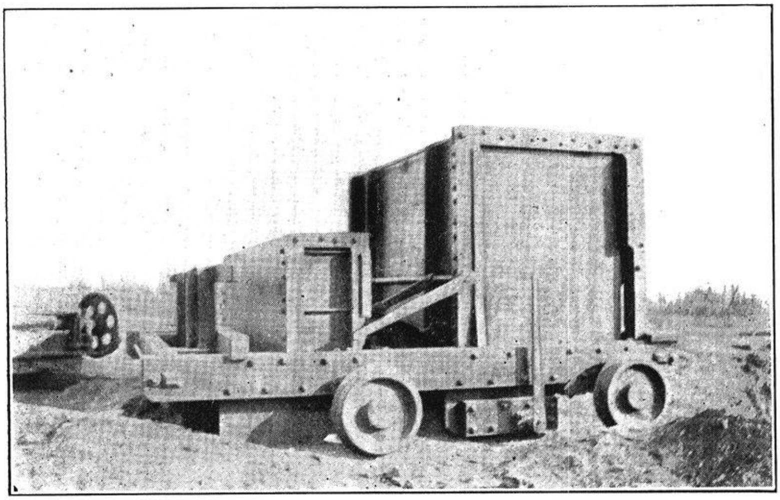


PLATE IV.

pete with the cheaper ores; labor, power, and kerosene being the largest items. The ignition cost, which is now about 4½c per ton, may be cut down in the future by the use of coke oven gas. The process requires no great outlay of capital to install, and there is no reason why it should not soon be in use at a great many more blast furnaces throughout the country.

THE GRONDALL BRIQUETTING PROCESS.

Although the Briquetting process is now only applied to the Mayville ore, its effect upon the amount of flue dust made by the furnace is very strongly felt. Before the installation of the

Greenawalt sintering pans, a mixture of flue dust and fine ore comprised the charge of the Briquetting plant and, if the stock of flue dust far exceeds the capacity of the Greenawalt plant,

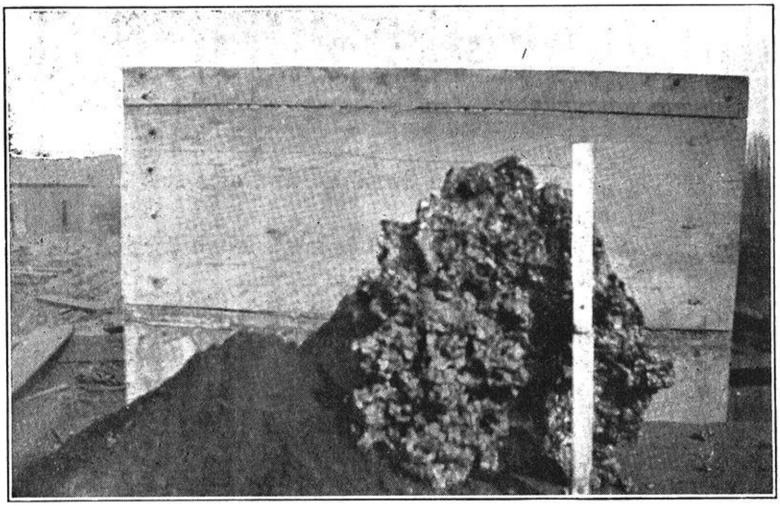


PLATE V.

this mixture may be again used. The process, however, is essentially the same for all ore or ore and flue dust.

The plant consists simply of large motor-driven brick presses,

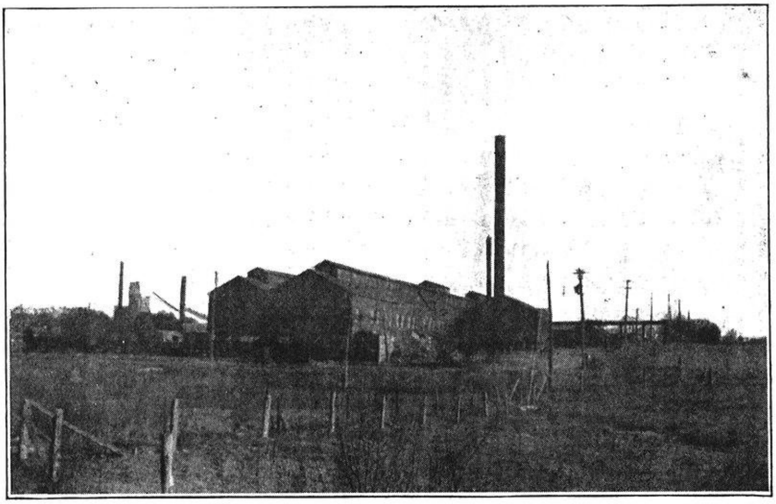


PLATE VI.

ten in number, and four long low kilns made of fire brick. (See Plate VI.) The fine ore, by means of belts, elevators and drags is deposited in small hoppers above each of these presses. It falls by gravity into the press and is made into brick forms. No binder is used, the moisture of the ore being sufficient to hold

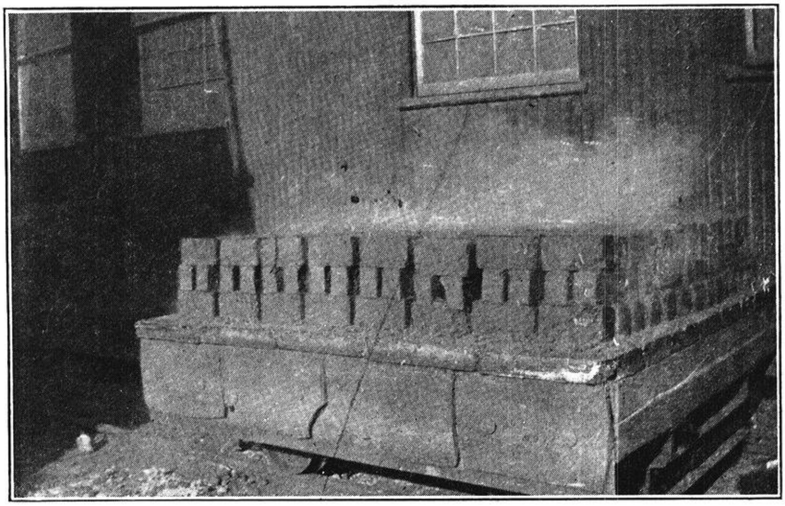


PLATE VII.

the briquettes together until it gets to the kiln. Two shapes of briquettes are made, both weighing from seven to nine pounds (unburned). They are taken from the presses and piled in regular rows upon small cars, which have a flat, fire-brick top. Two and sometimes three layers of briquettes are thus set on a car making from 270 to 352 briquettes to a car. These cars are 6′ wide, 6′ 6″ long, and about 26″ high. (See Plate VII.)

After these small cars are loaded with ore bricks they are pushed into the kilns where they are subjected to a heat of from 1,000° F. to 2,800° F. These kilns are 195′ long 6′ 6″ wide (inside) and average about 5′ high (inside). They hold thirty small cars each; the end of one car making a tight joint against the end of the next car. Hydraulic pressure is used to push the cars into the kilns, and when one is pushed in at one end this pushes thirty cars ahead of it, thus forcing one out of the kiln at the other end.

The kilns were originally designed for burning crude oil as a fuel and this was atomized with steam. Later tar was used and now coke oven gas has taken the place of the tar. The cars run

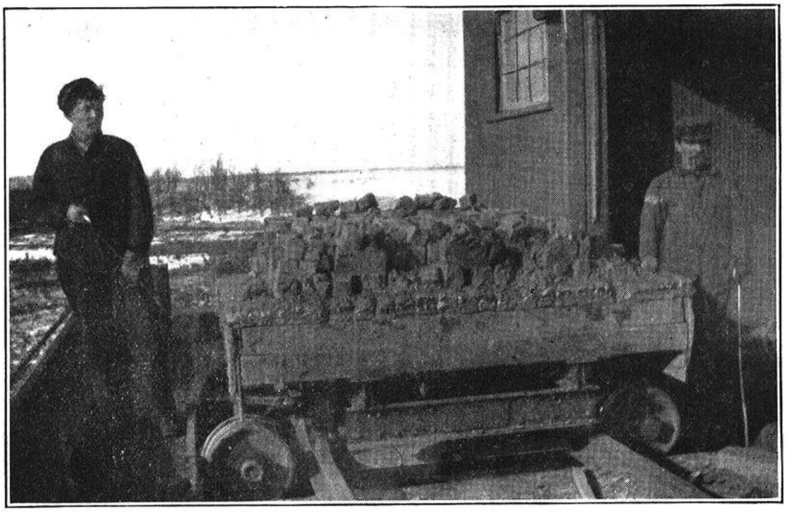


PLATE VIII.

on tracks throughout the length of the kilns, but on both sides of the cars are vertical plates which run in a channel iron filled with sand. This sand seal prevents any leakage of draught

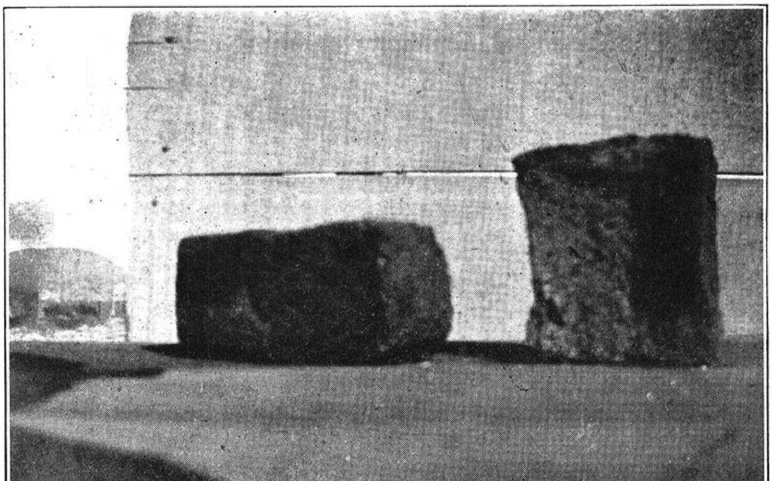


PLATE IX.

around the sides of the cars and makes it only necessary to heat the section of the kilns above the top of the cars.

The burners which furnish the heat for the process are set at various distances throughout the middle portion (about 100′) of the kiln. The roof of the kiln is raised at each set of burners and a reverberatory arch put in to deflect the flame down on to

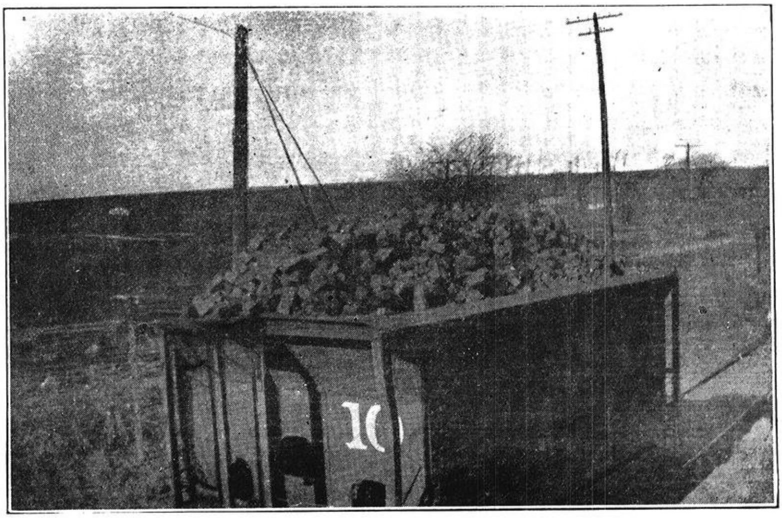


Plate X.

the briquettes. Air for the combustion of the gas is supplied by means of small fans at the end of each kiln and the burnt gases are taken off by means of one large stack, the pull of which is aided by a suction fan.

When a car of bricks enters the kiln, a door is at once shut behind it and it is then in a temperature of about 1,000° F. As other cars are pushed in and this car nears the burners the temperature gradually rises until, when the first combustion chamber is reached, the briquettes are at a temperature of about 2,000° F. By this time all the water has been driven off, and the carbonate in the ore are changed to caustics. While passing through the various combustion chambers which follow, the briquettes probably attain a heat of about 2,400° F. This effects a sufficient fusion of the ore particles so that when the briquette is cooled it will not be easily broken and may be handled in cars and bins, and eventually charged into the blast furnace without crumbling to any great extent. (See Plates VIII and IX.) Thus the desired change has been effected. A light powdery ore, one easily blown out of the furnace, has been converted into a heavier, larger product, a great percentage of which will remain in the furnace under the most adverse conditions.

During its passage through the kiln, which takes from five to fifteen hours,—depending upon the heat carried, the length of the heating zone, etc.,—the briquette has changed from a moist red brick, weighing about eight pounds, to a hard, dry, black brick weighing perhaps six pounds and having a porosity of about 35 to 40%. Chemically, the water and carbon dioxide gas have been driven off and a small part of the ferric iron oxide (Fe_2O_3) changed to the ferrous state (FeO). By these chemical changes the iron content of the briquette has been raised from about 47% in the ore to about 50% in the finished product.

Since too great a reduction to ferrous state is not desirable for the blast furnace, a blast of cold air is blown upon the hot briquettes as they emerge from the kilns. This tends to change the ferrous oxide formed in the heat of the kiln back to the ferric state by the rapid action of the oxygen upon the hot briquettes. This also cools the briquettes somewhat and they are thus more easily dumped, on a tip track, into large cars which convey them to the furnaces. (See Plate X.)

The greatest cost of this operation is that of the fuel used. In the present instance the use of the excess gas from the coke plant at Mayville makes this moderately low, and another plant of this kind uses natural gas with excellent results. But only in special cases and under the best conditions does the process become practical from a financial point of view.

THE RELATION OF THE ENGINEERING GRADUATE TO TECHNICAL JOURNALISM.

By E. T. Howson,

Engineering Editor, Railway Age Gazette, Chicago.

It has been the history of practically all professions and industries that the period of most rapid development in each particular line of activity has been accompanied by a corresponding growth in the scope and influence of the trade papers serving that field, each mutually helpful and assisting in the development of the other. This has been especially true in the engineering profession where the technical journals have been a very important agency contributing to its rapid expansion during the past ten years. The engineering profession is unusually well served in this regard and there are today a number of excellent papers devoting their attention wholly or in part to this field.

The influence of the technical journal in the engineering field is not always fully realized. Its important position can perhaps be best illustrated by attempting to imagine the conditions which would exist if there were no trade papers. A person desiring to know the latest developments in the use of wood block paving, for instance, would then have to wait until the next edition of Baker's "Roads and Pavements", or some similar book was published after an interval of perhaps five years. Even then, it is not entirely clear just where the authors of these various books would learn of the developments which should be incorporated in their revised editions if there were no papers in their field.

The first essential of any technical journal is accuracy. Above all, material appearing therein must be accurate. However, scarcely secondary to accuracy, is the news element. The successful wide awake paper not only describes new developments in the profession accurately, but prints this information while it is news. No matter how accurate and thorough an article on the construction of the Brooklyn bridge may be, it will not now receive the attention of the engineer to the extent that an equally accurate article describing the proposed methods of erection of the Quebec bridge will. The technical journals spend large sums of money to present information promptly so that their readers may be informed of the latest developments at all times. Several journals even publish elaborate daily editions at the times of the annual conventions of the important associations in their fields in order that their readers may have complete reports of these conventions without waiting for the regular weekly edition.

THE ENGINEER AS A READER OF A TECHNICAL JOURNAL

The relation of the engineering graduate to technical journalism may be that of a reader, a contributor, or an editor. Considering the large body of engineers, the relation as a reader is obviously the most important. It is perhaps entirely natural for the engineering graduate to feel that, after spending four hard years with his text books, there is little more to be learned on those subjects and that he has all the information necessary for his future success in his profession. The years immediately following graduation are a more or less critical period for the graduate as habits formed during the first few years of his business career are very apt to have a marked influence upon his later success. The graduate is very apt to fail to realize that the engineering profession is continually advancing and that for this reason text books begin to become out of date the day they leave the hands of the author for the print shop. As a result, if he relies upon his text books alone, he soon falls behind.

The technical paper is the medium which supplements his text books and enables him to keep abreast of the times. If the paper is properly edited, he will find there the latest developments in any branch of his work. Therefore, the engineer who keeps in touch with the progress in his special line must read regularly, those technical papers devoted to his specialty. It is an instructive fact in this regard that the most active supporters and the most regular readers of technical papers are those engineers ranking among the leaders in their fields. The extent to which these men rely upon their technical journals is evidenced by the number of inquiries by telephone and messenger which the important papers regularly receive if for some reason, the paper is not received at the regular time. In this connection, one will note that most of the technical papers are published late in the week in order that they may contain as late news as possible and still reach the majority of their subscribers on Saturday so that they can be read on Sunday.

After deciding that he should subscribe for a technical paper, the problem is to select the one or more, best suited to his particular needs. This is a day of specialization in technical papers as in all other lines of industry, and the editorial matter in the columns of each paper is prepared for a particular class of readers. The demands for space are such that no paper can properly cover the entire field of engineering. One paper, therefore, specializes in municipal work and devotes the larger portion of its space to sewerage, paving and water supply; another specializes in structural designing and construction; a third is devoted to the construction and operation of electric railways; another to steam railways, etc. Therefore, to secure the most for his money, the engineer should select the publications which most completely cover the particular field he is interested in.

In making his decision the subscription price is frequently very unwisely the primary consideration. If the reader secures any benefit at all from a publication, this benefit will exceed in value the subscription price many times over. It is a well known fact that no technical paper could exist if dependent upon subscriptions alone, and that the far greater proportion of its revenues are derived from the advertising pages. The advertiser desires to reach a certain specialized class of readers interested in his equipment, and advertisers are coming more and more to study the subscription lists of the various papers before placing their business. It is for this reason that the more progressive trade journals are endeavoring to make their subscription rolls 100 per cent complete among possible buyers in their field and they frequently spend several times the subscription price to secure such subscriptions, while on the other hand, they do not attempt to solicit subscriptions to any extent among those who have no influence in the purchase of materials. If the publishers themselves concentrate their energy in their particular field to this extent, the engineer should exercise equal care in selecting his paper.

The benefits to the engineer of regularly reading a technical paper may be direct or they may be indirect and intangible. Many times one will find an idea directly applicable to his own work, enabling him to save the price of the subscription several times over. The intangible results are fully as valuable, even if indirect. No engineer can regularly read the editorials and descriptive articles in a properly edited paper without materially increasing his knowledge on this subject and being influenced thereby. The influence of the daily press in public affairs is commonly realized. The strength of the properly edited technical paper is no less important in its more limited field.

THE ENGINEER AS A CONTRIBUTOR TO A TECHNICAL JOURNAL

Of less general application but scarcely less important to the relation as a reader, is that as a contributor to a technical journal. All technical publications are dependent to a large degree upon contributed articles. Obviously, it is impossible for any paper to maintain a sufficient staff to properly cover all the ramifications of even a highly specialized field in a country as large as ours. The extent to which the various papers rely upon contributed articles varies widely. On some journals the editorial staff is limited to three or four men who spend nearly all their time in the office editing contributions for publication. On other journals as many as 15 experienced technical editors are employed, each spending a large portion of his time visiting important work and writing his own articles.

However, there are several reasons why the engineer should contribute to his technical papers whenever he has information of value to the profession. In the first place his duty to the profession should prompt him to give out the details of any method by which he has secured beneficial results so that other men similarly situated may have the benefit of his experience. This broad minded spirit is becoming increasingly evident from year to year and has undoubtedly exerted an important influence in the broadening and strengthening of the entire engineering profession. It is unfair to his associates for anyone to be a sponge, absorbing the good ideas of his fellow members but refusing to give up any of his own.

Aside from this public spirited policy, the rewards of contributing to the trade journals are also real. The beneficial effects to the author of a well prepared instructive article are not fully realized in general. Those engineers in private practice realize this advantage more than those in the employ of other men, although the value is just as great here as elsewhere. It is true that this can be overdone until it becomes mere publicity, a problem with which all editors have to contend. However, a well written article upon a subject of general interest is certain to reflect credit upon the author and to call him to the attention of other engineers. Very frequently an employer has been attracted by an article appearing in a paper, with the result that the author has received a flattering offer of advancement. One high railroad official has frequently stated that he can trace every important promotion to articles he has written. I have personally known of a number of such instances within the past few years.

Another benefit of writing is that resulting from concentration of thought upon one definite subject. It is the common experience that in properly preparing the description of a piece of work, questions arise which were unthought of while the work was in progress and points will be raised which will lead to further investigation and study.

THE ENGINEER AS AN EDITOR OF A TECHNICAL JOURNAL

The third and most limited relation is that of editor of a technical journal. While the number of engineers who have entered editorial work within the past few years has grown rapidly, the field still is and must necessarily remain, very limited, and the proportion of engineers who will engage in this work will always be small.

The principal requirements of an editor are a thorough knowledge of his subject and an ability to write clear, concise English. In daily paper and magazine work, the ability to write good English is the important essential. While also important in technical journalism, it is secondary to a knowledge of the subject. It is vastly more important that an editor know his field thoroughly, for he is expected to lead in the many technical problems of the day. For this reason the engineering student who aspires to this work has little opportunity of entering it directly from college and is handicapped if he does so. It is a general practice of the larger papers to draw their men from the ranks of the field they serve, giving preference to technically trained men with several years of practical experience. Therefore, a student who plans to enter technical journalism should consider a few years of actual experience in his profession as an essential part of his journalistic preparation.

The rewards vary widely. In direct monetary results they compare favorably with other branches of engineering. In opportunities for investigation, wide experience, and acquaintanceship, they are unexcelled. The editor who sits in his office with his scissors and blue pencil has been almost entirely superseded by one who spends a large portion of his time out on construction work in actual contact with engineers in the field, studying their problems with them and gaining the results of their experience. The opportunity for thus seeing work under all sorts of conditions is invaluable to the engineer, whether he remains in editorial work or returns later to the active practice of his profession.

The Wisconsin Engineer.

EDITORIALS

Class finances have usually been handled in a manner that was not sufficiently open or business like to prevent suspicion. After some of our past treasurers have left school, we find bills coming up that should have been paid by them, or at least if there was a lack of funds they should have made this fact known, and shown the reason for this lack. To avoid the unpleasant whisperings that always occur when such things happen, the conference has devised a scheme by which the report of the treasurer may be properly audited and published. Like too many of the conference rulings that are made, placed in the minutes, and forgotten, this law seems also to be ignored. We feel that the conference should see that their important rulings are lived up to; even if the court doesn't seem to take much interest in enforcing student legislation. The general feeling against student self-government is directly due to the eratic manner in which its rulings are carried out. If the conference does not shake off its phlegmatism, its life will surely be held in the balance—and found wanting.

Many of our alumni will take interest in reading the short article by Prof. Mack concerning the "Summer Problem for Engineers" that was once required for graduation. This problem required about the same amount of work as does the ordinary thesis. One of the advantages of the thesis over an assigned problem is the fact that a man can work out something in which he is especially interested. The disadvantage of the thesis is that too often the time is too limited to perform a thorough or satisfactory solution of the problem which was undertaken. Though theses have always been looked upon as a burden, we find there are quite a few that add very reliable information to the world's knowledge.

Some time ago one of the professors took his class into the Engineering library where they were given a talk on the method of classifying books. All of us derived considerable benefit from this talk; but many of us had obtained some of the information piece meal, in our effort to find proper references at an earlier time. A talk of this kind will do much to make the library of profit to the Senior; but should we wait until our college course is nearly completed before we get this information? In what better way could a professor of any freshman subject utilize an hour, than by bringing his class into the library for such a talk as Mr. Volk gave us? We hope that the freshman will be able to have this opportunity, and throughout their college course obtain the benefits from an hour so well invested.

This is a decade in which the engineer is coming into his own, for he is being recognized as a man to solve certain peculiar economic as well as theoretical problems. In times past, much of the very important work relating to the economics of production was left to men who had good business judgment, however their lack of technical training handicapped them in the solution of many questions. Today the engineer is not only a technician but he is also an economist and a business man. The various engineering societies are beginning to appreciate this and have drawn up a code of ethics for the professional engineer. When such a code is recognized and lived up to, then may we say for a certainty that the engineer has come into his own.

* * *

AN EARLY PROBLEM FOR ENGINEERING STUDENTS.

In the University Catalogue of 1873–74, page 36, under Department of Civil Engineering, which was then the only engineering department in the University, the following problem was outlined:

During the vacation at the close of the Junior Year, students are required to prepare a Memoir on some selected subject; that for 1874 is: "Water supply for the city of Madison, Wisconsin."

The following is given as a specimen of the projects required for the degree of Civil Engineer: "Project for the location and building of a railroad." The road to begin at the East Madison depot, in the city of Madison, and run to the depot in the town of Oregon, distance, 10 miles. No gradients greater than $\frac{1}{2500}$ and no radius of curvature less than 600 feet. Double track with a gauge of three feet. Distance between tracks five feet, and five feet between outside rail of track and the sides of the excavation or embankment. Slopes of embankments two to one, and cuttings one and one-half to one. Ballast of broken stone. Proper provision made for the passage of public and private roads and water courses.

Full specifications and estimates for each class of work.

Suitable profile and cross-section drawings of the road.

The Memoir, by reference to the specifications, estimates and drawings will give a complete history of the work from its beginning to its completion.

It is probable that an extensive problem of this nature was in effect the same as the present day thesis.

The opening paragraph under "Department of Civil Engineering" is as follows:

"The object of this department is to give students such instruction in the theory and practice of Engineering as to fit them, after a moderate amount of practice in the field, to fill with credit the most responsible positions in the profession of the Civil Engineer."

This definition of the purposes of an engineering course would be exceedingly difficult to improve.

—JOHN G. D. MACK.

* * *

"STUFF"

I. A. BICHELHAUPT.

Having just spent a couple of days (and nights) trying to catch up in our work, we sit down with considerable eclat to worry the typewriter for a few minutes. It has occurred to us that since the weather is too cold for another Ampere hunt, that we might fill a couple of pages in this issue with a little semi-serious dissultation on "Why is An Engineer". Now, this may sound like an initiation into the famous society of A. S. M. E. —but it ain't. Again it may sound like a Freshman theme—and we know positively that if it was it would come back with red marks all over it. However, it is neither. It is rather a learned review of the mental processes of an average fellow who left home and mother to become an Engineer. Everybody join in on the chorus and ladies kindly remove their hats.

OUR BROAD ENGINEERING COURSE

The average student enters the Engineering School in a chaotic frame of mind. Perhaps he was advised by his parents —perhaps he has a natural leaning towards the profession—or perhaps he does it merely as a mercenary investment. At any rate he is a little doubtful as to the outcome. His class mates, his advisor, and his friends all tell him that he is up against a stiff proposition. To him it is all vague—a sort of a mlll through which he must flounder and in four years come out an accredited engineer. The chances are that he does not know exactly what an engineer is. He suspects that he has merely to show his degree to the world and immediately assume the title.

As the course opens up to him he begins to see its possibilities both for success and failure. But the tendency is to slide through rather than to prepare for his career. The foundation work is monotonous and he looks forward to the latter years when he may start on the subjects taking up special engineering work and practice. As he goes on, instead of becoming simpler, his work becomes more vague. He realizes how much there is that he is missing and in his efforts to learn everything, learns nothing. At this point the average student is apt to cultivate the feeling which may be best expressed by the words, "Oh, what's the difference—as long as I get through." And now is the time when professional interest must save him. This interest comes from practical work not theory. Now is the time to give the student research work to develop his pride in his profession. It is only human for man to prefer to explain rather than to be taught. Let the student take up research work that will cause him to feel that, in his small way, he is doing something that will be recognized and studied by others —even his superiors. If one student can explain something to another student or even to a professor, it causes him to expand—to grow mentally and rise to the occasion with the best there is in him.

Consider, for example, the cheerful frame of mind in which you, yourself, left the class room after having been given a chance to explain to the professor and class some phase of practical work which you had been fortunate enough to do.

And then comes the application of this self confidence and ability in the real technical work which one meets with after school. You learn to meet difficulties and to stand on your own feet in consultation. Sometime ago I heard a shop superintendent chuckling over the fact that his eighty dollar a month foreman had erected a hundred and twenty-five ton crane in thirty-six hours after a recently graduated engineering student had spent four days trying to perfect a way to do the job. And still a fair minded man could hardly use such an instance as an argument against a college education. One could not expect a college to include the erection of a big crane in its required course. This education can only give us the elements and principles of engineering; the rest lies in our ability. Such an education can however develop the analytic and creative in us and can prepare us to meet such original work and select the correct principles of procedure. The details and labor saving schemes must come through experience.

Clear and conservative thinking is the keyword to success. Suppose for instance, that in the class-room you learn to discourage a certain type of installation. A while later, you are bravely talking to some old and practical engineer, trying to make a good impression. He mentions this installation and perhaps comments favorably upon it. You hasten to disagree but when it comes to giving real reasons you can't do it. The old-timer can mention instances in which this certain installation has made good. You can merely give the impression which you received in the class-room—a sort of a vague idea that the installation is wrong. But you can't give cold facts because you don't know them. There you have it; practical versus theoretical. The outcome is usually that you close the subject feeling more than ever the deficiencies of your education. But was your education deficient? No—you were right; you know you were, but you couldn't prove it, because you hadn't thought it out. You hadn't applied the principles of reasoning to your education. You had learned it as a lesson rather than a fact, and when this particular thing was mentioned you rushed in with a hasty statement that you could not back up.

It seems that courses in thought—Psychology, Logic, and Analysis—would help the average student. We pay to much attention to formulated facts and technical experiments rather than to the hypothesis and reasoning ability which the successful man, regardless of his profession, should have.

And then to be able to think for other people, to follow their thought and views is a valuable acquisition. In shop management one must feel and think the emotions and thoughts of the men under him. To keep them contented and up to the highest pitch of efficiency he must foresee their needs—their difficulties and meet them before rather than after it is too late.

In short, Engineering is a broad subject. The successful engineer is not a mere machine—an ultimate of efficiency. He is a seeing, thinking, reading, literate and broad man. He must balance efficiency, system, and technical tendencies with the Literature, Psychology, and Art.

* * *

We received the accompanying poem from Mr. P. W. Beasley, in Laidlaw, Oregon, and we take this opportunity to present it to our readers. Of course there are all sorts of poems about Engineers, but we feel as Mr. Beasley did, that this one is unusually good.

THE HOBO ENGINEER.

I sometimes think I'll quit this life
And settle down and take a wife, by Jove!
Sometimes I think that I would love
To have some place I could call home,
And settle down, no more to roam.
But Hell! that very thing I tried,
And found myself dissatisfied.
I've often tried to settle down
To office work and live in town,
And act like civilized folk do—
Take in the shows and dances, too.
But I'd no more than get a start
Than "Wunderlust" would sieze my heart;
And in my night dreams I would see
The great "white silence" calling me;
And at the chance I'd never fail
To drop it all and hit the trail
Back to the solitudes again.
With transit, level, rod and chain,
To lead the simple life once more,
And do the same thing o'er and o'er
Day after day, week after week.
Sometimes we go to town to seek
A little fun and, sometimes—well,
Sometimes we raise a little Hell.
We don't mean to, but then you see,
When we've been out two months or three
In silent places, where the face of

Of white men seem so out of place,
Well—when we hit the "Great White Way"
Our joyful spirits get full sway.
We try to crowd into one night the
The joys of many nights. 'Taint right?
Well maybe not. 'Tis not for me
To shape out final destiny.
But when our last survey is done,
And tied into the "Great Unknown",
And to the Chief our records brought
Of lonely work with danger fraught,
Of hardships cheerfully endured,
That best results might be secured.
Against all this our little sprees
Will seem as ponds compared to seas.
And angels surely will decide
There's a balance on the credit side;
And God, I think, will drop a tear
And bless the "Hobo Engineer."

I. A. Bicklehaupt.

We just had a long talk with the Worthy Editor and he convinced us that it was time to get our copy in for next month. Be that as it may—he won the argument. Watch our concentrated cloud of dust.

The first thing at hand which needs attention is a deep throated plea on the part of the oppressed student for uniform and symmetrical notes from the faculty. A great many of the upper-class courses have adopted the practice of giving out stereotyped copies of notes on the lectures. This is a very laudable project and its advantages need not be extolled in this article. However, these notes are copied upon paper which runs towards exceptional lengths. The result is that the student, in placing these notes in an ordinary loose-leaf note book has to either spend a good bit of valuable time trimming the paper down to the proper length or else has to fold under the ends of the paper. Withall it results in an untidy notebook. This is not written in a critical vein as much as in a suggestive way.

Desiring to please those of poetic nature we submit the following. It speaks for itself and can be quoted most admirably in any technical address or after-dinner talk. All rights reserved as to publication.

The Engineer
Is not the weir
Who's satisfied with learning
'Bout ancient kings,
And other things,
Or deep artistic yearning.
Nor does his thought
Amount to naught,
But straight aesthetic culture—
His mind's not turned,
To things more learned,
Or barn-yard agriculture.
His mistress cruel,
The long slide-rule,
He worships night and day;
And when he's done,
He has his fun,
And then he hits the hay.

MORAL: We may graduate and we may not.

* * *

The other day a bunch of representative fellows happened to drift together and in talking over the affairs of the school, the matter came up as to whether the engineers carry their part in the activities incident to a University of this size. The result of the discussion is immaterial. The theme of the discussion is all-important.

Do we or do we not assume the responsibilities in student government, student discipline, and student society that we should? Are the Engineers too wrapped up in their profession to attend to the moral and social obligations of college life? Do our opinions and politic beliefs count for anything in the eyes of others?

It seems so.

Inquiry shows that all political moves, such as class elections, etc., seek recognition in the Engineering school. Also inquiry shows that the men set forth by the Engineering school to represent then in politics and student government have been and are men of serious intent—men who enter the activity not for empty honor but to do things and to do these things in a fair-minded manner. The Engineers are well represented in dramatics, in press work, and in athletics. In short, compared with the other schools on a proportional basis of men enrolled, it leads. Let's keep it up.

* * *

Why not have another of those big faculty-student smokers. The last one was eminently successful, thanks to the efforts of a few. Let's have another one this semester and make it a traditional affair.

* * *

We're sorry that we can't kick in with any of our famous class-room jokes this month—but Bill Miller and Admiral Dewey both plead overwork. Remember that these boys have not got a monopoly on the funny stuff. All contributions will be gratefully received.

* * *

Desunt Non-nulla. I. A. B.

* * *

DEPARTMENTAL NOTES.

DEPARTMENT OF MINING AND METALLURGY.

Since the death of the late Professor F. T. Havard last spring, a long and thorough canvass of the metallurgical field has been made to find a suitable successor. After consideration of a number of men eminent in the profession, the choice finally narrowed to Richard S. McCaffery, who comes to us this semester as Professor of Metallurgy.

Professor McCaffery was born in New York, June 2, 1874. After three years of academic work in the College of the City of New York he went to the Columbia School of Mines, graduating in 1896 with the degree Engineer of Mines. Then followed twelve years of active field work, embracing an unusually broad metallurgical experience. Beginning as assayer and chemist with the Establecimento Mineral at Casa Palca, Peru, his subsequent work as Superintendent of the Copper Corporation of Chili at Chanarel, Superintendent, and later, Manager of the Santa Fe Copper Company, New Mexico, then as Manager of the Salt Lake Copper Company and General Superintendent of the Tintic Smelting Company, Silver City, Utah, gave him wide practice in the design, erection and operation of plants producing copper and associated metals.

In ferrous metallurgy Mr. McCaffery was for a year personal assistant to Mr. Henry M. Howe, engaged in iron and steel research work, and alter became General Manager of the Glamorgan Pipe and Foundry Company, operating plants at Lynchburg and Radford, Va., where he instituted important improvements in casting practice.

In addition to his operating practice, he has done considerable consulting and examination work at mining and metallurgical properties in various parts of the United States and abroad.

In educational work, Mr. McCaffery was for a year assistant in Metallurgy at Columbia University. In 1908 he was called to the University of Idaho as Professor of Mining and Metallurgy to re-organize and develop those courses, and in the past five years has accomplished this with notable success. From this work he comes to Wisconsin.

Professor McCaffery is a man whose teaching ability, technical attainments and sincere, sympathetic personality will command the respect and affection of those associated with him, and the College of Engineering, and especially the Department of Mining and Metallurgy, are fortunate in being able to add his strength to their staff.

WITH THE ALUMNI.

The new Engineer Alumni Directory is completed at last, and will be ready for distribution about the first of April. The names, this time, are arranged alphabetically instead of under the .arious courses as had been previously done. Every bit of information is strictly up-to-date and as reliable as the most untiring efforts of Professor Disque could make it. No less than three different sets of reply cards were sent out to the alumni who did not respond; and out of the list of about seventeen hundred names, there are not more than twenty which were not heard from and consequently not listed. This directory offers the alumni a splendid opportunity to get together even after college days are over. *The Wisconsin Engineer* will be pleased to hear from any of the alumni and then tell the others what those alumni are doing.

* * *

C. E. Head, '13, is Assistant Manager of the Head-Simmons Publishing Company, Kenosha, Wisconsin.

C. W. Hejda, '04, has the position of Engineer and Chief Inspector of the Bureau of Fire Prevention and Public Safety at Chicago.

J. G. Zimmerman, '04, is a Research Engineer for the Thordarson Electric Mfg. Co., Chicago.

F. Zeidlback, '10, is now at Pendleton, Oregon. He is in charge of the construction of the plant for the Pendleton City Water Works.

H. B. Wheeler, '09, is with the National X-Ray & Reflector Co., Chicago.

J. H. Thickens, '08, is director of the laboratories of the Beaver Board Company at Buffalo, N. Y.

H. H. Stoelting, '12, is among the fortunate young engineers to get an interesting and important position. He is the engineer in charge for the Jos. Hanreddy Co., who are constructing the new intake tunnel for the Milwaukee Water Works.

L. E. Spray, '12, is a Signal Draftsman for the A. T. & S. F. Ry. at Topeka, Kansas.

G. A. Scarcliffe, '11, is with the Brazilian Iron & Steel Co., Ouro Preto, Brazil.

J. D. Sargeant, '07, is with the Chain Belt Co., Milwaukee, Wis.

H. F. Lutze, '08, is doing general engineering work at Los Animas, Colo.

R. H. Kroening, '12, is a member of the Eson-Kroening Construction Co., Milwaukee.

C. Hinrichs, '09, is the Chief Engineer of the Seattle Construction and Dry Dock Co., Seattle, Wash.

E. R. Hoffman, '12, is with the Washington State Highway Dept., Olympia, Wash.

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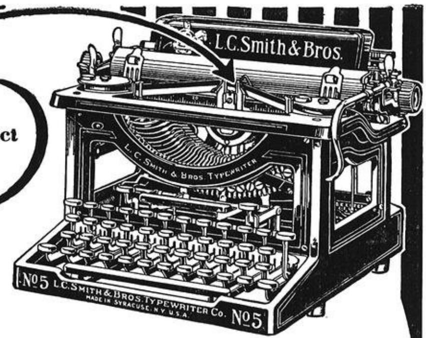

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